

# **Free Trade Agreements and the SADC Economies**

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## I. Introduction

Countries in Southern Africa have engaged in a variety of trade liberalization initiatives. For example, South Africa and the European Union (EU) negotiated a free trade agreement (FTA) in 1999, after more than two years of contentious negotiations. Because of South Africa's predominance in the sub-region, the implementation of this agreement will have an impact on trade flows in the rest of Southern Africa. The South Africa-EU FTA will also affect other regional trade initiatives. It has strained discussions over the formation of a free trade area within the Southern African Development Community (SADC), of which South Africa is a prominent member.<sup>1</sup> It also raises questions regarding the continuing viability of the South African Customs Union (SACU) arrangement by which customs revenues are shared amongst South African and its smaller neighbors (Botswana, Lesotho, Namibia, and Swaziland).

Independent of these regional trade agreements, the EU recently agreed to unilaterally liberalize trade with African countries in an effort to stimulate economic growth in the region. The proposal extends other programs such as the Lome Accords by which developed countries open their markets to products from developing countries.

In addition to participating in regional trade agreements, countries in Southern Africa are also members of the World Trade Organization (WTO) and therefore have an interest in multilateral tariff negotiations. Prior to the WTO, developing countries were often at the periphery – OECD countries set the agenda for multilateral tariff reforms and the interests of developing countries were considered only after the major countries reached agreement on their issues. To be effective members of the next WTO round of negotiations, developing countries must be able to evaluate the economic consequences of different WTO agreement. Developing countries should also create alliances with respect to their main export and import commodities and the markets they approach for their exports.

While the eventual configuration of trade agreements in Southern Africa will be driven by a variety of political considerations as well as negotiated outcomes, it is also useful to provide some quantitative benchmarks against which different arrangements can be compared. This paper offers a preliminary empirical assessment of the impact on South Africa and the rest of Southern Africa of the various regional integration and liberalization arrangements recently agreed to or currently under consideration:

- (1) What is the impact of the EU-South Africa Free Trade Agreement (FTA) on trade welfare, and economic structure in South Africa and the rest of Southern Africa?
- (2) What are the gains to the rest of Southern Africa of joining the EU- South Africa FTA and on what terms?
- (3) Can South Africa serve as a growth pole for the region?

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<sup>1</sup>The Southern African Development Community (SADC) includes Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe.

- (4) How does the EU's unilateral tariff elimination compare to an FTA with South Africa and the rest of Southern Africa?
- (5) How does a FTA with the EU, South Africa and the rest of Southern Africa compare to the gains from global tariff reduction?

We approach these questions using a multi-country, computable general equilibrium (CGE) model to analyze the impact of trade liberalization on countries, sectors, and factors. Our model consists of fourteen linked country/region models. To focus on trade flows among countries in Southern Africa, we have seven countries in the region (South Africa, Botswana, Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe), the rest of SADC, the rest of Sub-Saharan Africa, and five others (European Union, High-Income Asia, Low-Income Asia, North America, and Rest of World). Each country model has seventeen sectors and two labor types, and is linked to all other countries through explicit modeling of bilateral trade flows for each traded sector.

We use the model to simulate a series of alternative scenarios, starting with the impact on the EU and South Africa of the recently signed FTA between those two countries. Then we consider the effects of expanding this agreement to include the rest of Southern Africa (Botswana, Malawi, Mozambique, Tanzania, Zambia, Zimbabwe and the rest of SADC), either by entering a parallel FTA with South Africa or by including all countries in the FTA. To indicate the importance of trade within this region, we also consider the effects of multilateral tariff reduction by 50 percent, rather than the regional FTA. Finally, we describe the effects of the EU's recent initiative to unilaterally eliminate tariffs and non-tariff barriers against all African countries.

It should be stressed that our empirical results should not be interpreted as "predicting" or "forecasting" what the different alternatives will bring. As will be evident, our representation of the different possible arrangements will be quite crude. For example, in the EU-South Africa free trade scenario, we assume all tariffs between the two economies are immediately set to zero, rather than phased in over time and with some exclusions; we also make no attempt to capture the other dynamic effects that should be associated with such an agreement, such as increased investment flows, changing production technologies, or skill upgrading. We focus instead on understanding the impact on trade, production, and resource allocation that might occur if different changes in tariff structures were imposed.

The next section provides an overview of the economic structure, trade linkages, and protection structure among the countries used in the model. Section three presents the main feature of the Southern Africa CGE model. We discuss empirical results in section four. Section five presents the conclusions.

