A fresh look at a Preferential Trade Agreement among the BRICS

by Ron Sandrey and Hans Grinsted Jensen

Please consider the environment before printing this publication

This publication should be cited as: Sandrey, R. and Jensen, H. G. 2013.
A fresh look at a Preferential Trade Agreement among the BRICS.
Stellenbosch: tralac.

SWEDEN

A fresh look at a Preferential Trade Agreement among the BRICS

by Ron Sandrey and Hans Grinsted Jensen

Summary and key points

To date, little emphasis has been placed upon examining future trading relationships within the BRICS (Brazil, Russia, India, China and South Africa) countries. In general, economic theory suggests that the gains from trade are greater when a wider suite of countries is involved, and this is the fundamental basis of the multilateral liberalisation objectives of the World Trade Organisation (WTO). With the WTO currently stalled in its trade reform objectives, the question is raised as to whether or not trade liberalisation within BRICS may be an objective worth pursuing as this bloc represents a significant portion of the so-called 'South-South' trade. This paper explores the trade and economic implications of a Preferential Trade Arrangement (PTA) between the member countries of BRICS[1]. The starting point is that except for the importance of China as an import source intra-BRICS trade is, in general, not very high: this so because the EU is commonly the main import source and export destination.

In order to present a realistic analysis we accept that a full Free Trade Agreement (FTA) is not feasible at this point in time. Rather, we will undertake two base scenario runs using the Global Trade Analysis Project (GTAP) computer model. The first is (a) where all bilateral tariffs are reduced by 50% between the BRICS, while the second is (b) where all bilateral tariffs are reduced by a lesser 25%. In both (a) and (b) we also simulate a situation whereby all tariffs are reduced by two percentage points to reflect gains from closer cooperation between the BRICS countries in areas such as administrative and infrastructural efficiency improvements to reflect an improvement in reducing non-tariff barriers (NTBs). We also report upon scenario (c) where results from a simulation whereby just this 2% NTB tariff reduction applies. We do, however, also present and discuss two additional scenarios. In the first of these, (d), we accept that South Africa will not liberalise its clothing sector in the face of an import surge and accordingly a simulation is run whereby all intra-BRICS textile, clothing and footwear are exempt from the tariff liberalisation. In the second, (e), we accept that India will not reduce gold tariffs for South Africa. This second simulation makes a very large difference to

---

[1] The S in this acronym should perhaps denote 'SACU' in the paper as we have included the full SACU membership in the modelling given their common tariff schedule.

South Africa, and given the increasing costs of gold recovery in South Africa it should be regarded as the most realistic.

Note that in all simulations we included the BLNS countries[2] in the Southern African Customs Union (SACU) as part of the BRICS configuration given their common tariff border. As discussed later, with the latest GTAP version we are able to treat both Botswana and Namibia as countries in their own right but we are obligated to treat Lesotho and Swaziland as an aggregation.

The welfare results for South Africa from the base scenario with a 50% tariff reduction plus the 2% across-the-board reduction reflecting NTB improvements are significant. These gains suggested an improvement of $6 365 million ($6.36 billion – and this is in real terms) in welfare by the end period of 2015. This represents a gain of 1.66% in South African welfare (as defined in GTAP) at the time, and this is an impressive gain from this type of trade change. Of course, the gains to both China ($18.3 billion) and India ($24.9 billion) are large, but as a percentage of welfare China's is a much lower 0.33% while India is half that of South Africa at 0.83%. Russia ($10.2 billion) and Brazil ($8.0 billion) gain less but both of these gains are around 0.5% of Gross Domestic Product (GDP). Neighbouring Namibia gains $94 million (0.74% of GDP) while the gains to Botswana ($27m) and the Lesotho-Swaziland aggregation of $28 million are virtually the same as Botswana's. We see from GTAP that this gain for South Africa relies upon increased gold production for export to India, and in this paper we question that result and run an alternative scenario.

We are able to split these gains into those from the 50% tariff reduction and those from the 2% NTB reduction used to proxy gains from NTB reduction. For South Africa, we find that just over two-thirds of the gains are from the 50% reduction, with similar splits for China, Russia and Brazil. The situation is, however, different for India, with around 80% of the gains deriving from tariff reductions. Furthermore, we can disaggregate the welfare changes for South Africa to find that the majority ($2.6b) of the gains result from tariff changes in India, with another $1.0 billion deriving from efficiency and other gains as a result of South Africa's own tariff reductions and $645 million deriving from tariff reductions in China. India's gains are overwhelming from its own tariff reductions, while much of the gains to China gains are somewhat evenly spread across tariff reductions in India, Brazil and Russia. Interestingly, Brazil makes few gains from its own tariff reductions, confirming that Brazil is a more open economy than its fellow BRICS. By GTAP sector the large gains to South Africa are from nonferrous metals followed by 'vehicles' and then 'other manufacturing'.

---

[2] Botswana, Lesotho, Namibia and Swaziland.

South Africa is the big gainer in the labour market, as the increases to both skilled and unskilled labour in South Africa of 0.31% and 0.32% respectively are significantly higher than elsewhere. More detailed analysis shows that in a country that has a high unemployment rate the labour market changes are hopefully reflected in increased employment – for South Africa, getting the labour force into employment is a real priority. South Africa, India and Brazil all make gains in the agricultural sectors, with gains to South Africa and Brazil in processed sugar (at the expense of mostly Russia but also marginally India) noteworthy. The big sector gainer is nonferrous metal production, however, as resources are drawn into this sector at the expense of others in South Africa. Conversely, the sensitive textile and clothing sectors see their production decline by around 5.5% with reduced tariffs on imports from the globally competitive BRICs.

