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Can Regional Integration Accelerate
Development in Africa?
CGE Model Simulations of the Impact of
the SADC FTA on
the Republic of Madagascar

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**Can Regional Integration Accelerate Development in Africa?
CGE Model Simulations of the Impact of the SADC FTA on the Republic of Madagascar**

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Abstract

Madagascar plans to start phasing out its customs tariffs on imports from the Southern African Development Community in 2007. This paper uses a CGE model to evaluate the impact of the SADC FTA on Madagascar economy. The results suggest that the SADC FTA would only have a limited impact on Madagascar's real GDP because the liberalization affects only a small share of its total imports. However, Madagascar's trade and production pattern would change and benefit the textile and clothing sector. Removing rigidities in the labor and capital market would increase the gains but they would remain limited. Gains from the SADC FTA become substantial only when the regional liberalization is accompanied by a multilateral liberalization.

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[1] The author is with the Trade Policy Division of the IMF's Policy Development and Review Department. He thanks Brian Ames, Robert Flood, Christian Josz, Brad McDonald, Ialy Rasoamanana, Tom Krueger, and Pierre van den Boogaerde for their comments. All errors remain his sole responsibility.

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I. INTRODUCTION

In 2007, Madagascar plans to start phasing out its customs tariffs on imports from the Southern African Development Community (SADC) and gain better market access to the bloc. The Malagasy authorities have expressed great hope that joining the SADC Free Trade Area (FTA) will boost the development of the country, by fostering trade and investment.[2]

Quantifying the impact of the SADC FTA on all sectors of the economy requires a general equilibrium analysis. This paper uses the Global Trade Analysis Project (GTAP) model to simulate several scenarios. Consistent with the literature, the simulations found that the reciprocal elimination of customs tariffs between SADC countries and Madagascar would only have a limited impact on Madagascar's real GDP. Real GDP would not significantly be affected because the actual liberalization under the SADC FTA affects less than 6 percent of Madagascar total imports. Under all scenarios the benefits of the SADC FTA are limited, but, as predicted by the economic literature, become significant when the regional liberalization is combined with a multilateral liberalization. The reason is twofold. First, the trade liberalization would then affect all Madagascar trade. Second, a multilateral liberalization would reduce the cost associated with the potential trade diversion.

II. MADGASCAR TRADE PATTERNS AND TRADE POLICY

Over the past years, Madagascar has been liberalizing its trade regime on an unilateral and regional basis. Unilaterally, Madagascar reduced its simple average MFN tariff from 16.2 percent at the end of 2005 to 13.6 percent in 2006, slightly below the SSA average of 14.5 percent.[3] This reflects in part the elimination of the top band of 25 percent. The number of tariff bands thus declined from five to four (0, 5, 10, 20). Except for 19 specific tariff lines (out of 6155) on oil, oil products, and gases, all tariffs are ad valorem. Moreover, the authorities intend to "further streamline the tariff structure," "eliminate tariff distortions by reviewing the categorization of merchandise," and conclude a "study of the advisability and fiscal and economic impact of a uniform nonzero customs tariff and of other options" (IMF, 2006b).

Madagascar is also embarking on preferential trade agreements. In addition to joining the SADC FTA, Madagascar has been a member of the Common Market for Eastern and Southern Africa (COMESA) since 1993 and was one of the nine countries forming the COMESA FTA in 2000.

Overlapping membership in SADC and COMESA (Table 1) will limit the impact of the SADC FTA on Madagascar. Madagascar's imports from SADC account for 12.5 percent of its total imports. However, four SADC members already have duty-free access to

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[2] SADC members are listed in Table 1. For more details on SADC, see Khandelwal (2004) and Chauvin and Gaulier (2002).

[3] Excluding other duties and charges, the average is 13 percent in Sub-Saharan Africa.

Madagascar because they also belong to the COMESA FTA.[4] These four countries account for 6.9 percent of Madagascar imports and 55 percent of Madagascar imports from SADC countries. Therefore, the SADC FTA will lead to an elimination of customs tariffs on 5.6 percent of Madagascar imports, not 12.5 percent. Moreover, the impact will largely be limited to imports from South Africa, which account for 88 percent of Madagascar imports that will be actually liberalized by the SADC FTA. Appendix I provides more details on Madagascar's pattern of trade.

Table 1. SADC and COMESA: Overlapping Memberships [1]

SADC Members	that are also Members of the COMESA	and of the COMESA FTA	Share in Madagascar imports (in percent, 2005) [2]	Share in Madagascar imports from SADC (in percent, 2005) [2]
Angola	X		0.0	0.0
Botswana			0.0	0.0
Democratic Republic of the Congo	X		0.0	0.0
Lesotho			0.0	0.0
Madagascar	X	X		
Malawi	X	X	0.2	1.6
Mauritius	X	X	6.7	53.5
Mozambique			0.0	0.0
Namibia			0.0	0.0
South Africa			4.9	39.6
Swaziland	X		0.4	3.2
Tanzania			0.3	2.0
Zambia	X	X	0.0	0.0
Zimbabwe	X	X	0.0	0.0

1/ There is also overlapping membership with the Indian Ocean Commission and the Cross Border Initiative but there impact on trade is negligible.
2/ IMF's Direction of Trade database.

[4] For a matrix of trade preferences between the COMESA member states, see http://www.comesa.int/trade/Folder.2005-09-06.3314/Part%20III%20The%20FTA/view.

III. JOINING SADC: PROCESS AND MOTIVATIONS

Two years after becoming SADC's 14th Member, Madagascar plans to start phasing out its tariff on imports from SADC in 2007. By 2012, tariff on SADC import will be almost fully eliminated (Table 2). Madagascar's tariff reduction on SADC imports discriminates between South Africa and the rest of SADC.[5] Nonetheless the differences between tariff on South Africa imports and rest of SADC will be minimal.[6] In addition to the FTA, SADC plans to achieve a customs union by 2010.[7] With the SADC, Madgascar will also benefit from an elimination of the tariff on its exports to the SADC members that are not part to the COMESA (Table 1). These countries are the members of the Southern African Customs Union (SACU), Mozambique, and Tanzania. In 2006, these countries average tariff was respectively 11.4, 12.1, and 7.2 percent. In addition, the preferencial access granted to Madagascar exports by the Democratic Republic of Congo and Angola will be increased.

Madagascar expects that the SADC FTA will boost its economic development. In an address to the 25th SADC Conference in 2005, the President of the Republic of Madagascar stressed "we firmly believe in the impact SADC can and should have in the development of our countries" (Ravalomanana, 2005). The Minister of Industrialization and Commerce stated in the 2006 SADC Review that regional cooperation is "an essential aspect of our development" (SADC, 2006a).