Figure 1a: SADC GDP

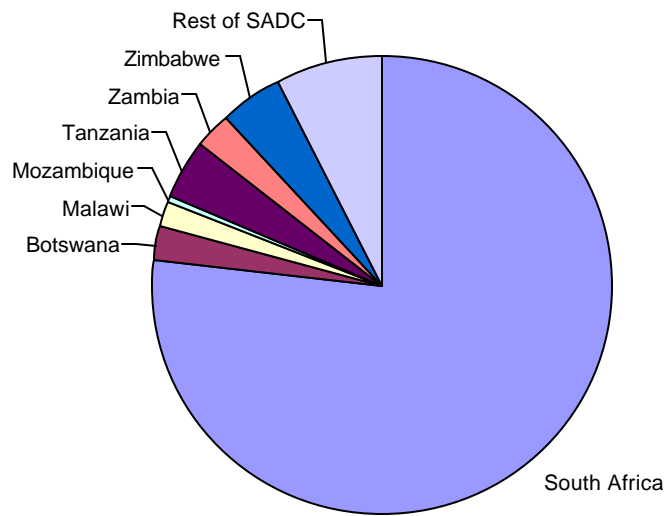


Figure 1b: SADC Exports

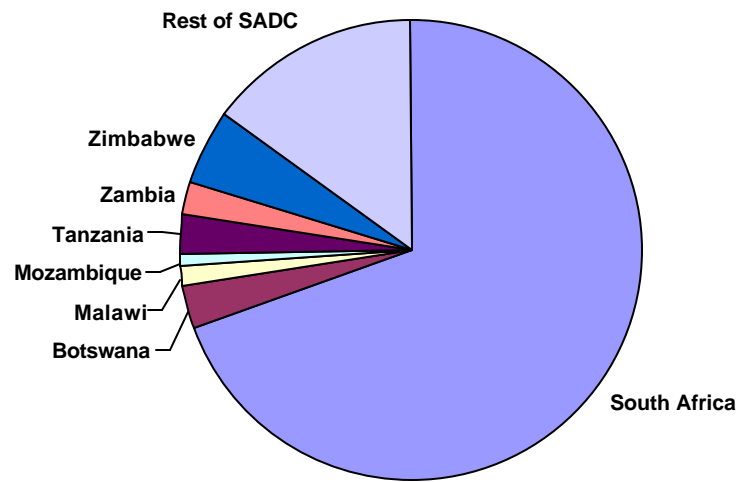


Figure 2a: EU and African GDP

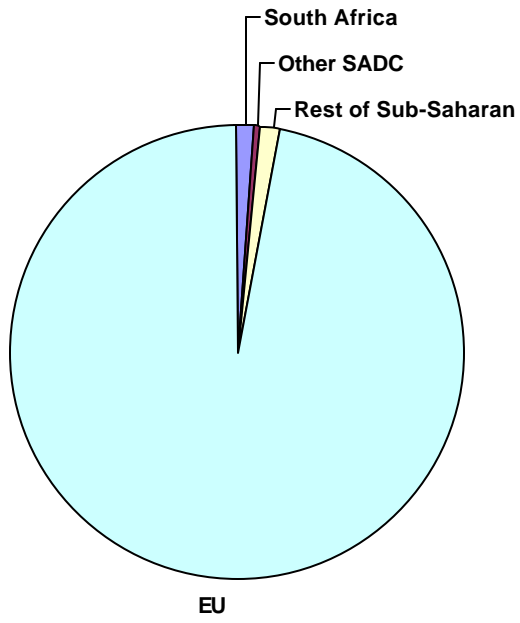


Figure 2b: EU & African Exports

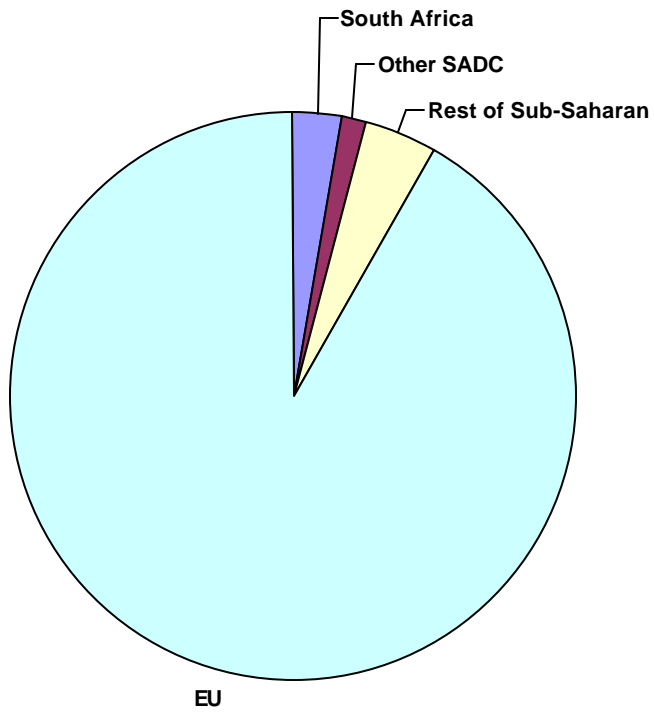


Table 1: GDP, Trade Dependencies, and Value Added

	South Africa	Botswana	Malawi	Mozambique	Tanzania	Zambia	Zimbabwe	Rest of SADC	EU
GDP and Trade Flows (billion US \$)									
GDP	132.837	4.363	2.866	1.381	7.011	4.135	8.008	12.918	9770.843
Exports	33.297	1.577	0.630	0.382	1.314	1.093	2.568	7.170	1052.925
Imports	31.107	1.031	0.549	0.911	1.963	0.968	3.147	5.210	912.372
Trade Dependence (percent)									
Export/GDP	0.251	0.361	0.220	0.277	0.187	0.264	0.321	0.555	0.108
Import/GDP	0.234	0.236	0.191	0.660	0.280	0.234	0.393	0.403	0.093
Factor Share in Value Added (percent)									
Land	0.006	0.008	0.038	0.042	0.044	0.029	0.018	0.011	0.003
Unskilled Labor	0.398	0.311	0.443	0.420	0.489	0.393	0.383	0.297	0.346
Skilled Labor	0.194	0.146	0.102	0.140	0.063	0.102	0.149	0.127	0.231
Capital	0.389	0.528	0.408	0.390	0.392	0.463	0.444	0.473	0.418
Resources	0.013	0.006	0.009	0.009	0.012	0.013	0.005	0.092	0.002
Share of labor in agriculture									
	0.027	0.072	0.316	0.349	0.556	0.285	0.141	0.119	0.034

Source: Southern African Model data base derived from GTAP v5, prerelease #1.

	South Africa	Botswana	Malawi	Mozambique	Tanzania	Zambia	Zimbabwe	Rest of SADC	EU
Percent of total output									
Grain	0.6	0.8	7.6	3.7	9.5	4	1.8	1.3	0.3
Fruits & Vegetables	0.8	1.9	2.4	5	6.7	1.5	1.5	1.7	0.6
Other Agriculture	0.4	0.1	15.3	5.9	8.4	5	8.8	2.2	0.4
Livestock	1.9	1.6	1.3	1.7	2.1	2.1	3.2	1.6	1.3
Forestry & Fisheries	0.6	0.2	2.3	3.3	3.9	4.5	0.3	0.7	0.4
Energy & Mines	3.6	3.5	0.5	0.3	1.2	1.3	3.5	19.1	0.3
Food Processing	6.8	10.1	10.3	11.2	15.3	11.8	11.9	7.9	5.7
Textiles	1.6	1	1.3	0.7	0.4	1.8	3.6	4.3	1.1
Apparel	0.6	0.5	1.5	0.4	1.9	1.5	0.8	2.9	1.2
Wood & Paper	3.8	2.8	3.2	0.7	1.4	2.2	1.8	1.3	3.5
Basic Intermediates	12.1	3	6.4	1.6	4	9.5	10.2	5.3	2.9
Machinery & Equipment	10.1	8.8	3	1.4	1.7	3.5	5.7	5.6	16.1
Utility	5.9	2.2	2.8	2.7	2.4	5.7	1.6	1.7	1.9
Construction	5	18.4	1.6	9.1	4.2	5.8	8.1	7.5	7.3
Trade	18.4	14.5	25.2	24.6	20.1	20	15.7	15.4	18.1
Dwellings	14.8	13.4	12.1	12.6	10.4	13.6	10.3	9	25.1
Public	13.1	17.2	3.4	15	6.4	6.1	11.2	12.5	13.9

Source: Southern African Model data base derived from GTAP v5, prerelease #1.

Table 3: Export Shares									
	South Africa	Botswana	Malawi	Mozambique	Tanzania	Zambia	Zimbabwe	Rest of SADC	EU
	Percent of total exports								
Grain	0.8	0.5	0.6	2.2	0.8	0.3	3.1	0.0	0.2
Fruits & Vegetables	3.0	7.3	0.8	7.3	6.2	1.0	2.0	0.2	0.5
Other Agriculture	0.7	0.3	66.8	8.0	28.0	4.1	38.1	0.2	0.2
Livestock	0.7	0.2	0.0	0.1	0.9	0.1	0.4	0.0	0.2
Forestry & Fisheries	0.6	0.2	0.1	3.2	0.8	0.2	0.3	0.1	0.2
Energy & Mines	9.2	14.9	1.8	1.1	0.0	1.6	3.2	56.0	0.5
Food Processing	5.3	23.8	4.2	32.9	9.6	3.8	8.1	9.0	5.1
Textiles	1.7	4.8	3.4	2.5	1.5	4.1	2.5	6.1	2.3
Apparel	1.8	1.6	3.3	1.0	1.7	0.3	2.7	8.2	2.4
Wood & Paper	4.8	7.2	0.3	1.0	0.8	0.2	3.2	0.2	3.0
Basic Intermediates	36.1	6.7	0.3	2.4	2.1	53.4	13.9	0.6	14.8
Machinery & Equipment	17.7	15.9	0.9	7.3	5.5	4.1	7.4	7.8	40.2
Utility	1.2	0.1	0.1	8.1	0.1	9.4	0.0	0.0	0.3
Construction	0.1	0.5	0.5	0.7	0.4	0.5	0.5	0.2	1.0
Trade	9.4	8.4	8.9	11.7	20.4	8.9	7.8	5.1	17.3
Dwellings	6.1	6.8	7.2	9.4	18.8	7.2	6.3	6.1	10.7
Public	0.8	0.8	0.8	1.1	2.0	0.8	0.7	0.3	0.9

Source: Southern African Model data base derived from GTAP v5, prerelease #1.



Table 4: Import Shares									
	South Africa	Botswana	Malawi	Mozambique	Tanzania	Zambia	Zimbabwe	Rest of SADC	EU
	Percent of total imports								
Grain	0.5	0.8	0.3	4.0	1.4	0.8	1.6	0.7	0.8
Fruits & Vegetables	0.4	0.3	0.3	0.3	0.7	0.2	0.3	1.2	1.5
Other Agriculture	0.5	1.0	0.7	0.5	0.3	0.2	1.2	0.5	1.9
Livestock	0.2	1.0	0.0	0.0	0.1	0.2	0.2	0.4	0.5
Forestry & Fisheries	0.1	0.2	0.1	0.0	0.2	0.1	0.1	0.2	0.6
Energy & Mines	4.9	1.6	1.5	0.5	3.8	7.2	0.4	0.5	4.4
Food Processing	4.4	10.3	2.1	5.8	11.8	1.5	3.0	11.1	5.1
Textiles	2.9	2.2	3.9	4.7	3.3	3.3	4.0	9.3	3.3
Apparel	2.3	2.4	1.4	4.9	2.9	1.7	0.8	2.1	6.7
Wood & Paper	2.9	1.7	4.9	3.4	2.5	4.3	2.8	3.4	3.3
Basic Intermediates	17.9	34.1	28.1	32.5	15.7	22.2	30.6	12.4	2.6
Machinery & Equipment	48.6	23.5	37.7	31.3	37.3	42	38.3	37.7	36
Utility	0.1	0.7	0.6	3.7	0.2	0.0	6.3	0.2	0.2
Construction	0.1	0.7	0.6	0.3	0.5	0.6	0.4	0.2	1.0
Trade	8.7	9.6	8.5	3.8	12.1	7.4	5.0	11.5	15.3
Dwellings	4.9	8.8	8.3	3.8	6.5	7.3	4.7	8.2	15.4
Public	0.7	1.1	0.9	0.4	0.7	0.9	0.5	0.4	1.5

Source: Southern African Model data base derived from GTAP v5, prerelease #1.

## II. Economic Structure and Trade Patterns

Macroeconomic data for the regions in our Southern Africa simulation model are presented in table 1.<sup>2</sup> There are enormous differences in size, the role of trade, and factor endowments among the regions. As seen in figure 1a, South Africa is the prominent economy in the region – it accounts for almost 70 percent of SADC GDP, followed by the rest of SADC which accounts for 15 percent of regional GDP.<sup>3</sup> The other countries in the region are quite small, each accounts for less than 6 percent of regional GDP. However, South Africa (and Africa in general) is small compared to other major trade partners for the region, as seen in figure 2a. A similar pattern holds for exports – South Africa is the major exporter among the SADC countries, but it is small in the global market when compared to the EU (figures 1b and 2b).

SADC countries are more dependent on trade than is the EU. For example exports as a share of GDP range from 56 percent for the rest of SADC to 19 percent for Tanzania (see table 1). In contrast, the EU exports 11 percent of its GDP. A similar pattern holds for imports as a share of GDP. This high trade dependency means that trade liberalization can induce large structural changes in South Africa and the rest of Southern Africa.

Characteristic of developing countries, the SADC countries (with the exception of South Africa) have a high share of labor in agriculture (see table 1). The extreme example is Tanzania where 56 percent of the labor force is employed in agriculture; the share also large for Mozambique (35 percent) and Malawi (32 percent). South Africa is more like the EU; both have approximately 3 percent of the labor force employed in agriculture.

There are sizeable differences in the production structures among African countries, other developing countries (Low-income Asia and Rest of World) and developed countries (European Union, High-income Asia and North America). The developed countries have a large service sector (an aggregate of the sectors utility, construction, trade, dwellings and public) and sizable capital goods (machinery and equipment) and intermediate sectors (See appendix tables). For the EU, these sectors account for 85.3 percent of total output. Output structure in South Africa and Botswana is more like the EU in that these sectors account for 79.4 and 77.5 percent of output respectively. In contrast, the share of services, capital goods and intermediate sectors is smaller in the other SADC countries, ranging from 49.2 percent of output in Tanzania to 67 percent of output in Mozambique.