There are some significant changes to South African trade flows. Exports of sugar increase by 9.13%, nonferrous metals by (an unrealistic) 16.4%, 'other machinery' by 11.3% and vehicles by 3.7%. All imports increase, with the dramatic changes as expected in the textile, apparel and footwear sectors that highlight an increase of 44% in clothing (a result that is mostly driving the reduction in the clothing sector).

The other two alternative modelling scenarios are surprising in the first case but more realistic in the second. The first is where there are no tariff reductions in textile, clothing and footwear duties for all BRIC imports. Here the results are actually some $56 million above the base result of reducing these tariffs, suggesting that leaving protection in place is a good strategic policy option for South Africa. Overall, there is a solid increase in labour when the sector is protected against the base scenario and when there is no protection to these sectors. With this protection, the clothing and footwear sector the large output losses in the base scenario are actually replaced by small sector gains.

The second scenario is where there is no reduction by India on tariffs for imports of nonferrous metals (gold) from South Africa. Here the welfare outcome for South Africa reduces to $3,847 million, a reduction of $2,518 million (over $2.5b) from the base case. Thus, a significant part of the overall gains to South Africa when all duties are reduced derives from preferential access to the Indian market for precious metals (gold), and this is apparent by examining employment gains that are sharply reduced to levels little more than one-third of those from the base scenario.

Thus, a surprising result for South Africa from the two alternative scenarios is that on the one hand protecting the clothing sectors actually marginally increases overall gains for South Africa while blocking preferential access for nonferrous metals into India makes a large difference to South Africa.

We were also able to examine the 'collateral damage' to nonparticipating countries in the east African region, and here we find that they are indeed negatively impacted as the BRICS enter a preferential trading arrangement. We find that when 'elephants dance the grass does indeed get trampled', with Egypt the main loser. Overall, most of the losses to these east African economies result from changes in India rather than in South Africa.

1. Introduction

South Africa recently received an invitation to join the party of the so-called BRIC nations of Brazil, Russia, India and China. This expands the acronym to BRICS – with the extra S representing South Africa, an acronym used throughout this paper to describe this wider country grouping. On the face of it this is indeed an honour, and it supports the case made by many that South Africa is one of the BRICS 'countries of the future'. The fundamental question relates to possible trade opportunities for South Africa to explore in order to gain from this 'bonding'.

A comprehensive analysis of the economic and trading relationships between the BRICs and South Africa is presented in Sandrey et al. (2013), but to date little emphasis has been placed upon examining future trading relationships within the BRICS. In general, economic theory suggests that the gains from trade are greater when a wider suite of countries is involved, and this is the fundamental basis of the multilateral liberalisation objectives of the WTO. However, the WTO is currently stalled in its trade reform objectives, and this raises the question as to whether or not trade liberalisation within the BRICS may be an objective worth pursuing. An examination of this is the objective of the current paper.

We do know from previous tralac research (Sandrey and Jensen, 2008) that comprehensive FTAs between China and South Africa and South Africa and India would be beneficial. The results for a South African/China FTA show that there are comfortable welfare gains to South Africa, and these gains derive from enhanced allocative efficiency and capital allocation in the economy However, negating these gains are labour-related losses and terms of trade[3] that go against South Africa. South Africa does gain modestly in the agricultural sector, but the big action is in the manufacturing sector with increased imports from China. Much of this is focused in the textile, clothing and leather (footwear) (TCF) sectors, with output in the apparel sector reducing by a massive 42% as a result of

---

[3] Where terms of trade are the relative changes in import and export prices following a change.

tariff-free access for China. Such a result is not politically acceptable to South Africa despite making compensatory gains elsewhere in the economy that outweigh these losses.

For the Indian FTA, a simulation of comprehensive tariff reform is dominated by the massive effects on South Africa's gold sector, as this shows large welfare gains. While theoretically possible given the model assumptions use, such a result also seems politically (and operationally)[4] implausible, but an alternative approach that holds the Indian nonferrous metal (gold) tariffs at their initial value still produces an outstanding welfare gain for South Africa and good gains for India. Similarly, Sandrey and Jensen (2010) using the same modelling approach show that an FTA between the Mercosur grouping of Brazil, Argentina, Uruguay and Paraguay on the one hand and SACU on the other also produces 'comfortable' gains to South Africa.

Similar tralac quantitative research has also focused on assessing South Africa's future trade policy options with the increasing emphasis on the African continent and, in particular, the so-called 'tripartite' agreement. The trade and political economy background to this agreement was discussed in Sandrey et al. (2011), along with the quantitative analysis of how South Africa's trading relationship with the tripartite countries may be advanced by the adoption of an FTA between South Africa (or, more properly, SACU) and the Common Market for Eastern and Southern Africa (Comesa), the East African Community (EAC) and the Southern African Development Community (SADC) with a focus on trade in agriculture. Jensen et al. (2012) extended that analysis to the manufacturing sector, while Jensen and Sandrey (2103) narrowed down the tripartite agreement to examine possible gains from perhaps a more manageable agreement between SACU, EAC and Egypt.

All of this research used the GTAP database and its associated general equilibrium model for the analysis, and importantly, the three African-related papers used the same latest GTAP model configuration that will be used in the current paper Thus, results from the African liberalisation simulations and results from this paper are directly comparable, enabling us to glean some pointers on where South Africa's priorities should be.