Table 2. Planned Reduction in Madagascar Customs Tariff on SADC imports
(Simple tariff average, in percent)

	2006	2007	2008	2009	2010	2011	2012
South Africa	13.6	2.6	2.5	1.2	1.2	0.6	0.0
Rest of SADC	- [1/]	2.6	2.5	1.2	0.6	0.0	0.0

1/ Countries that are both members of COMESA and SADC already had preferential access to the Malagasy market under the COMESA. Other countries faced MFN tariffs averaging 13.5 percent.
Source: Staff calculation based on the tariff reduction agreed in October 2006.

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[5] This reflects the SADC provision of asymmetry of treatment between member states at different level of development.

[6] Tariffs will remain on sugar products as well as oil, petroleum products, and gases.

[7] At the SADC extraordinary summit held in Midrand, South Africa, on October 23, 2006, SADC members confirmed their intention to implement the FTA starting in 2008 and a customs union in 2010. Moreover, they decided that member countries adversely impacted by the tariff disarmament would benefit from privileged access to the SADC regional development fund (SADC, 2006b).

More specifically, the Malagasy authorities expect that regional integration will promote economic development by increasing further Madagascar trade openness[8] and by fostering investment. In the 2006 SADC Review, they indicated "The main objective of the government is to promote strong economic growth by attracting new investments and opening up Madagascar to the world economy." In the Memorandum of Economic and Financial Policies attached to the request for a new three-year arrangement under the Poverty Reduction and Growth Facility, they indicated "Madagascar's recent admission to the Southern African Development Community (SADC) sends a strong signal to investors seeking new market opportunities, especially since member countries are relying on the country to act as the region's "bread basket." (IMF, 2006a).

Given the large body of empirical literature linking trade openness with higher growth (Hallaert, 2006), liberalizing trade may indeed promote economic development. However, although regional integration has long been seen in Africa as a means of achieving industrialization and development, it has not prevented the decline of Africa in world trade nor promoted intra-regional trade and a sustained high growth (Foroutan, 1993; Foroutan and Pritchett, 1993; Yeats, 1998; Khandelwal, 2004; van den Boogaerde and Tsangarides, 2005) for various reasons.

First, the potential trade from African regional trade agreements may be low. Gravity models have been widely and successfully used to estimate the potential bilateral trade flows based on the economic sizes and distance between two countries. Comparing the actual trade flows with the model prediction provides indication of the potential increase in trade of a trade agreement. Only a few studies have applied gravity models to sub-Saharan African (SSA). Two such studies, Foroutan and Pritchett (1993) on intra-SSA trade and, more recently, Chauvin and Gaulier (2002) on intra-SADC trade conclude that, although small, the actual level of intra-African trade is not below what we could expect. Therefore, the trade potential of an intra-African regional agreement may be low.

Second, past experience shows that the actual intra-regional trade liberalization was limited in Africa because of (i) import-substitution policies,[9] (ii) tariff-revenue constraints, (iii) inequal distribution of costs and benefits of integration, (iv) severe distorsions in the trade regimes of many African countries, (v) high transaction costs due to inadequate infrastructures, (vi) limited product complementarities,[10] and (vii) institutional constraints as well as conflicting goals due to African countries' membership in several regional groups (Chauvin and Gaulier, 2002; Foroutan, 1993; Hallaert, 2004; Khandelwal, 2004; SADC, 2006b; Yeats, 1998). Moreover, the complementary policies (macroeconomic stability, appropriate exchange rate, investment policies, etc) that are crucial to ensure that trade liberalization promotes growth were often not implemented.

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[8] Reflecting past liberalization, Madagascar trade openess (measured by the share of exports and imports in GDP) increased from 15 percent of GDP in 1985 to about 33 percent in 2005.

[9] The SADC agreement includes, for example, provisions for protection of infant industries.

[10] Significantly, the Communiqué of the recent SADC extraordinary summit indicated: "Summit noted that SADC's trade pattern consist mainly of commodities and that there is a need to diversify the SADC economies and increase intra-regional trade and growth" (SADC, 2006b).

Investment policy appears to be one of the crucial complementary policies. Some cross-country studies suggest that trade liberalization affects growth primarily through an increase in investment (Baldwin and Seghezza, 1996; Levine and Renelt, 1992; Wacziarg, 2001). Aptly, the Malagasy government puts a strong emphasis on the role of investment in joining SADC. It views a lack of saving as hampering the investment needed to foster the country's development (Ravalomanana, 2005).[11] However, in joining SADC most of the expected impact on investment is placed on the role of foreign direct investments (FDI), especially from South Africa. In December 2006, Madagascar and South Africa signed a protocol on mutual investment promotion aiming at creating a legal framework to promote investment between the two countries. In this regard, cross-country studies show that the relation between trade liberalization, foreign investment and domestic investment can be complex (Harrison and Revenga, 1995).

Madagascar also expects to become the "region's basket bread" (IMF, 2006a).[12] Once again, this expectation appears supported by the literature which finds that a potential increase in food trade may exist in African regional groups (Chauvin and Gaulier, 2004; Yeats 1998). Finally, the Malagasy clothing industry also expects that the reduction of a high customs tariff on its export to South Africa (36.6 percent)[13] will boost its exports helping to diversify out of the United States and the European Union markets. Indeed, exports to the Northern Hemisphere are cyclical, with low activity in the first month of the year. Due to its location in the Southern Hemisphere, South Africa's demand for textiles would be mostly concentrated during this period of low activity.[14] Malagasy exporters would then be able to produce for the South African market without much additional investment.

This paper aims to quantify the various expected impacts of the SADC FTA. Therefore, simulations have a particular focus on the development side, proxied by the impact of the SADC FTA on growth and welfare, provide estimates on its impact on trade flows and investment, and assess the potential gains that the Malagasy authorities expect for agriculture and for the textiles and clothing industries.

IV. THE IMPACT OF THE SADC FTA

A. Model and methodology

The impact of the SADC FTA is estimated using the Global Trade Analysis Project (GTAP), a widely used Computable General Equilibrium (CGE) model based on neoclassical theory. The GTAP database is benchmarked to the global economy in 2001 and all results are thus

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[11] In 2005, investment, at 22.5 percent of GDP, was 10.4 percentage points higher than saving.

[12] Agriculture accounts for 26 percent of GDP and 31 percent when agro-industry is added (IMF, 2005b).

[13] In 2006, South Africa's average tariff on textiles and apparel from SADC was 8.3 percent.

[14] For an analysis of the potential impact of SADC membership on Madagascar's exports of textiles, see Oxford Analytica (2005)

presented in 2001 U.S. dollars (Appendix VI). For the purpose of this paper the GTAP database has been aggregated into the 8 regions and 6 industries listed in Table 3.

SADC members are split in three: Madagascar, South Africa, and the rest of SADC.[15] The rationale for singling out South Africa is threefold. First, the Malagasy authorities expect most of the gains to come from trade and FDI with South Africa. Second, Yeats (1998) as well as Chauvin and Gaulier (2002) argued that while there is little potential to increase intra-African trade under a FTA because of the limited product complementarities, an exception may be trade with South Africa. Third, as already mentioned, 88 percent of Madagascar imports effectively liberalized under the SADC FTA are from South Africa.