With the exception of South Africa and Botswana, primary products (an aggregate of grains, fruits & vegetables, other agriculture, livestock, and forestry & fisheries) are quite important for the

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<sup>2</sup> The data set is aggregated from the GTAP 1997 data set, version 5, prerelease#1. For model regions that are made up of more than one national economy, all figures on exports and imports reported in these tables (and used in the model) refer to trade with economies *outside* that region, and thus exclude trade that occurs among members of the same region. In constructing the regional data sets, this “within region” trade is netted out and treated as another source of domestic demand.

<sup>3</sup> Based on the disaggregation in our data base, SADC refers to South Africa, Botswana, Malawi, Mozambique, Tanzania, Zambia, Zimbabwe, and the region, “rest of SADC” which includes all other SADC economies.

SADC countries (see table 2). They account for as much as 30.6 percent of output in Tanzania, 28.2 percent of output in Malawi, and 19.6 percent of output in Mozambique. In contrast, primary products account for only 3 percent of EU output. Food processing also is an important sector for the SADC economies. It ranges from 6.8 percent of output in South Africa to 15.3 percent of output in Tanzania. In contrast, food processing is 5.7 percent of output in the EU.

International trade theory generally identifies two different types of international trade. Trade among developed industrial countries with similar endowments and technology is largely “intra-industry,” with high exports and imports within sectors, whereas trade between high and low-income economies (with very different factor endowments and technological processes) is largely inter-industry, with more sectoral specialization.<sup>4</sup> With a tremendous range in factor endowments and income levels between the SADC economies and other economies in the model, particularly the EU, there is ample scope for Heckscher-Ohlin forces (based on different factor endowments and comparative advantage theory) to influence trade.

Trade shares are consistent with intuition about international comparative advantage. For example, 40 percent of total exports from the EU are in capital goods, 14.8 percent are in intermediates, and 30.2 percent are in services (see table 3). There is evidence of two-way trade in capital goods and services as each sector accounts for 36 and 33.4 percent of total imports, respectively.

In the SADC countries, trade patterns are consistent with the Heckscher-Ohlin model. For all countries, capital goods and basic intermediates are a large share of total imports (see table 4). In general those commodities are small shares of total exports as well, with the exception of South Africa and Botswana where there is some evidence of two-way trade in these goods (see table 3). Interestingly, 53.4 percent of Zambia’s exports are in basic intermediate goods, with over 70 percent of production in that sector being exported. Typical of developing countries, many of the countries in the region have high shares of primary products in total exports – 68.3 for Malawi, 43.89 for Zimbabwe, 36.7 for Tanzania and 20.8 for Mozambique. Food processing is an important export commodity for Mozambique (it is 32.9 percent of total exports) and Botswana (23.8 percent). Parts of southern Africa is rich in natural resources; reflecting this, export shares of energy and minerals are high for South Africa (9.2 percent of total exports), Botswana (14.9 percent) and the rest of SADC (56 percent). In Botswana and the rest of SADC, a large share of production of energy and minerals is exported (87.3 and 91.6 respectively).

Most general equilibrium analyses of regional economic liberalization focus on the removal of *ad valorem* equivalent price distortions against imports that arise from existing trade barriers and other sources. This is also the primary focus of the simulations conducted in this paper, since the pattern and degree of protection are important determinants of the impacts of trade liberalization. The larger the

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<sup>4</sup>“Intra-industry” in this context refers to the two-way trade between industries that produce commodities that are similar in input requirements and highly substitutable in use, such as similar televisions manufactured by different producers.

Table 5: Sectoral Bilateral Import Tariffs and Non-tariff Barriers (Percent *ad valorem*)

	South Africa	Botswana	Malawi	Mozambique	Tanzania	Zambia	Zimbabwe	Rest of SADC	EU
<i>South Africa</i>									
Grain	0.0	1	0.0	0.0	0.0	0.0	1.1	0.0	0.2
Fruits & Vegetables	0.0	4.6	0.0	0.0	0.0	0.0	4.9	0.0	4.2
Other Agriculture	0.0	1	0.0	0.0	0.4	0.0	0.6	0.0	1
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forestry & Fisheries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Energy & Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Processing	0.0	7.6	0.0	0.0	4	0.0	7.1	4	9.9
Textiles	0.0	11.9	12	12	14.3	10	12	12	12
Apparel	0.0	30.4	31.4	31.3	30	50	25.9	30.8	26.8
Wood & Paper	0.0	5.3	5.3	0.0	16.7	10	4.8	6.1	5.5
Basic Intermediates	0.0	4.7	2.6	3.4	1.4	1.1	3.5	3	3.7
Machinery & Equip.	0.0	7.2	5.1	2.3	4.1	3.4	4.3	3.6	4.6
Total	0.0	7.9	20.8	6.7	2.1	2	4.5	5.4	4.3
<i>Botswana</i>									
Grain	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.7
Fruits & Vegetables	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3
Other Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	1.2
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forestry & Fisheries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy & Mines	16.7	0.0	9	0.0	0.0	0.0	6.7	9.1	3.2
Food Processing	7.4	0.0	0.0	0.0	3.8	0.0	7.4	0.0	9.8
Textiles	12.1	0.0	12	0.0	0.0	0.0	11.4	10	11.9
Apparel	20	0.0	31.4	31.6	0.0	0.0	26.8	50	27.5
Wood & Paper	7.7	0.0	0.0	0.0	0.0	0.0	4.3	0.0	5
Basic Intermediates	3.3	0.0	0.0	0.0	0.0	3	4.2	0.0	3.3
Machinery & Equip.	6.3	0.0	0.0	0.0	0.0	0.0	2.4	0.0	3.6
Total	3.3	0.0	21.6	10.4	1.9	2.1	4.5	4.5	4
<i>Malawi</i>									
Grain	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fruits & Vegetables	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.9
Other Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	4.2	0.0	20
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forestry & Fisheries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7
Energy & Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Processing	50	0.0	0.0	0.0	0.0	0.0	16.4	0.0	13.7
Textiles	14.4	14	0.0	0.0	0.0	0.0	13.6	0.0	14
Apparel	30.8	0.0	0.0	0.0	0.0	0.0	29.1	0.0	28.3
Wood & Paper	5.7	6.3	0.0	0.0	0.0	0.0	5.7	0.0	5.6
Basic Intermediates	5.7	6	0.0	0.0	0.0	16.7	5.4	7.4	8.2
Machinery & Equip.	10.1	11.7	0.0	0.0	11.8	0.0	10	11.1	9.7
Total	8.5	8.7	0.0	0.0	9.5	7.4	7.5	6.6	7

Note: Tariffs are for imports *from* column country *to* row country.

Source: Southern African Model data base derived from GTAP v5, prerelease #1.

Table 5: Sectoral Bilateral Import Tariffs and Non-tariff Barriers (Percent *ad valorem*)

	South Africa	Botswana	Malawi	Mozambique	Tanzania	Zambia	Zimbabwe	Rest of SADC	EU
<i>Mozambique</i>									
Grain	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	2.4
Fruits & Vegetables	0.0	0.0	0.0	0.0	0.0	0.0	34.8	0.0	18.8
Other Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	7.4	0.0	7.7
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forestry & Fisheries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy & Mines	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Processing	0.0	0.0	0.0	0.0	50	0.0	24.3	0.0	33
Textiles	35	34.8	0.0	0.0	0.0	0.0	34.8	0.0	35
Apparel	35	33.3	0.0	0.0	0.0	0.0	33.3	0.0	34.8
Wood & Paper	5	5.6	0.0	0.0	0.0	0.0	7.5	0.0	5.5
Basic Intermediates	9.4	10.6	0.0	0.0	0.0	25	7.8	0.0	8.1
Machinery & Equip.	10.4	8.3	0.0	0.0	0.0	0.0	9.2	0.0	11
Total	13.2	15.3	0.0	0.0	24.6	1.8	10.3	0.0	9.5
<i>Tanzania</i>									
Grain	7.1	0.0	11.1	9.5	0.0	0.0	0.0	0.0	9.3
Fruits & Vegetables	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3
Other Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	10.9	0.0	10.7
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Forestry & Fisheries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2
Energy & Mines	7.5	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.6
Food Processing	16.8	16.5	17.9	20.8	0.0	0.0	11.1	0.0	14.5
Textiles	12.9	9.1	0.0	0.0	0.0	12.5	15.8	0.0	13.3
Apparel	22	0.0	33.3	0.0	0.0	0.0	0.0	0.0	21.2
Wood & Paper	9.4	9.1	11.1	0.0	0.0	11.1	10.9	0.0	9.2
Basic Intermediates	9.7	9.7	6.7	0.0	0.0	8.7	9	9.4	9.5
Machinery & Equip.	6.7	9.4	6.9	16.2	0.0	7.6	7.8	5.9	7.7
Total	9.4	10.3	2.5	15.2	0.0	8.3	9	2.8	6.5
<i>Zambia</i>									
Grain	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0
Fruits & Vegetables	0.0	0.0	0.0	0.0	0.0	0.0	25	0.0	20.5
Other Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	4.6	0.0	8
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7
Forestry & Fisheries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10
Energy & Mines	5.6	8.3	8.4	0.0	0.0	0.0	1.3	8.7	8.4
Food Processing	0.0	0.0	0.0	0.0	25	0.0	12.8	0.0	11.2
Textiles	19.4	19	0.0	0.0	14.3	0.0	18.8	0.0	19.4
Apparel	17.6	33.3	0.0	0.0	0.0	0.0	17.6	16.7	20
Wood & Paper	11.4	10.9	0.0	0.0	0.0	0.0	9.1	0.0	11.9
Basic Intermediates	4.1	3.2	0.0	0.0	0.0	0.0	3.5	0.0	4.2
Machinery & Equip.	7.9	8.6	0.0	0.0	0.0	0.0	8.1	6.7	8.6
Total	7.1	8.5	8.3	0.0	8.6	0.0	4.7	7.8	8.2

Note: Tariffs are for imports *from* column country *to* row country.