---

[4] South Africa's increasing costs of gold recovery are casting some gloom over the sector. South Africa remains the world's highest-cost producer of gold with marginal cash costs rising by 5% to $1124/Oz in Q2, 2013, as reported by http://www.bullionstreet.com/news. Now South Africa's Chamber of Mines admits that the country's gold mines have been in decline as falling ore grades and the cost of mining at increased depths erode margins. While gold prices fall, the costs of wages and electricity among other key expenses continue to increase (http://www.southerntimesafrica.com 15 July 2013).The 'easy gold' has disappeared from South Africa. Historically the world's No.1 gold mining producer, South Africa has halved its production since 1998 and it is now being overtaken by China as a producer.

In order to present a realistic analysis we accept that a full Free Trade Agreement (FTA) is not feasible at this point in time. Rather, we will undertake two base scenario runs. The first is (a) where all bilateral tariffs are reduced by 50% between the BRICS, while the second is (b) where all bilateral tariffs are reduced by a lesser 25%. In addition, we will simulate (c) where all tariffs are reduced by two percentage points to reflect gains from closer cooperation between the BRICS in areas such as administrative and infrastructural efficiency improvements in both (a) and (b). Note that this is a two percentage point reduction; therefore even when tariffs are zero there are still gains. We are simulating this tariff reduction by initially calibrating the two percentage points into the database on top of the average tariffs already found in that database.[5] General analysis of trade agreements has repeatedly found that such gains do exist from closer cooperation, and the two percentage point figure sounds reasonable. Finally, we present two additional scenarios. The first of these is scenario (d) where we accept that South Africa will not liberalise its clothing sector in the face of an import surge and accordingly run a simulation whereby all intra-BRICS textile, clothing and footwear are exempt from the tariff liberalisation. The second is scenario (e) where we accept that India will not reduce gold tariffs for South Africa (and recognise the increasing costs of gold recovery in South Africa).

2. The BRICS trading relationship

Before continuing with the FTA discussion and analysis it is important to place the BRICS merchandise trade with the partner countries in perspective. The major export destinations for the BRICs and South Africa are shown in Table 1 for the most recent 2012 December year. These destinations are all led by the EU rather than by the US. We note that this is a distinct change from the generally accepted situation of the so-called 'Asian miracle' economies of the end decades of the twentieth century where the US was the dominant market for the largely manufacturing exports from Asia. Furthermore, intra-BRIC trade is not very high. The exceptions are where Brazil sends 17.0% of its exports to China, and South Africa sends 11.6% to the same destination. All other intra-cells are below Russia's 6.8% to China. Thus, there is little suggestion of a 'club' operating here among the BRICs.

---

[5] This includes adding two percentage points to a zero tariff.

Table 1: BRIC and RSA exports by destination, % 2012

Exported from	Brazil	Russia	India	China	RSA
Global total $ (billion)	243	353	297	1,899	87
% exported to					
EU 27	20.1	53.4	16.7	18.7	20.4
US	11.0	2.7	12.1	17.1	8.7
China	17.0	6.8	5.0		11.6
India	2.3	1.3		2.7	4.2
Russia	1.3		0.7	2.0	0.5
Brazil		0.6	2.1	1.7	0.9
BRIC subtotal	20.6	8.7	7.8	6.4	17.2
South Africa	0.7	0.05	1.7	0.7	

Source: WTA (Some 10.8 % exports from South Africa are 'unidentified' – likely gold)

Table 2 continues the theme and shows where each of the BRICs and South Africa were sourcing imports from during the same 2012 year. Again, the EU is the main importing source, but here much more intra-BRIC trade is apparent as imports from China are significant for all countries (including China itself, re-imports from perhaps Hong Kong of mostly manufacturing products). The intra-BRIC/SA import share is higher than the comparable export share, but it is still not that high and strongly influenced by imports from China. Again, the BRICs/South Africa 'club' members are not, on average, significant traders among themselves.

Table 2: BRIC and RSA imports by source, % 2012

Imported into	Brazil	Russia	India	China	RSA
Global total $ (billion)	223	290	490	1,817	102
% imported from					
EU 27	21.4	42.8	11.1	11.7	28.7
US	14.5	5.3	5.0	7.0	7.4
China	15.3	17.6	11.0	*7.9**	14.4
India	2.3	1.0		1.0	4.5
Russia	1.3		0.9	2.4	0.2
Brazil		1.1	1.1	2.9	1.7
BRIC subtotal	19.0	19.9	13.0	14.2	20.7
South Africa	0.4	0.2	1.6	2.5	

Source: WTA

*Some 7.9% imports into China are re-imports, and this distorts the BRIC total.

We have not undertaken a separate analysis of the details of the bilateral BRICS trade for 2012, but rather refer the reader back to Sandrey (2013) where such an examination of the 2010 trade showed that iron and steel products were the only imports that featured in the top five imports from South Africa in every BRIC import list. Precious stones and metals (mostly diamonds and gold) feature as major imports into Brazil, India and China; fuel (possibly coal) features as a major import into Brazil, India and China; and ores (probably iron ore) feature as major imports into Russia, India and China. The others are machinery and organic chemicals into Brazil, fruit (oranges) and smaller values of both machinery and electrical machinery into Russia, inorganic chemicals into India, and nickel-related products into China. More extensive reporting from all BRICS shows that machinery and electrical machinery from China appear in every list, and, interestingly, footwear and clothing make up the other three imports into both Russia and South Africa. Fertilisers, fuel, and iron and steel dominate Russian imports into the countries shown. Agricultural products completely dominate Russian imports from Brazil but not from the other countries, while imports from India are a more eclectic mix with fuels, pharmaceuticals, fertilisers and ores featuring at different times.