Table 3. Region and Industry Aggregation

Regions	Industry
Madagascar	Agriculture and food
South Africa	Rice
Rest of SADC	Textiles
European Union (25)	Apparel
U.S.	Other manufacturing
Canada	Services
China	
Rest of the world	

The sectoral aggregation is determined by Madagascar's expectations that the FTA will boost its exports of agricultural goods, textiles, and clothing. These industries are therefore singled out, as is the rice sector because of its importance for the Malagasy economy (rice accounts for 1/3 of agricultural production, IMF, 2005b) as well as because of the intention to increase rice exports to the SADC region.

A two-step approach is taken in this paper. First, the database was updated for the liberalization of trade in textiles and clothing in early 2005. In 2001, textile trade was constrained by many bilateral quotas on textiles and clothing. The elimination of these quotas by the United States, the European Union, and Canada led to a dramatic increase in imports of some textiles and clothing products from China, prompting the European Union and the United States to revive some quantitative restrictions. To account for this partial liberalization, all bilateral quota restrictions on textiles are eliminated except U.S. and E.U. quotas on imports. In this case, the "export taxes"[16] on Chinese textiles and clothing to the U.S. and E.U. markets were halved.

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[15] The SACU members except South Africa are included in the rest of SADC.

[16] In GTAP, bilateral quota restrictions are converted into export tax equivalent.

Second, using this updated database, the implementation of a *full* SADC FTA is simulated i.e. a total and reciprocal elimination by all SADC countries of import tariffs on intra-regional trade. Two alternatives are considered:

- In the first scenario, all prices and wages are assumed to be flexible so as to maintain the current level of employment.

- In the second scenario, real wages of skilled and unskilled labor in all countries and regions are assumed to be rigid so as to allow the SADC FTA to affect the level of employment.

B. A marginal impact on GDP and welfare

A key objective of Madagascar in the SADC FTA is to promote its development. This can be proxied by impact of the SADC FTA on real GDP and welfare.[17] Under all scenarios, the impact of SADC FTA on Madagascar's real GDP and welfare is negligible (Table 4).

Table 4. Impact on Real GDP
(in millions of 2001 U.S. dollars, percentage changes in parentheses)

	Scenario 1	Scenario 2
Madagascar	-0.1 (0)	1.3 (0)
South Africa	34.4 (0)	595.9 (0.5)
Rest of SADC	-111.1 (-0.2)	500.6 (0.9)
European Union	-0.5 (0)	-76.0 (0)
United States	1.0 (0)	-52.0 (0)
Canada	-0.1 (0)	-0.8 (0)
China	0.4 (0)	-10.3 (0)
Rest of the World	-39.0 (0)	-201.0 (0)
World	-115.0 (0)	757.7 (0)

In scenario 2, Madagascar's real GDP would increase by 0.03 percent, while in scenario 1 it would not be affected.[18] The difference lies in the impact of increased employment. In

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[17] In GTAP, welfare is measured as an equivalent variation in income i.e. using the base period prices. Therefore the equivalent variation measures the amount that individuals would have paid to go back to the pre-SADC FTA situation after it was implemented. For more details on the welfare decomposition see Huff and Hertel (2001) and McDougall (2003). World welfare is the sum of regional welfares. Changes in welfare can be decomposed into allocative efficiency effects, technology effects, endowment effects, and terms of trade effects. Appendix I does not report the technology effect which is set to zero in the simulations presented in this paper. The investment and saving prices do not convey a genuine economic impact.

[18] As GTAP estimates the static impact of the SADC FTA, all references to changes in GDP (as well as its components, for example table 8) have to be understood as changes in the *level* of GDP not changes in the

Scenario 2, the SADC FTA would increase skilled labor employment (+0.1 percent) and to a lesser extent unskilled employment (+0.05 percent). This increase in employment would not affect real wages which, in this scenario, are assumed to remain constant, although nominal wages would slightly decline (-0.05 percent) following the small negative impact on prices of the FTA (Table 5). As discussed below, the increase in employment boosts consumption, which becomes a strong contributor to the increase of the real GDP (Table 8).

The welfare impact (Appendix II) provides additional details on the impact of the SADC FTA. In both scenarios, the impact on Madagascar is marginal, albeit of different sign, and mostly due to a deterioration of the terms of trade. Only if the SADC FTA leads to an increase in employment (scenario 2) would Madagascar experience a welfare gain, because of the higher level in employment. The gain from this endowment effect would then outweigh other sources of welfare losses.

For SADC as a whole, the FTA would improve welfare by $74 million US to $1.2 billion US, but the distribution effect is ambiguous: while South Africa would gain under both scenarios, the welfare impact on the rest of SADC and Madagascar is ambiguous.

Table 5. Change in Real Wages in the SADC
(in percent)

	Scenario 1	Scenario 2
Madagascar		
Unskilled labor	0.02	0 [1/]
Skilled labor	0.05	0 [1/]
South Africa		
Unskilled labor	0.26	0 [1/]
Skilled labor	0.25	0 [1/]
Rest of SADC		
Unskilled labor	0.98	0 [1/]
Skilled labor	1.11	0 [1/]

1/ Scenario 2 is based on the assumption that there is no change in
   real wages of both skilled and unskilled labor.

C. A trade diverting or a trade creating FTA?

Following the works of Jacob Viner (1950) and James Meade (1955), the static global welfare impact of preferential trade agreements (PTA) is measured by the gains from trade creation (an improvement in allocative efficiency due to the replacement of production and consumption of domestic goods with imports from more efficient partner countries) net of

growth *rate* of GDP although an increase in the growth rate can be expected in the transition period following the trade liberalization.

the costs of trade diversion (a welfare cost associated from switching from a non-member efficient supplier to a less efficient partner in the PTA following the discriminatory trade liberalization). From a national point of view, the formation of a PTA also affects the terms of trade and thus individual countries welfare (Collier, 1979; Pomfret, 1988). In GTAP, the gains from trade creation are reflected in the allocative efficiency, while trade diversion is reflected in the terms of trade by an increase in the true cost of imports (Gilbert and Wahl, 2002). Changes in the direction of trade also provide some indications on trade diversion and trade expansion.

South Africa appears to benefit from net trade creation:

(i) *Trade creation* would be rather large, as suggested by allocative efficiency gains (Appendix II) and the replacement of some (relatively inefficient) domestic production by imports notably rice and apparel (Appendix IV). For example, the value added of the rice sector would decrease by about 2 percent, while imports of rice would increase by 3 percent (exports would also decline). Similarly, the value added of the apparel industry would decline by 0.4 to 1.3 percent while imports would increase by about 8 percent. The decline in output is limited by an increase in exports of 4 percent.