Source: Southern African Model data base derived from GTAP v5, prerelease #1.

Table 5: Sectoral Bilateral Import Tariffs and Non-tariff Barriers (Percent *ad valorem*)

	South Africa	Botswana	Malawi	Mozambique	Tanzania	Zambia	Zimbabwe	Rest of SADC	EU
<i>Zimbabwe</i>									
Grain	1.5	0.0	1.7	0.0	0.0	1.7	0.0	0.0	3
Fruits & Vegetables	13.8	14.3	25	0.0	0.0	0.0	0.0	0.0	18
Other Agriculture	1.4	0.0	0.7	1	1.4	0.6	0.0	0.0	2
Livestock	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4
Forestry & Fisheries	5.3	0.0	0.0	7.4	0.0	0.0	0.0	0.0	2
Energy & Mines	4.1	3.7	0.0	3.9	0.0	0.0	0.0	0.0	4
Food Processing	17.5	15.9	13.8	15.4	0.0	5.6	0.0	20	15.4
Textiles	18.4	18.5	18.2	17.2	20	17.9	0.0	18.4	18.4
Apparel	41.9	38.5	38.5	33.3	0.0	37.8	0.0	45.2	40.2
Wood & Paper	16.2	17.4	17.3	25.1	14.3	24.2	0.0	13.6	15
Basic Intermediates	11.6	11.3	10.8	10.9	20	11.2	0.0	10.7	20.9
Machinery & Equip.	11.6	20.4	15.5	11.5	9.4	11	0.0	9.3	10.9
Total	12	16.3	4.7	13	1.9	7.7	0.0	21.9	12.3
<i>Rest of SADC</i>									
Grain	2	0.0	0.0	0.0	0.0	0.0	2.1	0.0	18
Fruits & Vegetables	13.1	13.1	14.3	0.0	0.0	0.0	13.2	0.0	13.1
Other Agriculture	21.4	0.0	0.0	0.0	0.0	0.0	12.7	0.0	22.2
Livestock	8.4	10	0.0	0.0	0.0	0.0	0.0	0.0	7.2
Forestry & Fisheries	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7
Energy & Mines	17.6	26.4	30.3	0.0	0.0	0.0	0.0	0.0	23.6
Food Processing	11.1	11.7	0.0	0.0	10.8	0.0	26.9	0.0	14.6
Textiles	24.3	24.3	0.0	0.0	0.0	0.0	16.7	0.0	24.4
Apparel	24.4	16.7	0.0	0.0	0.0	0.0	25	0.0	24.5
Wood & Paper	21.5	20.8	0.0	0.0	0.0	0.0	22.2	0.0	21.2
Basic Intermediates	13.3	8.8	0.0	0.0	0.0	0.0	9.1	0.0	12.5
Machinery & Equip.	18.8	18.5	0.0	0.0	20	0.0	17	0.0	19.1
Total	15.3	15.2	27.6	0.0	7.3	0.0	18.5	0.0	15.4
<i>European Union</i>									
Grain	1.7	2.9	0.0	0.0	3.3	0.0	5.2	8.3	0.0
Fruits & Vegetables	6.8	2.2	0.0	1.1	1.8	15.5	10.5	1	0.0
Other Agriculture	4.6	4.8	3.1	3	5.9	2.8	6.1	3.7	0.0
Livestock	3.4	3.9	0.0	0.0	7.4	9.4	5.8	51.7	0.0
Forestry & Fisheries	12.4	0.0	0.0	0.0	0.0	0.0	1.9	2.7	0.0
Energy & Mines	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Processing	26.8	15.2	45.3	0.7	14.4	48.3	50.5	41.8	0.0
Textiles	4.9	0.0	0.0	0.0	0.0	4.6	7	10.9	0.0
Apparel	7	0.0	0.0	0.0	0.0	3.3	7	10.5	0.0
Wood & Paper	3.3	0.0	0.0	0.0	0.0	0.0	1.5	1.1	0.0
Basic Intermediates	1.2	0.0	0.0	0.0	0.1	0.1	2.3	0.3	0.0
Machinery & Equip.	2	0.0	0.0	0.0	0.1	0.3	0.8	0.5	0.0
Total	4.2	5.6	5.4	0.8	3.6	9.3	8.8	13.8	0.0

Note: Tariffs are for imports *from* column country *to* row country.

Source: Southern African Model data base derived from GTAP v5, prerelease #1.

Table 6: Trade Dependency for Selected Countries

	EU		South Africa		Zimbabwe	
	Avg Tariff	Export Share	Avg. Tariff	Export Share	Avg. Tariff	Export Share
South Africa	4.2	30.4	0.0	0.0	12.0	3.7
Botswana	5.6	35.6	7.9	13.0	16.3	2.5
Malawi	5.4	43.9	20.8	6.0	4.7	2
Mozambique	0.8	42.6	6.7	4.4	13.0	2.9
Tanzania	3.6	42.6	2.1	0.8	1.9	1.0
Zambia	9.3	20.5	2.0	1.5	7.7	2.7
Zimbabwe	8.8	38.7	4.5	12.2	0.0	0.0
Rest of SADC	13.8	32.5	5.4	0.2	21.9	0.2
EU	0.0	0.0	4.3	1.2	12.3	0.1

Note: Avg. Tariff refers to the *column country* tariff against imports from the *row country*; Export share refers to the *row country's* exports to the *column country*.

Source: Southern African Model data base derived from GTAP v5, prerelease #1.

initial distortion, the greater the response to a particular policy change. Table 5 presents *ad valorem* import protection (tariff plus NTB) rates by sector and country of origin (omitting the nontraded service sectors) for the regions that are the main focus of our analysis – the EU, South Africa, Botswana, Malawi, Mozambique, Tanzania, Zambia, Zimbabwe, and the rest of SADC. (Appendix tables contain detailed import protection data by sector for all regions in the model, along with other sectoral taxes and subsidies on exports and production).

Import protection rates vary substantially by sector and source of imports. South Africa protects apparel (with rates varying from 50 percent against Zambia to 26 percent against Zimbabwe), textiles (ranging from 14.3 percent against Tanzania to 10 percent against Zambia) and food processing (ranging from 12.3 percent against High-income Asia to 3 percent against Low-income Asia). South Africa has a high trade weighted average tariff against Malawi (20.8 percent) and its average tariffs against other SADC countries range from 2 to 7.0 percent. It also has a low average tariff against the EU at 4.3 percent.

Botswana's protection structure is quite similar to that of South Africa: it protects apparel (ranging from 50 percent against the rest of SADC and 27 percent against Zimbabwe); textiles (12 percent against South Africa and 10 percent against the rest of SADC); and food processing (17.5 percent against High-income Asia, 9.8 percent against the EU and 3.8 percent against Tanzania). It also has high production subsidies to the textile sector.

All SADC countries have high tariffs on apparel, textiles and food processing, with the highest being in the apparel sector. In addition, all SADC countries protect fruits & vegetables and other agriculture against import from the EU. South Africa and Botswana have the lowest tariffs against the EU in these sectors. At the other extreme, Malawi has a tariff of 38.9 percent against fruits & vegetable imports from the EU, the rest of SADC has tariffs of 22.2 against other agriculture from the EU.

The EU protects processed foods with the highest tariff rates against SADC countries. For example, the EU tariff on processed foods from Zimbabwe is 50 percent, Zambia 48 percent and rest of SADC 41 percent. It also has high tariffs against fruits and vegetables from Zambia (16 percent) and Zimbabwe (11 percent). Its highest tariff in the region is against livestock from the rest of SADC (52 percent). The EU's average tariff against SADC countries varies by country, but it is higher for SADC countries than any other region in the model. It ranges from 0.8 percent against Mozambique to 14 percent against the rest of SADC. The EU's average tariff is greater than its trade partners average tariff against the EU for Botswana and Zambia. The EU has a lower average tariff than does its trade partner for the other SADC countries – South Africa, Malawi, Mozambique, Tanzania, Zimbabwe and rest of SADC.

On domestic markets, the EU provides high input subsidies to grains; it also subsidizes exports of food processing and livestock. In general the SADC countries do not subsidize production or exports – the one extreme exception is Botswana's high input subsidy to textiles (see appendix tables). Some SADC countries have high taxes on output – Tanzania taxes the energy and minerals sector 17.4



percent; Zambia taxes basic intermediates 24.4 percent and capital goods 16.8 percent; Zimbabwe taxes fruits & vegetables 13.1 percent and forestry & fisheries 29.4 percent.

All SADC countries depend heavily on the EU for export sales. (See table 6 for a summary and appendix tables for full details). Malawi has the highest trade dependence with 44 percent of its exports going to the EU; 68 percent of its food processing exports and 53 percent of its other agriculture. Mozambique sends 43 percent of its exports to the EU: 87 percent of its textiles, 83 percent of its other agriculture, 62 percent of its food processing, and 51 percent of its energy and minerals go to the EU. Like Mozambique, Tanzania sends 43 percent of its exports to the EU: 68 percent of its textiles, 49 percent of its food processing and 48 percent of its other agriculture. Zimbabwe sends 39 percent of its total exports to the EU and is particularly dependent on the EU for exports of its fruits & vegetables (84 percent), apparel (61 percent), textiles (60 percent), and other agriculture (57 percent).