3.   The GTAP database/model

The standard GTAP model[6] is a comparative static general equilibrium model: while it examines all aspects of an economy it does not specifically incorporate dynamics such as improved technology and economies of scale over time. The economic agents (consumers, producers and government) are modelled according to neoclassical economic assumptions, with both producers and consumers maximising profits and welfare respectively, with markets perfectly competitive, and with all regions and activities linked. Results are measured as a change in welfare arising from the reallocation of resources and the resulting change in allocative efficiency, as terms of trade effects, as capital accumulation, and as changes in employment. This change in welfare is based upon a representative household, so unless this is modified it is not possible to examine the distributional aspects. The standard GTAP model also does not address the time path of benefits and capital flows. These changes are important as they allow consumers to borrow, which in turn allows consumption patterns to vary over time. The database is Version 8.1 GTAP database[7] (Badri and Walmsley, 2008) with the base year 2007 where the 2007 tariff data originates from the Market Access Maps (MacMap) database compiled by the Centre d'Etudes Prospectives et d'Information Internationales (CEPII). The

---

[6] See Hertel and Tsigas (1997) for an explanation of the structure of the GTAP model; Hertel et al. (2007) for a discussion of its usefulness in policy making; and Valenzuela et al. (2008) for its sensitivity to modelling assumptions.
[7] The Version 8 database can be found on https://www.gtap.agecon.purdue.edu/databases/v8/v8_doco.asp.

main unskilled/skilled labour market closure of the model has been changed so that the supply of unskilled/skilled labour is endogenously determined by labour supply elasticities.

The GTAP model expresses the welfare implications of a modelled change in a country's policy as the Equivalent Variation (EV) in income. This measures the annual change in a country's income (gains or losses) from having implemented, for example, an FTA. The EV in this case is simply defined as the difference between the initial pre-FTA scenario income and the post-FTA scenario income, with all prices set as fixed at pre-FTA levels. If a country's EV in income increases due to a policy change, the country can increase its consumption of goods equal to the increase in income and thereby improve the national welfare in the country. Total welfare gains/losses can be decomposed into contributions from improvements in allocative efficiency, capital accumulation, changes in the employment rate of the labour force, and terms of trade (Huff and Hertel, 2000).

Gains from **allocative efficiency** arise from improved reallocation of resources from less to more productive uses. For instance, when import tariffs are abolished, resources shift from previously protected industries towards sectors where the country has a comparative advantage, producing an increase in real GDP and economic welfare.

Terms of trade effects are the consequence of changing export and import prices facing a country. So, when a country experiences an increase in its export price relative to its import price (e.g. due to improved market access), it may finance a larger quantity of imports with the same quantity of exports, thus expanding the supply of products available to the country's consumers. While allocative efficiency contributes to increases in global welfare, the terms of trade affect the distribution of welfare gains across countries; essentially, one country's terms-of-trade gain is another country's terms-of-trade loss. The global total must therefore add to zero, and if a large proportion of the benefit to South Africa from an FTA is derived from terms-of-trade effects, this implies transfers to South Africa from the rest of the world.

Capital accumulation summarises the long-run welfare consequences of changes in the stock of capital due to changes in net investment. A policy shock affects the global supply of savings for investment as well as the regional distribution of investments. If a trade agreement has a positive effect on income through improvements in efficiency and/or terms of trade, a part of that extra income will be saved by households, making possible an expansion in the capital stock. At the same time, rising income will increase demand for produced goods, pushing up factor returns and thus attracting more investments. Generally, economies with the highest growth will be prepared to pay the largest

rate of return to capital, and will obtain most of the new investments. Therefore long-run welfare gains from capital accumulation tend to reinforce the short-term welfare gains deriving from allocative efficiency and terms of trade.

The welfare effects of changed **employment** rates are the consequence of changes in the employment of the labour force due to changes in the real wage (see also Liu et al., 1998 for a technical discussion). In a situation where the demand for labour increases and thereby the real wage, the amount of labour employed increases, reducing the relative increase in the real wage and thereby increasing the competitiveness of the country's industries.

4. The GTAP simulations[8]

The analysis undertaken here is based upon a variant of the GTAP model to simulate the impact of possible market-access reforms resulting in a PTA involving SACU and the BRIC countries. Regional production is generated by a constant return to scale technology in a perfectly competitive environment, and the private demand system is represented by a non-homothetic demand system (Constant Difference Elasticity Function).[9] The foreign trade structure is characterised by the Armington assumption (a technical term implying imperfect substitutability between domestic and foreign goods).

The macroeconomic closure is a neoclassical closure where investments are endogenous and adjust to accommodate any changes in savings. This approach is adopted at the global level, and investments are then allocated across regions so that all expected regional rates of return change by the same percentage. Although global investments and savings must be equal, this does not apply at the regional level, where the trade balance is endogenously determined as the difference between regional savings and regional investments. This is valid as the regional savings enter the regional utility function. The quantity of endowments (land and natural resources) in each region is fixed exogenously within the model, while the extent to which labour is employed is endogenously determined. The capital closure adopted in the model is based on the theory that changes in investment levels in each country/region are on-line instantly, updating the capital stocks

---

[8] See Hertel et al. (2007) for a discussion of the usefulness of the GTAP in modelling free trade agreements.
[9] Hence, the present analysis abstracts from features such as imperfect competition and increasing returns to scale, which may be important in certain sectors. We are therefore using what can be thought of as a base GTAP structure.

endogenously in the model simulation.[10] Finally, the numeraire used in the model is a price index of the global primary factor index.

The applied ad valorem equivalent (AVE) tariff data found in the GTAP Version 8.1 database originates from the MacMap database (Bouet et al., 2005) and contains bilateral applied tariff rates (both specific and ad valorem) at the 6-digit Harmonised Systems (HS6) level. These are then aggregated to GTAP concordance using trade weights.