Table 6. Change in the Terms of Trade [1/ 2/]
(In percent)

		Scenario 1	Scenario 2
Madagascar	Terms of Trade	-0.07	-0.06
	Px	-0.05	-0.05
	Pm	0.02	0.01
South Africa	Terms of Trade	0.68	0.72
	Px	0.67	0.71
	Pm	-0.01	-0.02
Rest of SADC	Terms of Trade	-0.31	-0.41
	Px	-0.11	-0.21
	Pm	0.20	0.21

1/ Changes in terms of trade on non-SADC countries (as well as import and export prices) are close to zero.
2/ Because GTAP differentiates products by country of origin, changes in the terms of trade can be decomposed in three components: (i) changes in world prices; (ii) changes in regional export prices; (iii) changes in regional import prices. Given the small share of the SADC region in total trade, the SADC FTA has virtually no impact on world prices and only (i) and (ii) are reported here.

(ii) *Trade expansion* (i.e. an expansion of exports to partner countries) provides additional gains, as indicated by an increase in export prices (Table 6) as well as a 25 percent jump in exports to SADC (Appendix III). Interestingly, the simulations suggest that, because of

supply side constraints, the increase in SADC demand for South African products would not be fully met by an increase in production (South Africa's real GDP is simulated to be higher by 0.8 to 1.4 percent following the implementation of the FTA) but would also lead to a reduction in exports to third countries.

(iii) *Trade diversion* does not appear to be an issue for South Africa. Its import prices are not increasing and imports from third countries would increase. The reason is that the scope of trade diversion is limited: SADC exports to South Africa are concentrated in a few products that account only for a limited share of its imports (excluding trade with other SACU countries, South Africa's import from SADC accounts for only 2.1 percent of its imports).

By contrast, South Africa's weights in its partners imports is larger (about 5 percent for Madagascar) and its exports are more diversified. Therefore, a FTA with South Africa can lead to trade diversion for other SADC countries. This is indeed what the simulations suggest for both Madagascar and the rest of SADC. First, their import prices would increase (Table 6). Second, their imports from South Africa would increase significantly while imports from the rest of the world would contract (Appendix III).

Madagascar would experience net trade diversion. Although the increase in import prices is marginal (Table 6), Madagascar imports would switch from non-SADC suppliers to SADC suppliers. Imports from South Africa would increase by about 9 percent and imports from the rest of SADC by 2 percent, while imports from non-SADC would decline by 0.5 percent (Appendix III). This trade diversion does not appear to be offset by trade creation since (i) efficiency gains are negligible; (ii) total trade would barely increase (+0.4 percent at most, Appendix II); and (iii) domestic production does not appear to be affected significantly by imports (Appendix IV).

In sum, simulations suggest that the SADC FTA would have a different impact on its various members: it would be more trade diverting than trade creating for Madagascar and the rest of SADC, but more trade creating than trade diverting for South Africa. The impact on the world is ambiguous and limited. The world welfare would decline by 115 millions US dollars in scenario 1 but would increase by 757 millions in the scenario 2. In both cases, SADC area trade with the rest of the world would decline hinting that the FTA may be, on a net basis, trade diverting.

D. Why the SADC FTA does not boost Madagascar GDP

This section aims at explaining why the impact of the SADC FTA on Madagascar's real GDP is extremely limited by reviewing two channel by which trade liberalization may affect GDP: increase in trade and investment.

As already mentioned, the SADC FTA impact on trade (and thus on the economy) is expected to be limited because the trade liberalization it implies is limited. Indeed, simulations indicate that export volume growth is marginal at about 0.5 percent for both Madagascar and South Africa and 4 percent for the rest of SADC. Because this increase is

accompanied by an increase in the volume of imports (Table 7),[19] net exports do not contribute to increase Madagascar GDP and even tend to have a negative impact for South Africa's and the rest of SADC's (Table 8).

Table 7. Change in Volume of Trade of SADC members
(in percent)

	Scenario 1	Scenario 2
Madagascar		
Exports	0.4	0.5
Imports	0.3	0.4
South Africa		
Exports	0.5	0.4
Imports	2.1	2.8
Rest of SADC		
Exports	3.8	4.4
Imports	4.9	5.9

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[19] Changes in value are provided in appendix II.

Table 8. Decomposition of the Change in Real GDP
(in percent)

	Scenario 1	Scenario 2
Madagascar		
GDP	0.00	0.03
Consumption	-0.02	0.01
Investment	0.01	0.02
Exports	0.10	0.10
Imports	-0.09	-0.10
South Africa		
GDP	0.0	0.5
Consumption	0.2	0.6
Investment	0.2	0.5
Exports	0.2	0.2
Imports	-0.6	-0.7
Rest of SADC		
GDP	-0.2	0.9
Consumption	-0.3	0.6
Investment	0.5	0.8
Exports	1.6	1.8
Imports	-1.9	-2.4

Investment may be another channel through which trade liberalization may affect GDP.[20] This is one of the main benefit from SADC that the Malagasy government is expecting from the SADC FTA. Table 8 indicates that investment would indeed positively help to increase the real GDP. However, its impact is limited and smaller than in South Africa or the rest of SADC. Capital account, which reports changes in the saving and investment balance, would improve marginally (by 0.1 to 0.2 percent) owing to a limited increase in inflows of foreign capital.

The impact of investment is limited partly because scenarios 1 and 2 assume that the endowment in capital is fixed. As discussed in section G, when this assumption is relaxed the contribution to growth in scenario 1 does not change but the contribution in scenario 2 increase, but remains limited, from 0.02 to 0.08 percent (Table 12). The actual impact could be, however, larger because the model make no allowance for dynamic gains that may affect investment and the inflows of FDI. Past experience suggest that that following the trade reform of the second half of the 1980's Madagascar experienced a significant increase in FDI inflows (Harrison and Revenga, 1995). However, this experience may not be relevant since

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[20] For details, see Wacziarg (2001).

the increase in FDI may be more related to the introduction of export processing zones (EPZ) in 1989 rather than the outcome of tariff cuts.

E. A substantial change in the structure of trade

Although the SADC FTA would have only a limited impact Madagascar's total trade, it would affect significantly the trade structure.

Table 9. Change in the Geographical Structure of Trade
(in percent) [1]

		Scenario 1	Scenario 2
SADC	Total trade	2.7	3.2
	Intra-SADC	25.8	27.1
	Trade with third countries	-1.8	-1.5
Madagascar [2]	Total trade	0.3	0.4
	Trade with SADC	4.8	5.1
	Trade with third countries	-0.2	-0.1
South Africa	Total trade	1.6	1.9
	Trade with SADC	22.6	23.7
	Trade with third countries	-1.4	-1.2
Rest of SADC	Total trade	3.6	5.2
	Trade with SADC	29.0	30.3
	Trade with third countries	-2.7	-2.1

1/ Total trade is the sum of imports and exports measured at world price.
2/ For details, see Appendix III.