South Africa and Botswana are less dependent on the EU and send 30 and 36 percent of total exports to the EU, respectively. Both sell large shares of food processing (50 percent for South Africa and 52 percent for Botswana) fruits & vegetables (76 percent for South Africa and 77 percent for Botswana) and livestock (78 percent for South Africa and 64 percent for Botswana) to the EU.

On average, Zambia is the least dependent on the EU which buys 20 percent of its total exports. However, in certain sectors, the dependence is quite strong: it sends the EU 97 percent of its textiles, 84 percent of its fruits and vegetables, 83 percent of its food processing, and 63 percent of its other agriculture.

SADC countries are less dependent on South Africa than on the EU as a market for their exports. The export shares to South Africa range from 0.2 percent from the rest of SADC to 13 percent from Botswana. South Africa has higher average tariffs than does the EU against imports from Botswana, Malawi and Mozambique. The reverse is true for Tanzania, Zambia, Zimbabwe and the rest of SADC.

There is little trade among the SADC countries, with the exception of South Africa being an important destination for exports. Interestingly, Zimbabwe is the next most important country in the region, following South Africa, for all SADC countries. However, the export market shares are small, ranging from 0.2 percent from the Rest of SADC to 3.7 percent from South Africa.

### **III. Recent Literature**

The recent proliferation of regional trade initiatives in all parts of the world, including Southern Africa, has revived the debate over the benefits of RTAs versus multilateral tariff reform. Panagariya (2000) surveys the theoretical work, describing changes in trade creation and trade diversion under various assumptions about market structure and the welfare effects of other dynamic changes. Both Panagariya's survey and the early work on customs unions indicate that whether or not an RTA benefits its members depends on parameter values and initial economic structure – it is essentially an empirical issue that must be settled by analysis of data. Robinson and Thierfelder (1999) survey the empirical

literature in which multi-country CGE models have been used to analyze the impact of regional trade agreements. The multi-country CGE models differ widely in terms of country and commodity coverage, assumed market structure, policy detail, and specification of macroeconomic closure. In spite of these differences, surveys of these models support two general conclusions about the empirical effects of RTAs: (1) in aggregate, trade creation is always much larger than trade diversion; and (2) welfare — measured in terms of real GDP or equivalent variation — increases for member countries.

In this paper, we evaluate various types of RTAs for countries in Southern Africa as well as multilateral tariff reduction. Other empirical studies of regional trade options for Southern Africa consider similar issues:

- (1) What are trade creation and trade diversion effects of regional trade agreements (either with the EU or among SADC countries)?
- (2) What impact do FTAs have on non-member countries in the region?
- (3) What effect do global tariff reductions, as agreed to in the Uruguay round, have on Southern Africa?

Tsikata (1999) uses a partial equilibrium model of trade creation and trade diversion to measure import changes following an intra-SADC RTA. She focuses on the fiscal impact of an RTA by calculating revenue changes. Not surprisingly, she finds that countries with high trade dependence and high initial tariffs also experience the highest revenue losses from an RTA. South Africa, in contrast, does not depend on the region for trade and consequently would have a small revenue loss from an RTA.

CGE analyses of various FTAs in Southern Africa also emphasize changes in trade creation and diversion. Davies (1998) — using GTAP data and modeling framework — simulates a FTA between the EU and South Africa and finds strong potential trade diversion following an FTA.<sup>5</sup> Evans (1998) evaluates trade options for SADC countries — an FTA, a customs union, or open regionalism, by which SADC countries extend tariff reductions to all countries on a MFN basis. He finds that trade creation dominates trade diversion in an FTA as intra-SADC trade increases by 9 percent while trade with the ROW hardly changes. With free trade, there is also trade creation as SADC trade expands by nearly 7 percent, but there are potential terms of trade costs. Under “high” export price elasticities, he finds that the welfare gain from free trade exceed those under an FTA.<sup>6</sup> Davies also describes the effect

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<sup>5</sup>He bases this conclusion on a discussion of pre-FTA tariff rates. Since South Africa had lower tariffs on the EU than other sources, he asserts that the other producers have lower costs so the FTA caused a switch from cheaper sources to the more expensive EU.

<sup>6</sup>However, these results are sensitive to export price elasticities. Under “low” export elasticities, welfare gains are higher with an FTA and there are actually welfare losses with free trade in SADC countries.

an FTA between South Africa and the EU has on the rest of Southern Africa. He finds that the rest of Southern Africa suffers as its trade volumes decline.<sup>7</sup>

Hertel et al. (1998) evaluate the effects on Africa of tariff reductions in manufactures, textile and clothing, and agriculture tariffs agreed to under the Uruguay Round. Like Davies, they use the GTAP data and modeling framework.<sup>8</sup> They find that the limited gains from the Uruguay Round in Africa are mainly due to the fact that Africa does not ease its trade restrictions as much as other countries, so world trade “bypasses the continent.” Textiles and apparel will be hurt most by the Uruguay Round. In contrast there will be a slight expansion of production of cereals, non-grain crops, and forestry and fish products. The production increase in the latter two products is projected to be sold in Asia, suggesting exports will become more diversified, rather than concentrated in Europe. They then simulate domestic reforms in both the trade and transportation sector and in food grain productivity. They note that in both sectors, “Africa lags significantly behind other low-income countries, and institutional reforms could provide major gains at low cost” (p. 229).

Lewis, Robinson and Thierfelder (1999) ask similar questions about the effects of regional and multilateral trade agreements in Southern Africa using a more aggregated version of the model than the one used here. The data for that model is for 1995 from GTAP version 4. They focus on the interaction between three countries: the EU, South Africa, and the Rest of Southern Africa (an aggregate of Botswana, Malawi, Mozambique, Tanzania, Zambia, Zimbabwe and the Rest of SADC). They find that (1) South Africa is not big enough to be a growth pole for the region and (2) the Rest of Southern Africa does better with a trilateral FTA with the EU rather than global tariff liberalization of 50 percent. The later result reflects the Rest of Southern Africa’s high trade dependence on the EU and the EU’s high initial trade barriers against the EU. See Lewis (2001) for a summary of this work and trade analysis of the region in more sectoral detail.

#### **IV. The Southern Africa CGE Model**

We analyze regional integration in Southern Africa using a multi-country computable general equilibrium (CGE) model. Such models are designed to quantify many of the economic forces accompanying regional integration that are considered in international trade theory.<sup>9</sup> The Southern Africa model we have developed is in the tradition of recent multi-country CGE models developed to analyze

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<sup>7</sup> As will be discussed below, we find that an FTA between the EU and South Africa actually helps the rest of southern Africa

<sup>8</sup> Since tariffs will be reduced by 2005, they first project the model forward using growth rates in relative resource endowments (population, unskilled labor, capital stock, skilled labor and productivity). This becomes the base model.

<sup>9</sup> For a discussion of the analytic and modeling issues related to analysis of free trade areas, see Baldwin and Venables (1995), DeRosa (1998), and Winters (1996). Robinson and Thierfelder (1999) summarize the findings from empirical models of regional integration.

the impact of the Uruguay Round of GATT negotiations and the impact of the North American Free Trade Agreement.<sup>10</sup>

The model developed in this paper consists of a multi-regional CGE framework containing a seventeen sector, fourteen-region, general equilibrium model, where the regional CGE models are interconnected through trade flows.<sup>11</sup> For the purpose of describing the model, it is useful to distinguish between the individual “country” models and the multi-region model system as whole, which determines how the individual country models interact. When the model is actually used, the *within* country and *between* country relationships are solved simultaneously.

The model database consists of social accounting matrices (SAMs) for each country, including data on their trade flows.<sup>12</sup> The development of a consistent multi-country database is itself a major task; for our model, we rely on version 5, prerelease #1 of the GTAP database. The SAM starts from multisectoral input-output data, which are expanded to provide information on the circular flow of income from producers to factors to “institutions,” which include households, enterprises, government, a capital account, and trade accounts for each partner country, and for the rest of the world. These institutions represent the economic actors whose behavior and interactions are described in the CGE models. The parameter estimates for the sectoral production functions, consumer expenditure functions, import aggregation functions, and export transformation functions are estimated from base-year data and other econometric sources. The various parameters used in the model represent point estimates for the base year (1997) and the model was benchmarked so that its base solution replicates the base data.

Each sub-regional or “country” CGE model follows closely what has become a standard theoretical specification for trade-focused CGE models.<sup>13</sup> In addition to seventeen sectors for each country model, the model has five factors of production (two labor types, land, natural resources, and capital). For each sector, the model specifies output-supply and input-demand equations. Output supply is given by constant elasticity of substitution (CES) functions over value added, while intermediate inputs are demanded in fixed proportions. Profit-maximization by producers is assumed,

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<sup>10</sup> These models, in turn, have built on multi-country models developed to analyze the impact of the Tokyo Round of GATT negotiations — in particular, the multi-country CGE model developed by Whalley (1985). See Hinojosa-Ojeda and Robinson (1992) and Brown (1992) for a review of NAFTA CGE models. Our model starts from the WALRAS model developed at the OECD to analyze the impact of the current GATT negotiations on the major OECD countries (OECD, 1990) and the RUNS model described in Goldin, Knudsen, and van der Mensbrugge (1993). Starting from a single country model of the U.S., Robinson et al. (1993) expanded the model to include Mexico for analysis of NAFTA. Other versions of the model are described in Lewis, Robinson, and Wang (1995), Lewis and Robinson (1996), and Hinojosa-Ojeda, Lewis, and Robinson (1995).