The baseline scenario updates the standard database with a projection of the world economy from 2007 to 2025, applying suitable shocks to GDP, population, labour and capital, as well as incorporating important developments, realised or planned, since 2007. These developments include the full implementation of the Trade, Development and Cooperation Agreement (TDCA) between South Africa and the EU and the assumption that the EPAs between all African countries except South Africa and the EU will be implemented. For the EPA, the assumptions are made that (a) EU27 tariffs are reduced to zero for all EPA countries and commodities, except for sugar and beef where reductions of 50% were made, (b) for South Africa, the EU reduces its tariffs by 20% in an agreement associated with the EPA, and (c) all EPA countries reduce their tariffs by a blanket 40% on EU imports.[11]

The countries and regional aggregations used in the model are shown in Table 3.

---

[10] This is the so-called Baldwin closure as documented in Francois et al. (1996).
[11] While this may not be an accurate prediction of the EPA outcomes, it seems to be a realistic one.

Table 3: GTAP country/region used and the associated GTAP codes

SACU	
RSA	Republic of South Africa
BWA	Botswana
NAM	Namibia
XSC	Rest of SACU (Lesotho and Swaziland)
BRIC	
CHN	China
IND	India
BRA	Brazil
RUS	Russian Federation
Other	
EU	EU27
US	United States of America
Rest of Africa	
RoW	Rest of the world

Source: GTAP database.

Note that we have changed the standard GTAP code of ZAF to RSA for ease of interpretation in this paper.

- Within SACU, South Africa, Namibia and Botswana are countries in their own right while the only alternative for the 'rest of SACU' is an aggregation comprising Lesotho and Swaziland.

- The remaining groupings are the BRIC countries (Brazil, the Russian Federation, China, and India), the EU, the US, the rest of Africa and the rest of the world (RoW).

For the GTAP sectors, we have aggregated the agricultural sectors into primary and secondary agriculture along with the two sugar-related sectors of the non-tradable cane that would normally be in primary agriculture, and sugar that would normally be in secondary agriculture as the processed output from cane. Manufacturing has retained its full suite of 16 sectors while natural resources and services are merged into their respective aggregated sectors. The focus of this report is on manufacturing, although only those sectors where there is a meaningful change will be reported on in most cases.

As always, we apply shocks to GDP, population, labour force, and natural resources to project the world's economy to the baseline year of 2025 – a year in which we assume that an FTA could be fully implemented. The projection of the world economy uses the exogenous assumptions listed in Table 4, and this is important in shaping the baseline scenario. The general sources for the assumptions in

Table 4 are given in a footnote to the table, and these assumptions represent the best estimates of the possible future path of the data. These GDP projections do not materially affect our computer simulation results for the PTA, as these FTA results are measured as deviations from the baseline resulting from the PTA. It is the baseline itself that is driven by the projections and other assumptions. The GDP projections do, however, provide a good guide as to where economic growth and therefore future trade opportunities are likely to derive from, even without a trade agreement.

The GTAP model then determines changes in output through both an expansionary and a substitution effect in each country/region of the model. The expansionary effect represents the effects of growth in domestic and foreign demand shaped by income and population growth and the assumed income elasticities. The substitution effect reflects the changes in competitiveness in each country/region shaped by changes in relative total factor productivity, cost of production as well as any policy changes. The GTAP model uses this set of macroeconomic projections to generate the 'best estimate' of global production and trade data for 2025. The relative growth rates of each country/region for GDP, population, labour, capital and total factor productivity play an important role in determining the relative growth in output of the commodities when projecting the world economy from 2007 to 2025, and we can now take the resulting data set from this baseline simulation as the new base for our PTA scenario. A simulation scenario measures the difference between our baseline model's output in 2025 in the absence of, for example, the PTA, against the likely output if a PTA were concluded. The model results shown in this chapter therefore present the isolated effect of a possible PTA or other simulated scenario in the year 2025.

Table 4: Baseline 2007 to 2025: yearly percentage change

	Real GDP	Total population	Total labour	Unskilled labour	Skilled labour	Capital	TFP
South Africa	3.5	0.5	1.1	1.9	1.0	4.2	0.3
Botswana	4.0	0.9	1.4	3.4	1.3	4.3	0.4
Namibia	4.0	1.3	1.3	3.4	1.0	4.4	0.4
Lesotho- Swaziland	4.1	1.0	1.7	5.2	1.6	4.5	0.3
EU27	1.2	0.2	-0.2	2.0	-0.9	1.5	0.1
US	2.5	0.8	0.5	1.2	-0.3	3.7	0.6
China	7.5	0.3	0.2	3.5	-0.1	8.8	1.0
India	6.6	1.2	1.8	4.8	1.6	8.2	0.9
Brazil	3.4	0.7	1.0	3.8	0.8	3.9	0.4
Russia	3.8	-0.2	-0.6	0.0	-1.3	4.8	0.7
Rest of world*	2.7	1.0	1.3	2.9	1.0	3.0	0.2

Sources: International Monetary Fund, World Economic Outlook Database (October 2012), Foure et al. (2012), and own assumptions.

* The rest of the world excludes Africa.

Note: The annual growth rate in total factor productivity (TFP) and capital are determined endogenously by the exogenous variables (GDP, unskilled/skilled labour force and natural resources), the model and the associated database. The world economy (real GDP) grows by an average of 2.9% a year where it is assumed that this increased production of commodities only requires an increased extraction of resources from the ground of an average of 1.5% a year (this is not shown in the table as it is the same across all entries). The remaining gap between the average 2.9 percentage growth in real GDP and 1.5% increase in resource extraction is explained by increased TFP.