First, the direction of trade would be substantially altered. Trade between SADC members would increase substantially at the expense of trade with third countries (Table 9). While Madagascar's total trade would barely increase (0.4 percent at most), its trade with SADC would increase by about 5 percent, while its trade with the rest of the world would decline.[21] Results confirm the prediction from the literature that the increase in Madagascar trade with SADC would be driven with trade with South Africa (+12.5 percent). In particular, exports to South Africa are expected to double (Appendix III). In contrast, Madagascar trade with the rest of SADC would increase by less than a percent with Madagascar's exports to that region dropping by 8 percent. This drop suggests that the impact of the Madagascar preferential access to many SADC countries under the COMESA FTA would be eroded by the formation

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[21] This trade diversion would affect all products (Appendix VI).

of the SADC FTA[22] and/or that the limited product complementarity prevents a significant expansion of trade between Madagascar and the rest of SADC. The fact that intra-rest of SADC trade expands significantly would suggest that the former factor may be more important.

Second, the product pattern of Madagascar trade would change. Madagascar would not become the region's bread basket: agricultural and food exports and production (including rice) would not be affected by the SADC FTA but instead imports would increase (Appendixes IV and V) leading to the deterioration in the sector trade balance (Table 10).

Table 10. Change in Madagascar Trade Balance
(in millions of 2001 US dollar)

	Scenario 1	Scenario 2
Food	-1.4	-1.5
Rice	0.0	0.0
Textiles	1.9	2.1
Clothing	0.9	1.0
Other manufacturing	-2.0	-2.3
Services	0.3	0.1
TOTAL	-0.3	-0.6

However, the textiles and clothing industries would be the major beneficiaries of the SADC FTA. Total exports would increase (Appendix V) leading to an expansion of production (Appendix IV). The expansion of trade in textiles and clothing is, as expected, explained by trade with South Africa. Exports of textiles to South Africa would jump by more than 500 percent and exports of clothing by 200 percent. Suggesting an increase in intra-industry trade, imports from South Africa would also increase by respectively about 58 and 116 percent. In contrast, trade in textiles and clothing with the rest of SADC and the rest of the world would not be affected much. Reflecting the current small share of South Africa in the country exports, Madagascar total exports of textiles will be limited to about 1 percent and exports of apparel to 0.5 percent.

The development in intra-SADC trade in textiles and clothing is particularly important because it would help Madagascar maintain a preferential treatment under the African Growth and Opportunity Act (AGOA), a U.S. unilateral trade preference program. The AGOA's third-country provision provides duty- and quota-free access for African apparels made from non-African and non-U.S. fabrics. After the expiration of the third-country provision, initially scheduled in September 2007 but recently extended until 2012, only apparel made with African or U.S. fabrics would become eligible to the preferential access. This would be

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[22] This may reflect a suppression of the trade diversion of the COMESA FTA. For details on suppression of trade diversion, see Wonnacott (1996).

a serious challenge for Madagascar because the supply of domestic fabrics is limited and the industry imports its inputs mostly from Asia.[23] The extension of the provision will give more time to Madagascar apparel industry to adjust by diversifying both its sourcing of fabrics (local production as well as developing intra-African trade) as well as its export markets (such as South Africa).[24] Simulations suggest that on both sides, the SADC FTA may be beneficial.

The results for textiles and apparel industries are quite dramatic and consistent with other studies (Chauvin and Gaulier, 2002). However, the actual increase may be more limited because the SADC Trade Protocol treats textiles and clothing as a sensitive industry which will be liberalized more slowly than other products. Moreover, SADC's strict rules of origin (Kandhelwal, 2004) and the willingness of South Africa to protect its textiles and clothing (Chauvin and Gaulier, 2002) might prevent a strong expansion of intra-SADC trade.

F. Resource allocation: A shift to the textiles and clothing industry

Although the impact of the SADC FTA on overall GDP is limited, changes in the structure of trade would affect the structure of production. In Madagascar, the real value added of the textiles and clothing industries would expand by about 0.9 and 0.3 percent respectively. The value added of other goods would decline slightly (Appendix IV). The rest of SADC would also benefit from the opening up of the South African market in textiles and clothing. In contrast, the expansion of South Africa's net imports in textiles and clothing would lead to a decline in its value added of the labor-intensive clothing industry (from -0.4 to -1.3) while the value added of the more capital-intensive production of textiles would increase (up to 0.9 percent). The main winner in food and food processed products would not be Madagascar (-0.1 percent) but South Africa (+1.4 to +1.9 percent) while the impact of the rest of SADC is ambiguous (-0.5 to +0.4 percent).

The change in the composition of production leads to a change in the demand for factor of production. In particular, under both scenarios, employment of both skilled and unskilled labor in Madagascar would shift to the textiles and clothing industries (Table 11). When total employment grows (scenario 2), the magnitude in the increase in employment in the textile and clothing industries remains the same but would not come anymore at the expenses of other sectors. In particular employment in other manufacturing would not decrease but

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[23] The elimination of the provision would affect almost all clothing exporters in Africa. Apparel imports under AGOA accounted for nearly half of non-oil AGOA trade in 2005. Of the 14 AGOA countries eligible to export apparel to the United States, 11 use third country fabric exclusively and about 95 percent of AGOA apparel is assembled from third country fabric. Moreover, apparel imports under AGOA accounted for nearly half of non-oil AGOA trade in 2005.

[24] Madagascar has already diversified its exports away from the United States after the elimination of the textiles quotas. In 2005, Madagascar exports of clothing to the U.S. declined by 14 percent while exports to the European Union increased by 12 percent (GEFP, 2006). The trend continued in 2006: based on figures for January-October 2006, Madagascar accounts for nearly two thirds of the net increase in exports to the EU between 2005 and 2006. At the same time, its exports to the US have continued to fall (World Bank, 2007). The addition of South Africa's market would further reduce the country's vulnerabilities. Madagascar clothing industry is also diversifying its production toward more sophisticated products.

increase slightly. In this case, the SADC FTA would have another benefit for Madagascar. It would not lead to a concentration of production but instead favor its diversification.

Table 11. Demand for Factor of Production in Madagascar
(percentage change) [1]

	Unskilled Labor	Skilled Labor	Capital
Food	-0.1 / 0	-0.1 / 0	-0.1
Rice	-0.1 / 0	-0.1 / 0	-0.1
Textiles	1.0	0.9 / 1.0	0.9 / 1.0
Clothing	0.3 / 0.4	0.3 / 0.4	0.3
Other manufacturing	0	-0.1 / 0	-0.1 / 0
Services	0 / 0.1	0 / 0.1	0

1/ First figure refers to scenario 1 and the second to scenario 2.

G. What can be done to maximize the gains from the SADC FTA? The role of domestic policies and multilateral liberalization

Scenario 1 assumes that the quantity of each endowment is fixed. This can be interpreted as an initial situation where there is full utilization of resources or a situation where rigidities prevent a full utilization of existing endowments. In this scenario, the impact of the SADC FTA is mainly to reallocate resources between sectors. Scenario 2 relaxes the assumption for labor, and assumes that the level of employment can change. This assumption appears realistic given the structure of the labor market in Madagascar. The labor force is limited at 8.3 million on a population of 18.1 million (MIGA, 2006), 82 percent of the labor force was employed in the agricultural sector and only 13.4 percent in the formal sector (Government of Madagascar, 2006). Under scenario 2, the losses occurred under scenario 1 turn into gains because of the increase in employment (Appendix II) and its impact on consumption (Table 4). But in both cases the impact is negligible.