<sup>11</sup> The model also permits regional interactions through endogenous migration of capital and labor, but for all experiments presented in this paper, this feature is not used. See Hinojosa-Ojeda, Lewis, and Robinson (1995) for analysis of a Greater North America Free Trade Area (GNAFTA) using a similar model that includes labor migration.

<sup>12</sup> Social Accounting Matrices are described in Pyatt and Round (1985).

<sup>13</sup> Robinson (1989) surveys CGE models applied to developing countries. Shoven and Whalley (1984) survey models of developed countries. The theoretical properties of this family of trade-focused CGE models are discussed in Devarajan, Lewis, and Robinson (1990). A full presentation of the southern Africa CGE model appears in an appendix of this paper.

implying that each factor is demanded so that marginal revenue product equals marginal cost. However, factors need not receive a uniform wage or “rental” (for non-labor factors) across sectors; sectoral factor market distortions are often imposed that fix the ratio of the sectoral return to a factor relative to the economywide average return for that factor.

In common with other CGE models, the model only determines relative prices and the absolute price level must be set exogenously. In our model, the aggregate consumer price index in each sub-region is set exogenously, defining the *numeraire*. The advantage of this choice is that solution wages and incomes are in real terms. The solution exchange rates in the sub-regions are also in real terms, and can be seen as equilibrium price-level-deflated (PLD) exchange rates, using the country consumer price indices as deflators.<sup>14</sup> Countries and regions in the model are linked by trade flows. We choose value foreign trade in North American dollars, and therefore fix the exchange rate for North America. In effect, foreign trade is valued in the prices of the *numeraire* country which we assign to be the North America region. World prices are converted into domestic currency using the exchange rate, including any tax or tariff components. Cross-trade price consistency is imposed, so that the world price of country A's exports to country B are the same as the world price of country B's imports from country A.

Each “country” model traces the circular flow of income from producers, through factor payments, to households, government, and investors, and finally back to demand for goods in product markets. The country models incorporate tariffs which flow to the government, and non-tariff revenues which go to the private sector. Each economy is also modeled as having a number of domestic market distortions. There are sectorally differentiated indirect, consumption, and export taxes, as well as household and corporate income taxes. The single aggregate household in each economy demands commodities with fixed expenditure shares, consistent with optimization of a Cobb-Douglas utility function.

One implication of including these varied existing distortions, which capture in a stylized way institutional constraints characteristic of the economies, is that policy choices must be made in a second-best environment. In our simulations involving the establishment of FTAs, we are not considering scenarios which remove all existing distortions. Existing taxes and factor-market distortions are assumed to remain in place, along with existing import barriers against the rest of the world. In this second-best environment, economic theory gives little guidance as to the welfare implications of forming a FTA.

Sectoral export-supply and import-demand functions are specified for each country. In common with other CGE models (both single and multi-country), the Southern Africa CGE model specifies that goods produced in different countries are imperfect substitutes. At the sectoral level, in each country, demanders differentiate goods by country of origin and exporters differentiate goods by destination market. Composite demand is for a translog aggregation of sectoral imports and domestic

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<sup>14</sup> De Melo and Robinson (1989) and Devarajan, Lewis, and Robinson (1993) discuss the role of the real exchange rate in this class of model.

goods supplied to the domestic market. Sectoral output is a CET (constant elasticity of transformation) aggregation of total supply to all export markets and supply to the domestic market. Allocation between export and domestic markets occurs in order to maximize revenue from total sales.

The rest of the world is treated like any other region in the model — with explicit production, consumption, and trade behavior in a separate regional CGE model. This is an extension of earlier versions of the model which represented the rest of the world as simply a supplier of imports to and demander of exports from the other model regions as a group. As the country coverage in the model expands — and correspondingly, the rest of the world shrinks — it is less plausible to build a model with an implicit “large” rest of the world. Instead, we allow downward sloping import demand for each region and upward sloping export supply curves from the rest of the world to each region.

For many single-country and multi-country models, a lack of detailed econometric work forced modelers to use simple functional forms, with few parameters, for the import-aggregation and export-transformation functions. The common practice is to use a constant elasticity of substitution (CES) function for the import aggregation equation, which is a very restrictive functional form and has led to empirical problems.<sup>15</sup> As a result of these limitations, modelers have begun to explore other formulations, while maintaining the fundamental assumption of product differentiation. In this model, we have used a flexible specification of the demand system called the almost ideal demand system (or AIDS).<sup>16</sup> The AIDS specification allows non-unitary income elasticities of demand for imports and also pairwise substitution elasticities that vary across countries.

We capture certain stylized features of labor markets in developing countries in the model. In South Africa and other SADC countries, there is high unemployment, suggesting a readily available supply of labor. We therefore assume there is a fixed wage in these countries and that the labor supply is endogenous to clear the market. When sectors expand, they can meet labor demands at the given wage by attracting workers who were not in the labor market (as well as attracting workers from contracting sectors). For other countries and factors, we assume that factor markets (including labor) clear. In these markets, while sectoral employment changes, aggregate employment is held constant; instead, wages adjust.

The Southern Africa CGE model, like other multi-country CGE models, has a medium to long-run focus. We report the results of comparative static experiments in which we “shock” the model by changing some exogenous variables and then compute the changed equilibrium solution. We do not

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<sup>15</sup> Armington (1969) used the specification in deriving import-demand functions, and the import aggregation functions are sometimes called Armington functions. Devarajan, Lewis, and Robinson (1990) discuss in detail the properties of single-country models which incorporate imperfect substitution. Brown (1987) analyzes the implications of using CES import aggregation functions in multi-country trade models. Others have criticized the use of the CES function on econometric grounds. See, for example, Alston *et al.* (1989).

<sup>16</sup> Hanson, Robinson, and Tokarick (1990) use the AIDS function in their 30-sector single-country CGE model of the U.S. They estimate the sectoral import demand functions using time-series data and find that sectoral expenditure elasticities of import demand are generally much greater than one in the U.S., results consistent with estimates from macroeconomic models.

explicitly consider how long it might take the economy to reach the new equilibrium, or what other adjustments (such as investment changes, technology transfer, productivity shifts, etc) might occur as well. The model's time horizon has to be viewed as “long enough” for full adjustment to occur, given the shock. While useful to understand the pushes and pulls the economies will face under the creation of an FTA, this approach has obvious shortcomings. In particular, it does not consider the costs of adjustment, such as transitional unemployment, that might occur while moving to the final equilibrium.

Given the medium to long-run focus of the analysis, the model incorporates a simple macro closure that does not account for any short-run adjustment mechanisms (such as Keynesian multipliers). In each regional model, aggregate real investment and government consumption are assumed to be fixed proportions of aggregate GDP. The trade balance in each region is also assumed fixed (with the real exchange rate adjusting to equilibrate aggregate exports and imports), so domestic savings are assumed to adjust to achieve macro equilibrium.

Our model has a number of features that are different from a “standard” GTAP model (Hertel, 1997). First, the use of sectoral export supply functions in each regional model (using CET functions) provides a treatment on the export side that is symmetric with the treatment of imports as imperfect substitutes with domestically supplied goods (the “Armington assumption” for specifying import demand functions). The standard GTAP model only assumes imperfect substitutability on the import side, which implies that domestic prices of exportables are very sensitive to foreign demand and changes in world markets. For exploring trade liberalization scenarios, the resulting model tends to generate unrealistically large terms-of-trade effects.

Second, the use of AIDS rather than CES import demand functions allows a more flexible treatment of degrees of substitutability between goods originating from different types of countries. In a model focusing on trade with very poor developing countries, the more flexible functional form is especially useful. For example, in the US, the degree of substitutability between domestic machinery and machinery imported from the EU is likely to differ from the degree of substitutability with imported machinery from a developing country.

Third, the standard GTAP model specifies a macro closure in which regional trade balances vary endogenously. In our model, regional trade balances are assumed fixed. Specifying fixed trade balances seems better in a model focusing on the impact of trade liberalization, where it is desirable to abstract from issues of short-run macroeconomic adjustment.

Fourth, the standard GTAP model specifies the exchange rate as the *numeraire* in each regional CGE model, while we specify a consumer price index as a *numeraire* in each region. Since all these models solve only for relative prices, the choice of *numeraire* is largely a matter of convenience. In models in which regional trade balances at equilibrium are not zero, it is important to note that they are defined in the prices of the *numeraire* country (in our case North America).

## V. Southern Africa Model Results

### Design of Alternative Scenarios

We present a series of scenarios in which trade becomes more liberalized. We begin with a FTA scenario between the EU and South Africa, in which we eliminate *all* bilateral tariffs and non-tariff barriers.<sup>17</sup> We then consider membership options for the rest of Southern Africa — either through a parallel FTA with South Africa, where South Africa is the hub and the other SADC countries and the EU are spokes, or as equal partners in regional FTA with the EU and South Africa. To illustrate the importance of trade in this, we also consider the effects of global tariff reduction rather than an FTA. Finally, we describe the effects of the EU's recent initiative to unilaterally eliminate tariffs and non-tariff barriers against all African countries.