After updating the GTAP database to the year 2025 the BRICS PTA is implemented using the updated GTAP database as the foundation for this simulation. This enables the gains achieved by implementing the BRICS PTA to be measured and put into perspective.

The following more precise assumptions are made:

- Scenario 1: all ad valorem tariffs and ad valorem equivalents of specific tariffs between the BRICS are reduced by 50% and an additional 2% was simulated to all tariffs (including those at zero) to reflect NTB reductions.

- Scenario 2: a similar 25% reduction in all ad valorem tariffs and ad valorem equivalents of specific tariffs between the BRICS of 25% is again implemented along with the 2% NTB proxy.

- Scenario 3: **only simulated** the assumed 2% blanket tariff equivalent to represent NTBs proxy from a PTA[12] (note that there is no empirical justification for this level). This 2% NTB has also been applied to services to proxy some gains from an FTA where services have been factored into all scenarios – these are effects of services associated with trade and production, as the 2% NTB on services has little direct effect.

Differences between the baseline and the primary scenario as measured by the changes in **2025 as expressed in 2007 real US dollars** are therefore the results of the implementation of the BRICS PTA.

5. The big-picture base simulation results

We use as our primary scenario the simulation whereby all tariffs between participants are reduced by 50% **and** factor in an additional 2% reduction as a proxy for enhanced efficiency gains in areas such as infrastructural cooperation between the two parties that can be viewed as a proxy for a reduction in NTBs. A PTA is more than just a tariff reduction programme, and we believe that this additional 2% advantage gained proxies this. To better assess the impacts of the 2% effects we will also report upon that NTB reduction in a separate presentation.

Table 5 shows the changes in welfare from the PTA assuming the scenario of (1) both a 50% reduction in merchandise tariffs and a 2% reduction in NTBs, (2) the contribution from the 50% tariff reduction and (3) the 2% NTB only. Summing (2) and (3) will give the totals expressed in (1). The data is expressed in US dollars (million) as one-off increases in annual welfare at the assessed end point of 2025. Note in particular that the gains from the 50% reduction ($25.1 billion) are significantly higher that the gains from the 2% NTB reduction ($5.3 billion). Thus, while the NTB reductions are important the 50% tariff reduction is more important. India is the major contributor to this difference, indicating that India has much to gain from tariff reductions within the BRICS. Again, we stress the doubts cast over the ability of the South African gold sector to achieve the projected output result from this base scenario.

---

[12] This is done operationally by first taking the initial database and running a GTAP programme that will increase tariffs by 2 percentage points in the database across all products (even zero tariffs) to represent a 2% NTB. In the FTA base scenario we then reduce the original tariff found in the database plus remove the additional 2% NTB tariff that has been added to the database to represent a reduction in NTBs.

Table 5: Results from a 50% tariff reduction plus 2% NTB, 2007 US dollars (million) at 2025

Welfare (EV)	Total $ (million)	EV as % Per capita utility	Contribution from ($ mill)	
			50% tariff only	2% NTB across board
South Africa	6,365	1.66	4,295	2,070
Botswana	27	0.16	-4	31
Namibia	94	0.74	52	42
Lesotho-Swaziland	28	0.46	15	14
China	28,335	0.33	18,508	9,827
India	24,947	0.83	20,585	4,362
Brazil	7,950	0.43	5,179	2,770
Russia	10,191	0.53	6,393	3,798
BRICS subtotal	77,937		55,024	22,914
Others				
Other Africa*	-1,448		-1,050	-398
EU	-18,248	-0.12	-10,954	-7,295
US	-8,788	-0.05	-5,901	-2,887
Rest of world	-19,040	-0.10	-12,029	-7,011
Global total	30,413		25,090	5,324

Source: GTAP output.

*'Other Africa' is an aggregation of non-SACU African countries. For South Africa, these total gains are some $6.4 billion in real terms, with roughly two-thirds from the 50% reduction and one-third from the NTB reduction. Within SACU, Namibia is the big gainer ($94 million) with this amount in an almost 50-50 split between 50% tariff reduction and NTB reduction. Both Botswana and the Swaziland and Lesotho aggregation gain by some $27 million and $28 million respectively, with Botswana actually losing marginally from the 50% tariff reduction.

The four core BRIC countries all gain significantly from the PTA. China and India gain some $28.3 billion and $25 billion respectively, while Brazil and Russia gain $8 billion and $10.2 billion respectively. India's gains are predominately from the 50% tariff reduction, while the other three have the comparable 2-to-1 split favouring 50% tariff reductions that are on display for South Africa. Not surprisingly, given its trading relationship with the BRICS, the EU is the biggest loser, followed closely by the rest of the world. Other African countries ('Other Africa') lose marginally, and not shown is that around one-third of these losses fall on Egypt. Both the 50% reduction and the 2% NTB reduction are welfare enhancing for the world economy, with most of the global gains from the 50% reduction rather than the 2% NTB proxy.

Expressed as a percentage South Africa's gains represent an increase of 1.66% in per capita utility[13] and are almost exactly double that of the next highest (China's 0.84%) and well above the gains from India, Brazil and Russia. Conversely, the losses to the other main global players, the EU, the US and the 'rest of the world' (excluding Africa) are modest. Not shown is that the rest of the African economies in the Tripartite FTA are also low but possibly significant (in the -0.10% to 0.20% range, generally at or above that shown for the EU).

To put these welfare results in perspective, the gains to South Africa here of $6.37 billion are significantly higher than those reported in Jensen and Sandrey (2013) for the so-called Tripartite FTA for all east African countries in SADC, EAC and Comesa. This result is very encouraging and supports the South African emphasis on becoming a genuine member of the BRIC configuration. But we shall see that much of the benefit relies upon increased gold production.