Table 12. Impact of the decline in the price of capital
(In percent)

Contribution to Growth		Scenario 1	Scenario 1b	Scenario 2	Scenario 2 b
GDP		0.00	0.02	0.03	0.43
	Consumption	-0.02	-0.01	0.01	0.38
	Investment	0.01	0.01	0.02	0.08
	Exports	0.10	0.09	0.10	0.22
	Imports	-0.08	-0.07	-0.10	-0.25

In this section, the assumption of fixed endowment in capital is relaxed for both scenarios 1 and 2.[25] When this modification affects the scenario 1 (scenario 1b) the results are similar to those of a relaxation of the assumption of fixed level of employment (scenario 2): the SADC FTA increase real GDP by a small 0.02 percent of GDP and the increase in investment remains negligible. However, when the SADC FTA can affect both the level of endowment in labor and in capital, the results become somewhat larger albeit still small: the GDP would increase by 0.4 percent and investment by 0.08 percent (Table 12). The bulk of the contribution to a higher GDP comes from more consumption. The welfare impact of endowment is also magnified. Not only is the endowment effect related of employment large ($10 million US) but there is also an impact of larger endowment in capital (about $8 million dollars). As a result, the welfare impact of the SADC FTA for Madagascar would switch from a loss of $1 million US in scenario 1 to a gain of $17.5 million. This represents a gain increasing from about $0.06 to $1 US per capita.

The reason for the stronger impact in scenario 2b compared to scenarios 1b and 2 is the following. Labor and capital are complementary inputs for a firm. Thus, in scenario 2, the possibility to increase employment is limited by the availability of capital and the gains from the SADC FTA remain marginal although larger than in scenario 1. For the same reason, the increase in the stock of capital is limited in scenario 1b by the availability of labor. By contrast, if both the level of employment and of capital are allowed to increase, this constraint disappears and the impact of the SADC FTA becomes larger.

Scenarios 1b and 2b represent different assumptions regarding the initial utilization of endowment in Madagascar. Scenario 1 can be seen as the outcome of the SADC FTA if there is full utilization of both capital and employment or if rigidities prevent to move to the full employment. Other scenarios relax this assumptions for employment (scenario 2), capital (scenario 1b) or both (scenario 2b). However, these scenarios have policy implications. If there are rigidities in the economy that affect the utilization of endowments, complementary policies that would remove these rigidities will increase the gain from the SADC FTA. The latest World Bank's investment climate assessment provides details on rigidities affecting the use of both labor and capital and thus suggests possible complementary policies. For example, 67 percent of firms surveyed quote the cost of finance as a major or severe constraint, 59 percent the access to finance, 31 percent the skills and education of workers and 15 percent labor regulations (Shah and al., 2005).

Under all scenarios, the gains from the SADC FTA are limited.[26] However, this does not mean that trade liberalization cannot foster significantly Madagascar's growth. The gains from the SADC FTA are small because (i) it is actually a small trade liberalization; and (ii) a regional liberalization is discriminatory liberalization and, as such, involves costs. A multilateral trade liberalization would both increase the coverage of the trade liberalization and eliminate the costs associated with trade diversion. For illustrative purpose, Table 13

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[25] Technically, this is done by assuming that the *real* price of capital is fixed.

[26] Results remain identical to those of scenario 1 when different specifications of labor market conditions in third countries (including South Africa) are considered.

presents a scenario under which the full liberalization of intra-SADC trade is combined with a partial and small (10 percent) multilateral reduction of the applied tariff. The result then appear much larger and appear consistent with Vamvakidis' (1998) conclusion. Vamvakidis found that economies have grown faster on average and have a higher investment share after a nondiscriminatory liberalization, both in the short and long run, but not after joining a preferential agreement.

Table 13. SADC and multilateral liberalization [1/]

		Real GDP (change in percent)	Welfare (in millions of U.S. dollars)	Welfare (in dollars per capita)
Scenario 1	SADC only	0.0	-1.0	-0.1
	SADC and a multilateral tariff cut	0.1	27.9	1.6
Scenario 2	SADC only	0.0	0.5	0.0
	SADC and a multilateral tariff cut	1.5	94.7	5.3

1/ The multilateral cut simulated is a uniform and nondiscriminatory 10 percent cut in the applied customs tariff rate of all regions on all goods. For SADC, the cut is limited to trade with non-SADC countries while intra-SADC trade is fully liberalized.

V. CONCLUSION

The simulations presented in this paper are consistent with previous studies. Madagascar's trade with South Africa would increase substantially under the SADC FTA but the impact on trade with the rest of SADC is limited and trade with third countries would decline. Most of the change in trade is due to changes in trade in textiles and clothing that would be the main beneficiary of the SADC FTA. Despite these trade changes, the impact on Madgascar's real GDP and welfare are limited because the trade liberalization is very limited (tariff elimination would affect less than 6 percent of Madagascar imports). Simulations also points that eliminating rigidities that affect the utilization of the factor of production would increase the gains from the SADC FTA. However, they would remain limited. In contrast, if the regional trade liberalization is accompanied by a multilateral liberalization, the gains become larger. The reason is twofold. First, the trade liberalization would then affect all Madagascar trade. Second, a multilateral liberalization would reduce the cost associated with the potential trade diversion.

The simulations presented in this paper provide only benchmark estimates and make no allowance for potential dynamic gains or costs (Wacziarg, 2001) and other gains such as increasing the credibility of policies and improving infrastructure. Such dynamic effects should not be underestimated since SADC has put a strong emphasis on addressing infrastructure constraints (Khandelwal, 2004), and Madagascar and South Africa signed, in

December 2006, two protocols aiming at promoting investment between the two countries and developing economic and physical infrastructures.

The simulations also ignore the fiscal impact of the SADC FTA. This impact is crucial for Madagascar because the country has one of the lowest tax revenue-to-GDP ratios in the world (about 10 percent of GDP in 2005) and about half of the tax revenue is taxes on international trade. Thus, Madagascar will have to find domestic measures to offset the losses in government revenue from regional tariff reductions because, unlike many African regional agreements such as SACU or COMESA, SADC has no provision for compensating fiscal losses (Walkenhorst, 2006) except that countries affected by the tariff cut would have a privileged access to the SADC regional development fund (SADC, 2006b). Further analysis is thus needed especially because:

(i) imports from South Africa appears to be on average more taxed than imports from the rest of the world. The basket of South Africa exports to Madagascar is such that it faces a trade weighted average tariff of 10.2 percent compared to 7.2 percent for the rest of the world.[27] Moreover, because tax exempt EPZ import relatively less from South Africa than from the rest of the world, South Africa share accounts for 4.8 percent of Madagascar total imports but 6.2 percent of Madagascar dutiable imports. As a result, the phasing out of tariffs on South African imports would lead to a reduction in Madagascar revenues from customs tariff of about 8.0 percent and of taxes on international trade (customs duties, tax on petroleum products, VAT, and excise taxes) of about 2.6 percent.[28]

(ii) the simulations point that Madagascar imports from non-SADC members would decline thus implying a second-round negative impact on customs revenue since only imports fromnon-SADC countries will continue to face a customs duty (IMF, 2005a).