#### *EU- South Africa FTA*

We find that an FTA between the EU and South Africa has a much bigger impact on South Africa than on the EU. South African real GDP increases by 0.41 percent and real absorption increases by 0.28 percent, whereas there are only negligible changes for the EU (Table 7). These lopsided gains reflect differences in both trade dependence and the bilateral tariff structure. South Africa is heavily dependent on EU export markets, with 30.4 percent of total exports going to the EU (table 6). The dependence is especially strong for commodities such as livestock (77.7 percent), fruits and vegetables (75.6 percent), other agriculture (46.0 percent), and food processing (49.9 percent). In contrast, only 1.2 percent of EU exports go to South Africa, with the largest share at 7.1 percent in the energy and mineral sector. The next highest export market shares to South Africa are machinery & equipment at 1.7 percent and basic intermediate goods at 1.6 percent. While the trade-weighted average tariff against South Africa is low (4.2 percent) the EU also has high tariffs against certain products from South Africa. For example, the tariff on food processing is 26.8 percent, on forest & fisheries is 12.6, and on fruit & vegetables it is 6.8 percent. While South Africa has high tariffs on apparel (26.8 percent), textiles (12.0 percent) and food processing (9.9 percent) from the EU, the tariffs against all other goods are less than 6 percent.

The GDP gains for South Africa also reflect an expansion of the labor supply as the supply of skilled labor increases by 0.46 percent and the supply of unskilled labor increases by 0.76 percent (Table 7). South Africa's terms-of-trade worsen slightly as the increase in demand for imports from the EU raises the price it faces on the world market.

For the EU and South Africa, there is no trade diversion, as trade with the FTA partner and with other countries both increase; there is only relative trade creation as trade with FTA partners increases by more than trade with other countries.

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<sup>17</sup>Hanson, Robinson, and Tokarick (1990) use the AIDS function in their 30-sector single-country CGE model of the U.S. They estimate the sectoral import demand functions using time-series data and find that sectoral expenditure elasticities of import demand are generally much greater than one in the U.S., results consistent with estimates from macroeconomic models



Table 7: Macroeconomic and Trade Performance Results for EU-South Africa FTA

	<i>Percent Change from Base</i>					<i>Billion US \$</i>		
	Real GDP	Real Absorption	Terms of Trade	Skilled Labor	Unskilled Labor	Trade expansion	Trade creation	Trade diversion
South Africa	0.411	0.278	-0.610	0.459	0.761	0.474	0.457	0.017
Botswana	-0.004	-0.028	-0.041	-0.012	-0.004	-0.001	-0.001	0
Malawi	0.031	0.054	0.113	0.043	0.054	0	0	0
Mozambique	0.098	0.132	0.098	0.078	0.173	0	0	0
Tanzania	0.018	0.026	0.034	0.027	0.03	0	0	0
Zambia	0.040	0.078	0.150	0.065	0.088	0	0	0
Zimbabwe	0.057	0.098	0.113	0.086	0.105	0	0	0
Rest of SADC	0.017	0.030	0.025	0.027	0.04	0	0	0
Rest of Sub-Saharan	0.000	0.004	0.016			0	0.001	0
North America	0.000	0.000	0.001			0.006	0.008	-0.002
EU	0.002	0.003	0.008			0.556	0.542	0.013
High-income Asia	0.000	0.000	0.002			-0.006	-0.008	0.002
Low-income Asia	0.000	0.001	0.003			0.005	0.009	-0.003
Rest of World	0.000	0.000	0.002			0.017	0.022	-0.004

Source: Authors' calculations from Southern Africa CGE model simulations.

While total exports from South Africa to the EU increase by 4.6 percent, there are large gains in formerly protected sectors (see appendix tables for sectoral changes). For example, food processing exports increase by 32.6 percent, forest & fisheries by 14.8 percent, and fruits & vegetables by 8.6 percent. Exports from the EU to South Africa increase by 4.3 percent with the biggest gains in apparel (26.6 percent), textiles (11.8 percent), and food processing (11.6 percent).

With the exception of Botswana, the other SADC countries also benefit from the bilateral FTA between EU and South Africa. The real GDP gains are slight, ranging from 0.017 percent in the rest of SADC to 0.098 in Mozambique; the real absorption gains range from 0.026 in Tanzania to 0.132 in Mozambique. The relatively large gains for Mozambique, compared to other SADC countries, reflects an expansion of the labor force by 0.173 for unskilled labor and 0.078 for skilled labor. EU exports to all SADC countries, except South Africa, decline slightly. However, all SADC, except South Africa, have slight export gains to the EU. In addition, trade among SADC countries expands slightly following the FTA between South Africa and the EU.

Botswana loses because of trade diversion – it depends most heavily on exports markets in South Africa, compared to the other SADC countries. Its exports to South Africa decline by 0.54 percent and the decline is concentrated in textiles and apparel, sectors which EU exports to South Africa expand by 11.8 and 26.6 percent respectively.

### *Southern Africa FTAs*

We consider two options for the other SADC countries when liberalizing trade in the region. They can either establish an FTA with South Africa, parallel to the EU-South Africa FTA, creating a “hub and spoke” FTA, in which South Africa is the hub; or they can form a regional FTA consisting of South Africa, all other SADC countries and the EU. Our results suggest that the EU is more important than South Africa for trade and growth in the other SADC countries— they gain far more from a regional FTA. For example, real GDP increases from 0.062 percent in Tanzania to 0.644 percent in Zimbabwe with a hub-and-spoke FTA (see tables 8 and 9). The gains range from 0.77 percent in Zambia to 2.4 percent in the Rest of SADC under a regional FTA. Each SADC country, except South Africa, has bigger GDP growth under the regional FTA rather than the hub-and-spoke type FTA. South Africa’s real GDP increases slightly more under the hub-and-spoke. Real absorption actually declines Mozambique, Tanzania, Zambia, Zimbabwe and the Rest of SADC under a hub-and-spoke FTA. In contrast, real absorption only declines for Mozambique under the regional FTA.

The labor market effects are consistent with the real GDP changes: the employment increases more for all countries in the region, except South Africa, under a regional FTA. Interestingly, there are greater spillover effects for South Africa in terms of real GDP and real absorption growth under a trilateral FTA than as the hub for the other countries.

Like South Africa, other SADC countries depend heavily on the EU as an export market. With the exception of Zambia, the other SADC countries are more dependent on the EU than is South Africa, sending more than 30 percent of their exports to the EU. Malawi, Mozambique, Tanzania and Zimbabwe have the strongest dependence with the EU accounting for more than 38 percent of each

Table 8: Macroeconomic and Trade Performance Results for EU-South Africa and South Africa – SADC FTA

	<i>Percent Change from Base</i>					<i>Billion US \$</i>		
	Real GDP	Real absorption	Terms of Trade	Skilled Labor	Unskilled Labor	Trade expansion	Trade creation	Trade diversion
South Africa	0.562	0.507	-0.348	0.644	1.022	0.679	0.671	0.007
Botswana	0.291	0.89	0.991	0.63	0.63	0.024	0.026	-0.001
Malawi	0.497	0.206	-1.399	0.768	0.983	0.012	0.011	0.001
Mozambique	0.637	-0.264	-3.305	0.587	1.444	0.005	0.005	0
Tanzania	0.062	-0.025	-0.484	0.143	0.126	0	0	0
Zambia	0.112	-0.378	-1.74	0.387	0.218	0.004	0.002	0.002
Zimbabwe	0.644	-0.278	-2.64	0.709	1.608	0.042	0.037	0.005
Rest of SADC	0.074	-0.223	-0.446	0.185	0.265	0.009	0.005	0.004
Rest of Sub-Saharan	0	0.001	0.006			-0.003	-0.002	-0.001
North America	0	0	0.004			0.006	0.013	-0.007
EU	0.002	0.003	0.011			0.548	0.544	0.004
High-income Asia	0	0	0.002			-0.012	-0.009	-0.003
Low-income Asia	0	0.001	0.004			-0.001	0.005	-0.006
Rest of World	0	0	0.002			0.008	0.016	-0.008

Source: Authors' calculations from Southern Africa CGE model simulations.

Table 9: Macroeconomic and Trade Performance Results for EU-South Africa – SADC FTA

	<i>Percent Change from Base</i>					<i>Billion US \$</i>		
	Real GDP	Real Absorption	Terms of Trade	Skilled Labor	Unskilled Labor	Trade Expansion	Trade creation	Trade diversion
South Africa	0.558	0.497	-0.37	0.639	1.016	0.667	0.658	0.009
Botswana	0.957	1.801	0.887	1.739	2.212	0.058	0.059	-0.001
Malawi	1.064	0.933	-1.041	1.555	1.971	0.03	0.03	0
Mozambique	1.178	-0.308	-5.131	1.051	2.583	0.008	0.008	0
Tanzania	0.585	0.336	-0.895	0.91	1.1	0.026	0.025	0.001
Zambia	0.77	0.419	-1.577	1.354	1.746	0.027	0.026	0.001
Zimbabwe	1.791	0.477	-3.395	2.051	4.001	0.149	0.142	0.007
Rest of SADC	2.399	1.938	-2.055	3.493	6.648	0.384	0.391	-0.007
Rest of Sub-Saharan	0	0.004	0.018			-0.001	-0.002	0.001
North America	0	0	0.002			0.014	0.021	-0.007
EU	0.004	0.006	0.018			1.165	1.136	0.029
High-income Asia	0	0	0.002			-0.013	-0.016	0.003
Low-income Asia	0	0.002	0.005			0.009	0.016	-0.007
Rest of World	0	0.001	0.005			0.022	0.02	0.002

Source: Authors' calculations from Southern Africa CGE model simulations.

country's total exports. While the shares vary by country, in general the dependence is quite strong in food processing, textiles, fruits and vegetables and other agriculture. In contrast, the other SADC countries export 0.2 to 13.0 percent of total exports to South Africa. This high dependence on the EU explains why these countries are better off with a regional FTA that includes the EU.