6. Drivers of the change

In this section we are able to examine the GTAP output to glean significant information as to the sources of the welfare gains. Table 6 starts by showing a matrix for the BRICS breaking down the welfare gains. These gains can accrue from (a) gains to the country's own economy through better efficiencies resulting from removing some distortions and (b) gains through other countries removing some of their constraints and inefficiencies. While trade per se is perhaps a major factor, it is not the only contributor.[14] The table starts in the third row by examining the $6,365 million gains to South Africa. Some $1,015 million are from unilateral gains from South Africa's own liberalisation, but the major contribution is from Indian trade liberalisation. Contributions from liberalisation in both Brazil and Russia are minor. Elsewhere, China obtains large (and similar) gains from India, Brazil and Russia, and solid (and again similar) gains from both South Africa and China's own liberalisation. Both Brazil and Russia gain most from their own liberalisation, while the rest of the world, the EU and the US all lose as India offers preferential opportunities to the BRICS.

---

[13] This measure is the same as an increase in real income with fixed initial prices. The (initial income)*(% change in per capita utility)/100 = change in real income.

[14] Note, however, that the only change we have made is to border tariffs; thus, import competition and export opportunities are driving these efficiencies.

Table 6: Individual country welfare gains by source, $ (million)

EV $ (million)	Contribution 50% tariff & 2% NTB reduction					
	Total	RSA	China	India	Brazil	Russia
RSA	6,365	1,015	645	2,619	113	-20
China	28,335	1,510	1,569	5,025	4,577	5,763
India	24,947	606	1,229	17,550	639	540
Brazil	7,950	304	829	435	2,700	905
Russia	10,191	-37	1,661	76	119	4,575
Rest world	-19,040	-280	-2,863	-6,655	-220	-2,009
EU	-18,248	-312	-1,729	-4,529	-760	-3,630
US	-8,788	-23	-1,105	-3,446	-786	-549

Source: GTAP output

Sector contributions to the changes

Table 7 introduces the agricultural and natural resources contribution to these welfare increases by GTAP sector for each of the PTA partners by both (a) the 50% tariff reduction on the left-hand side and (2) the 2% NTB change on the right-hand side. The two are additive. For South Africa, the table highlights the importance of processed sugar, and this result is consistent with other tralac research. The contribution for South Africa from primary agriculture is important while that from processed or secondary agriculture is less so. Note in particular that for the 50% tariff reductions the contribution from primary agriculture to India's improved welfare is massive, while, similarly, the same sector shows important losses for both the EU and the US. The agricultural gains are much less with just the 2% NTB, indicating the prevalence of high tariffs in agriculture. Natural resources contribution is high in some instances, and especially so in the 2% scenario as tariffs in these sectors are very low and often at zero to start with.

Table 7: Welfare contribution from agriculture and natural resources, 50% & 2% NTB $ (million)

| $ (million) | Contribution 50% tariff | | | | Contribution from 2% NTB reduction | | | |
| | Agriculture | | | | Agriculture | | | |
	Primary	Processed	Sugar	Natural resources	Primary	Processed	Sugar	Natural resources
South Africa	158	20	86	188	29	3	-1	185
China	-1,254	-23	-205	-182	512	154	-10	1,655
India	11,459	-55	315	570	226	-61	13	-257
Brazil	191	858	341	29	557	188	28	570
Russia	-757	587	284	-103	-185	225	18	-231
EU	-3,990	-454	-199	-257	-958	-121	-10	-2,834
US	-3,117	-231	-139	-72	-680	-75	-7	-627
Rest world	-5,351	-839	-308	-554	-1,254	-216	-19	-2,140
World	-3,498	-183	142	-551	-1,884	87	9	-3,826

Source: GTAP output

Table 8 and 9 continue by showing that the manufacturing sector contributions to welfare are from (i) the 50% reduction (Table 8) and (ii) the 2% NTB reduction (Table 9). The emphasis on the sector selection is on those sectors of most interest to South Africa rather than the BRICS overall. As a result the electrical machinery and general machinery sectors are not shown although it is the latter sector in particular that is globally important (especially to China). The nonferrous metal sector (the production and casting of copper, aluminium, zinc, lead, gold and silver) is the most important manufacturing sector for South Africa. It is likely that increased gold export to India would make a major contribution here, and we will examine this thesis in more detail later. Note also the South African losses in welfare from the clothing and leather sectors but the solid gains from the vehicle sector: this fact reinforces the competitiveness of that sector in South Africa vis-à-vis the BRICs.

Table 8: Contribution from selected GTAP manufacturing, 50% tariff, $ (million)

$ (million)	textile	clothing	leather	crp*	iron/steel	nonferrous	vehicles	Other manufacturing
RSA	67	-70	-42	183	144	2,286	519	480
China	565	979	80	2,015	523	538	807	8,738
India	114	142	83	1,339	518	1,667	507	2,639
Brazil	-15	-42	209	50	134	7	319	2,314
Russia	173	-371	42	988	456	117	239	3,208
EU	34	-455	-144	-920	-151	-451	-386	-2,227
USA	195	18	129	-563	-48	-402	-128	-739
RestWorld	-174	-207	82	-1,100	-157	-1,627	-481	-504
Total	936	-79	410	2,022	1,464	1,903	1,459	14,196

Source: GTAP output

* Chemicals, rubber and plastics

Table 9 below shows the welfare contributions to the 2% reduction in NTBs by sector. It duplicates Table 8 directly above that shows the gains in welfare from the 50% tariff reduction. Notable is that the contributions (and losses) from the 2% NTBs to the sensitive textile, clothing and leather sectors are much lower in the 2% NTB table, again reflecting the high actual tariffs in these sectors. The services sector has been added because in the 50% reduction there are no changes made to services, while in the 2% NTB reduction a proxy for a 2% tariff reduction is made. The results are not that dramatic, although India is the main gainer at the expense of mostly the EU.