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[27] This ratio is calculated on imports excluding EPZ imports, which are granted duty-free treatment, for the period January-October 2006 which were the latest data available when the study was undertaken. This period does not cover a full year (by using November 2005-October 2006) because import data for the end of 2005 were biased by the end of the temporary customs exemption on investment goods.

[28] See forthcoming "Republic of Madagascar: Selected issues" accompanying the 2007 Article IV Consultation.

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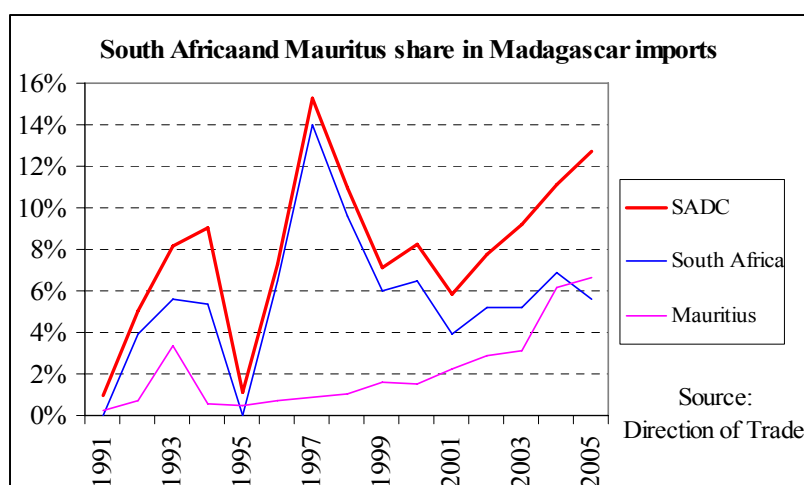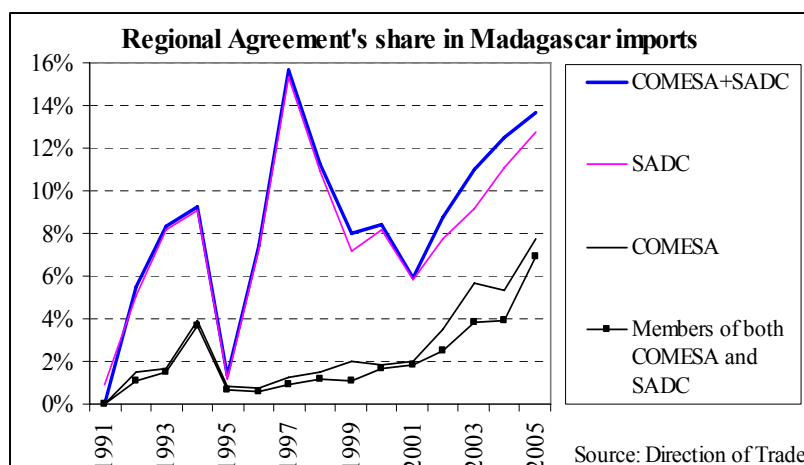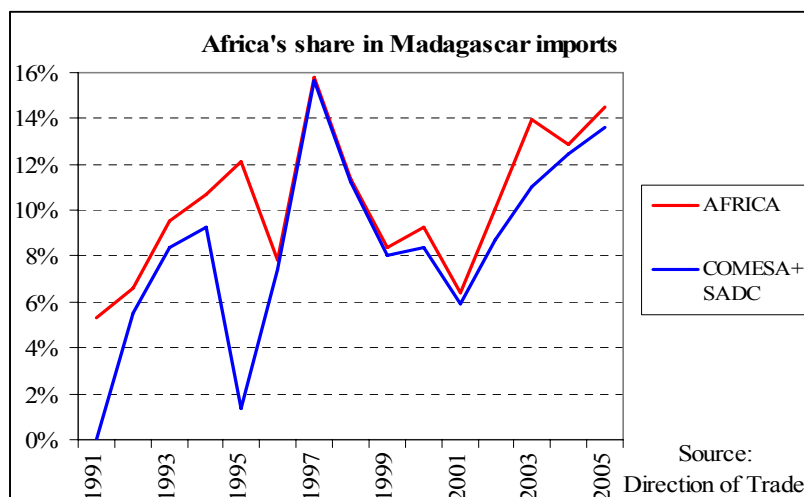
APPENDIX – I
Origin of Madagascar Imports

Imports from Africa represent only 15 percent of Madagascar total imports. However, this share has been increasing since 2001, recouping the loss experienced in the second half of the 1990s.

Moreover, virtually all Madagascar imports from Africa are from the COMESA and SADC areas. The exceptions are Côte d'Ivoire (0.1 percent of total imports) and the Maghreb countries (0.2 percent).

Trade with SADC appears more important than trade with COMESA. Moreover, in 2005, 89 percent of COMESA imports are from countries that are members of both SADC and COMESA (90 percent of which is imports from Mauritius). This is less true for imports from SADC: in 2005, only 35 percent of SADC imports were from countries belonging both to SADC and COMESA.

This reflects the weight of South Africa in Madagascar imports from both Africa and SADC. South Africa accounts 40 percent of Madagascar imports from SADC but imports from South Africa do not explain the recent increase in Africa and SADC market share since its share in Madagascar imports has been flat since 2000. Imports from Mauritius are the main reason fro the increase in trade with Africa and various African groups. Their value was 12 times higher in 2005 than in 2000.