With the exception of Mozambique and Tanzania, the EU has higher trade barriers against other SADC countries than it has against South Africa. Tariffs and non-tariff barriers are particularly high in the food processing, exceeding 40 percent for Malawi, Zambia, Zimbabwe, and Rest of SADC. When these tariffs are removed in a regional FTA, EU markets open for the other SADC countries, contributing to their GDP gains.

In either type of FTA — hub-and-spoke with South Africa the hub, or regional FTA — there is only slight absolute trade diversion for Botswana. For all other countries, trade expands to all regions with trade to FTA partners increasing relatively more.

All SADC countries, with the exception of Botswana, experience terms of trade losses under either type of FTA. For South Africa, the losses arise because it establishes free trade with the EU in either type of FTA. Since the EU has slightly higher average tariffs against South Africa and South Africa is heavily dependent on EU imports, South Africa's import demand rises, driving up the world market price of its imports and therefore worsening its terms of trade.

In contrast, Botswana has lower average tariffs against South Africa and the EU than those countries have against it. When tariffs are eliminated, demand for Botswana's exports go up by more than its demand for imports, creating a terms of trade gain for Botswana. The EU also experiences a terms of trade gain for each type of FTA, reflecting the region's strong dependence on the EU and the fact that the EU has a lower average tariff against the SADC country (South Africa, Malawi, Mozambique, Tanzania, Zimbabwe, and the Rest of SADC) than that country has on average against the EU.

### ***Global Tariff Reduction***

Next, we consider the importance of a regional FTA versus global tariff reduction. We simulate a global tariff reduction of fifty percent on the assumption that global trade reforms will not totally eliminate tariffs.

We find that the EU, South Africa, and most of the other SADC countries are better off in terms of real GDP growth under global tariff reduction (see table 10). Only Zimbabwe and the Rest of SADC are better off with a regional FTA.<sup>18</sup> The EU has high average tariffs and non-tariff barriers

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<sup>18</sup> This result differs from our earlier analysis (Lewis, Robinson and Thierfelder, 1999) where we found that the aggregate region, Rest of Southern Africa (which in the current version we have disaggregated into Botswana, Malawi, Mozambique, Tanzania, Zambia, Zimbabwe and Rest of SADC) did better with a regional trade agreement with South Africa and the EU than it did with global tariff reduction. In the updated version of the data base which is currently used, the EU tariffs against individual SADC countries are not as high as in the earlier version of the data base for the region as a whole. This difference explains the different result we find when comparing the regional trade agreement and global tariff reduction.

Table 10: Macroeconomic and Trade Performance Results for 50 Percent Global Tariff Reduction

	<i>Percent Change from Base</i>					<i>Billion US \$</i>		
	Real GDP	Real Absorption	Terms of Trade	Skilled Labor	Unskilled Labor	Trade expansion	Trade creation	Trade diversion
South Africa	0.774	0.751	-0.166	0.892	1.369	0.484	0.264	0.221
Botswana	1.075	1.609	0.671	1.864	2.489	0.039	0.024	0.015
Malawi	1.275	1.475	0.433	1.675	2.308	0.031	0.012	0.02
Mozambique	1.75	0.807	-3.485	1.388	3.277	0.007	0.004	0.003
Tanzania	1.095	0.912	-1.143	1.828	1.93	0.013	0.012	0.001
Zambia	0.885	0.861	-0.263	1.532	1.841	0.028	0.01	0.018
Zimbabwe	1.539	0.706	-2.297	1.754	3.211	0.085	0.063	0.022
Rest of SADC	1.923	0.939	-2.018	2.949	5.072	0.175	0.163	0.012
Rest of Sub-Saharan	0.079	-0.573	-2.163			0.544	0.302	0.243
North America	0.002	0.131	1.346			16.237	3.592	12.645
EU	0.098	0.218	1.151			16.254	0.305	15.949
High-income Asia	0.188	0.178	0.055			18.217	4.455	13.762
Low-income Asia	0.12	-0.697	-2.911			11.845	3.072	8.774
Rest of World	0.034	-0.068	-0.705			11.69	4.84	6.85

Source: Authors' calculations from Southern Africa CGE model simulations.

against these regions (Zimbabwe 8.8 percent and Rest of SADC 13.8 percent); the rates are quite high in certain sectors. Zimbabwe faces a 50.5 percent tariff against its food processing exports and a 10.5 percent tariff against its fruits and vegetables; the Rest of SADC faces a 51.7 percent tariff against its livestock exports to the EU and a 41.8 percent tariff against its food processing exports to the EU. Zimbabwe and the Rest of SADC also have high export market shares to the EU in these products: Zimbabwe exports 83.6 percent of its fruits & vegetables and 39.9 percent of its food processing to the EU; likewise the Rest of SADC sends 72 percent of its livestock and 88 percent of its food processing exports to the EU. Reflecting their high dependence on the EU, Zimbabwe and the Rest of SADC export more to the EU, total, than any other SADC country in both the regional FTA and the global tariff reduction experiments. The other SADC countries are more diversified in terms of trade dependence. All face high tariff barriers in textiles and apparel sales to Low-income Asia so benefit from the 50 percent reduction in these tariffs in the global reform scenario.

The EU has terms of trade gains with global tariff reduction and each types of regional trade agreement. In contrast, South Africa experiences terms of trade losses, with the highest loss being in the bilateral FTA with the EU. South Africa has high tariffs on products which it imports a high share of consumption; for example it has the highest tariff on apparel (with tariffs ranging from 26 to 31 percent) and it imports 35 percent of absorption. When it removes these tariffs the increase in import demand will then worsen its terms of trade. Botswana is the only other SADC country that experiences terms of trade gains when it participates in trade liberalization, regardless of the structure. In all cases, South Africa eliminates or reduces the tariffs it has against Botswana. Of the other SADC countries, Botswana is the most dependent on South Africa as a market for its products, sending 13 percent of its exports to South Africa; the export market share is particularly high in sectors against which South Africa maintains high tariffs: apparel (tariff of 30.4 percent and export share of 51.2 percent) and textiles (tariff of 11.9 percent and export share of 8.3 percent). When South Africa eliminates its tariffs, the world market price of these products from Botswana increases, creating terms of trade gains.

### ***EU Unilateral Tariff Elimination against Imports from Africa***

Recently, the EU has agreed to unilaterally eliminate tariff barriers on imports from Africa. We analyze the effects of this one-sided liberalization, focusing on the SADC economies. We find that the policy has little impact on the EU – its real GDP does not change (see table 11). With the exception of Mozambique, all other SADC countries gain as both real GDP and real absorption increase. The same countries also experience a terms of trade gain as demand for their exports increases, raising the price on world markets.

Mozambique is worse off because the EU already has low tariffs against that country, the average tariff is 0.8 percent. It also is quite dependent on the EU, sending 42.6 percent of its exports there. It experiences the smallest export gain compared to the other SADC economies.

Table 11: Macroeconomic and Trade Performance Results for EU Unilateral Trade Liberalization for Africa

	<i>Percent Change from Base</i>					<i>Billion US \$</i>		
	Real GDP	Real Absorption	Terms of Trade	Skilled Labor	Unskilled Labor	Trade Expansion	Trade creation	Trade diversion
South Africa	0.287	0.522	0.807	0.327	0.492	0.486	0.512	-0.027
Botswana	0.48	1.37	1.422	0.923	1.077	0.037	0.038	-0.001
Malawi	0.348	0.711	1.208	0.492	0.546	0.018	0.019	-0.001
Mozambique	-0.118	-0.247	-0.118	-0.143	-0.189	0.003	0.003	0
Tanzania	0.342	0.398	0.764	0.402	0.634	0.026	0.025	0
Zambia	0.488	0.855	0.957	0.59	1.183	0.023	0.025	-0.002
Zimbabwe	0.637	0.935	1.33	0.878	1.273	0.105	0.107	-0.001
Rest of SADC	1.733	3.539	1.389	2.04	4.495	0.342	0.374	-0.032
Rest of Sub-Saharan	0.034	0.32	0.889			0.425	0.444	-0.019
North America	0	-0.002	-0.019			0.019	-0.004	0.022
EU	0	-0.009	-0.093			0.737	0.63	0.107
High-income Asia	0	0	-0.003			0.063	0.043	0.02
Low-income Asia	0	0	0			0.055	0.04	0.015
Rest of World	0.001	0.005	0.024			0.035	-0.054	0.089

Source: Authors' calculations from Southern Africa CGE model simulations.



## VI. Conclusions

We have developed a multi-country model that focuses on Southern Africa to analyze the impact on African economies of both regional and global tariff reductions. The model is used as a simulation laboratory to sort out the relative empirical importance of different types of trade liberalization. The empirical results lead to a number of conclusions:

- Trade creation dominates trade diversion for the region under all FTA arrangements.
- With the exception of Botswana, the other SADC countries benefit from an FTA between the EU and South Africa — the recently signed bilateral agreement is not a “beggar thy neighbor” policy.
- Zimbabwe and the Rest of SADC region gain more from zero-tariff access to EU markets than from a partial (50 percent) reduction in global tariffs.
- The South African economy is not large enough to serve as a growth pole for the region. Access to EU markets and/or world markets provides substantially bigger gains for the other SADC countries than does access to South Africa.

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