Africa's share in Madagascar imports

Source: Direction of Trade

Regional Agreement's share in Madagascar imports

Source: Direction of Trade

South Africaand Mauritus share in Madagascar imports

Source: Direction of Trade

APPENDIX - II
Decomposition of the Welfare Effect
(In millions of 2001 U.S. dollars)

		Allocative Efficiency	Endowment Effect	Terms of Trade	I-S Effect	TOTAL
Madagascar	Scenario 1	-0.1	-	-0.8	-0.1	-1.0
	Scenario 2	-0.1	1.3	-0.7	-0.1	0.5
South Africa	Scenario 1	34.4	-	271.3	-50.1	255.5
	Scenario 2	210.7	385.8	288.3	-51.0	833.8
Rest of SADC	Scenario 1	-111.0	-	-75.0	5.3	-180.7
	Scenario 2	25.7	474.3	-100.2	5.5	405.2
European Union	Scenario 1	-0.5	-	-66.7	10.6	-56.7
	Scenario 2	-40.5	-35.7	-56.8	11.1	-121.9
United States	Scenario 1	1.5	-	-17.4	-3.3	-19.2
	Scenario 2	-16.7	-35.6	-19.8	-4.1	-76.2
Canada	Scenario 1	-0.1	-	-0.8	2.0	1.2
	Scenario 2	-0.5	-0.3	-1.1	2.2	0.2
China	Scenario 1	0.4	-	-12.2	9.5	-2.4
	Scenario 2	-1.5	-8.8	-11.9	9.6	-12.5
Rest of the World	Scenario 1	-38.8	-	-99.4	26.4	-111.8
	Scenario 2	-91.4	-109.2	-99.1	27.1	-272.6
WORLD	Scenario 1	-114.2	-	-1.1	0.2	-115.1
	Scenario 2	85.9	671.7	-1.3	0.2	756.5

APPENDIX – III
Change in SADC Direction of Trade [1]
(value, in percent)

		Madagascar	South Africa	Rest of SADC
1. Total trade				
	Imports	0.3 / 0.4	2.1 / 2.8	5.1 / 6.1
	Exports	0.4	1.1 / 1.2	3.8 / 4.3
	Total	0.3 / 0.4	1.6 / 1.9	4.4 / 5.2
2. Trade with SADC				
	Imports	4.5 / 4.8	14.1 / 15.3	29.3 / 30.6
	Exports	6.9 / 7.7	25.0 / 26.1	28.0 / 29.5
	Total	4.8 / 5.1	22.6 / 23.7	29.0 / 30.3
2.1 Trade with South Africa				
	Imports	8.5 / 8.7	-	25.2 / 26.4
	Exports	104.2 / 105.6	-	13.9 / 15.1
	Total	12.3 / 12.5	-	22.9 / 34.1
2.2 Trade with Rest of SADC				
	Imports	1.8 / 2.4	13.9 / 15.1	65.7 / 68.0
	Exports	-7.5 / -8.2	25.2 / 26.4	64.5 / 66.8
	Total	0.3 / 0.9	22.6 / 23.8	65.1 / 67.4
3. Trade with the rest of the World				
	Imports	-0.5	1.3 / 2.0	-6.4 / -7.3
	Exports	0.2	-3.6 / -3.8	0.7 / 1.1
	Total	-0.1 / -0.2	-1.2 / -1.4	-2.1 / -2.7

1/ Imports and exports are measured at world price. Values are the results for scenarios 1 and 2.

APPENDIX - IV
Change in Real Value Added by Sector [1]
(In percent)

		Agr. & Food	Rice	Textiles	Apparel	Other Manuf.	Services
Madagascar	Scenario 1	-0.1	-0.1	0.9	0.3	-0.0	0.0
	Scenario 2	-0.0	-0.0	1.0	0.4	-0.0	-0.0
South Africa	Scenario 1	1.4	-2.0	-0.1	-1.3	-0.4	0.0
	Scenario 2	1.7	-2.5	0.4	-0.9	-0.1	0.6
Rest of SADC	Scenario 1	-0.5	-0.4	3.5	6.4	-0.2	0.1
	Scenario 2	0.4	0.4	4.9	7.9	0.6	1.4

1/ Changes for non-SADC regions are below 0.05 percent for all sectors in all scenarios and are thus not reported here.

APPENDIX - V
Change in Madagascar Structure of Trade

	Change in imports at world prices (%) from		Change in exports at world prices (%) to	
	South Africa		South Africa	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Food	43.9	43.9	16.0	16.5
Rice	-	-	-	-
Textiles	57.8	57.8	535.9	537.9
Clothing	116.0	116.0	204.8	205.8
Other manufacturing	6.1	6.1	27.2	28.0
Services	-2.2	-2.2	1.7	2.2
	Rest of SADC		Rest of SADC	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Food	3.0	3.0	-14.3	-13.8
Rice	-1.4	-1.4	-	-
Textiles	0.7	0.7	-3.5	-2.6
Clothing	1.3	1.3	-2.9	-2.1
Other manufacturing	5.7	5.7	-7.3	-6.1
Services	-0.1	-0.1	-	0.9
	Rest of the World		Rest of the World	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Food	-1.2	-1.2	0.1	0.1
Rice	-0.2	-0.2	-	-
Textiles	-0.2	-0.2	0.3	0.4
Clothing	-0.5	-0.5	0.3	0.3
Other manufacturing	-0.7	-0.7	0.2	0.1
Services	-0.1	-0.1	0.1	0.1
	Total imports		Total exports	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Food	0.8	0.8	-0.1	-0.1
Rice	-0.3	-0.3	-	-
Textiles	0.5	0.5	1.2	1.3
Clothing	0.1	0.1	0.4	0.5
Other manufacturing	0.4	0.4	0.2	0.2
Services	-0.1	-0.1	0.1	0.1

APPENDIX - VI
The GTAP Model [29]

The GTAP model used in this paper is a comparative static, global general equilibrium model based on neoclassical theory.[30] Firms maximize their profits while consumers maximize their utility. All markets are assumed to be perfectly competitive, and constant returns to scale prevail in all production and trading activities.

Firms use both a composite of primary factors and a composite of intermediates to produce their output according to Leontief production technology. The primary factor composite is a constant elasticity of substitution (CES) function of labor, capital, land and natural resources, while the intermediate composite is a Leontief function of material inputs, which are in turn CES blends of domestically produced goods and imports. Imports are sourced from all regions, with their share depending on trading prices (the Armington approach).

On the demand side, each country or region is assumed to have a "super" household disposing of regional income in fixed proportions in the form of private consumption, government expenditure and savings. Household consumption is assumed to be a constant difference in elasticities function of various consumer goods while government expenditure is based on a CES function of various commodities. Both household and government consumption are CES blends of domestically produced goods and imports, which are in turn sourced from all trading regions based on the Armington approach.

In closing the model, regional savings are assumed to be homogenous and contribute to a global pool of savings, which is then allocated among regions for investment in response to changes in regional expected rates of return. These changes are assumed to be equalized across regions, thus giving rise to capital (i.e., savings) mobility across regions. This allows for greater changes in the trade balance as a result of trade liberalization and tends to dampen the terms of trade effects. In contrast to savings, capital stocks are assumed to be immobile across regions, although they are perfectly mobile within a region, as is labor. Land and natural resources are industry-specific, and only limited transformation of their uses among industries is possible.

The simplicity of the GTAP model makes its simulation results relatively easy to interpret, but limits its capacity to deal with more complex economic issues, such as the adjustment path over time and long-term effects of trade policies associated with investment accumulation, technology and productivity change. Also absent in the model are adjustment costs associated with trade liberalization. These limitations must be kept in mind when interpreting the results presented in this paper.

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[29] This appendix is from Mlachila and Yang (2004).

[30] See Hertel (1997) for more details on the GTAP model. More information on the database can be found at: https://www.gtap.agecon.purdue.edu/databases/v6/v6_doco.asp.