Table 9: Contribution from selected GTAP manufacturing, 2% NTB reduction, $ (million)

$ (million)	text	clothing	leather	crp	iron/steel	nonferrous	vehicle	other manufacturing	services
RSA	15	-5	-3	71	105	804	108	39	67
China	126	168	34	692	165	181	293	186	179
India	32	22	20	630	236	936	102	171	531
Brazil	-2	-8	126	-12	68	14	85	-24	10
Russia	43	-69	11	604	143	196	110	-1	283
EU	-1	-93	-69	-406	-91	-261	-124	-120	-471
US	41	0	22	-239	-42	-208	-41	-58	-248
RestWorld*	-48	-42	-12	-433	-182	-826	-158	-171	-593
Total*	201	-41	116	957	406	707	390	10	-270

Source: GTAP output

*Again the 'rest of world' excludes Africa.

Changes in production by GTAP sector

The upper section of Table 10 emphasises how South Africa is the big gainer in relative terms from this BRIC liberalisation. Of special interest are the changes to both skilled and unskilled labour in South Africa where the increases of 0.31% and 0.32% respectively are significantly higher than elsewhere. In this model the labour market closure is one whereby the amount of labour employed is determined by a labour-supply elasticity which is derived from initial unemployment rates (U). In a developed country with generally low unemployment rates the benefits to unskilled labour flow through in the form of higher real wages. In a country with a high unemployment rate the changes are hopefully reflected in increased employment. Getting the labour force into employment is a real priority for South Africa, and earlier tralac GTAP modelling research that alters the model closures for the labour market has reinforced this (Sandrey et al., 2011)[15].

The next block of data reviews the changes to the agricultural and natural resources sector. South Africa, India and Brazil all make gains in the agricultural sectors, with gains to South Africa and Brazil in processed sugar noteworthy (at the expense of mostly Russia but also marginally at the expense of India). The main lower section of the table looks at manufacturing by sector. Highlighted in the top three rows of this section are the sensitive textile, clothing and leather sectors, and especially notable are the reductions here reported for both South Africa and Russia along with the associated gains for China and India. Recall that this paper reports on a complete BRICS preferential trading agreement and not just a series of South African (SACU) bilateral agreements with the BRICs; this means that the South African results are but one contribution to the overall production changes. Following on from the contribution-to-welfare discussion above, South African output in the nonferrous metals sector increases by a massive (but perhaps unrealistic, as stressed in the discussion above) 16.29% (note also that production in India also increases in this sector, and this is again most likely the result of cheaper gold imports as gold jewellery is a very large Indian global export). Another sensitive sector for South Africa is the vehicle sector, and here production increases in all the BRICS at the expense of both the EU and the US.

---

[15] Section 8, Chapter 4, pages 135 to 137.

Table 10: Changes in production by GTAP sector, 50% tariff reduction and 2% NTB, %

	RSA	China	India	Brazil	Russia	EU	US
Labour and capital							
Unskilled	0.31	0.1	0.03	0.02	0.04	-0.02	-0.01
Skilled	0.32	0.11	0.04	0.02	0.01	-0.02	-0.01
Capital	3.06	0.43	1.6	0.77	0.64	-0.2	-0.12
Agriculture and natural resources							
Primary agriculture	0.64	0	-0.13	0.67	2.84	0.07	-0.02
Processed agriculture	0.56	0.06	0.88	0.76	-1.33	-0.06	0
Sugar	4.18	-0.02	-0.25	3.06	-13.04	0.08	0.01
Natural resources	0.98	-0.21	0.19	0.58	0.21	0.18	0.08
Manufacturing							
Textiles	**-5.4**	**1.59**	**0.61**	**-2.21**	**-9.09**	**-0.49**	**-0.01**
Clothing	**-5.44**	**0.96**	**3.07**	**-0.49**	**-9.23**	**-0.49**	**0.08**
Leather	**-4.51**	**0.77**	**1.8**	**2.8**	**-7.92**	**-0.52**	**0.28**
Lumber	-3.26	0.25	-0.39	-0.11	-1.51	-0.01	0.04
Paper, book	0.85	0.09	0.05	0.39	1.3	-0.08	-0.03
Petroleum	1.01	0.45	0.86	-0.36	0.2	-0.17	-0.07
Chemicals, rubber, plastic	1.14	0.35	1.61	-0.26	1.91	-0.18	-0.11
Nonmetal	-0.51	0.38	0.71	0.03	-0.78	-0.11	0.01
Iron/steel	1.66	0.5	0.05	-0.53	0.28	-0.2	-0.01
Nonferrous metals	**16.29**	**0.31**	**1.21**	**-0.82**	**0.37**	**-0.29**	**-0.17**
Fabricated metals	-1.27	0.55	0.23	-1.18	-4.87	-0.12	0.07
Vehicles	0.94	0.5	1.96	1.15	0.03	-0.15	-0.1
Other transport	0.38	0.73	0.72	0.62	0.25	-0.1	-0.26
Electrical goods	-1.45	-0.38	1.13	-2.34	-6.43	0.26	0.33
Other machinery	-0.87	0.56	0.59	-3.13	-2.66	-0.24	0.01
Other manufacturing	2.46	-0.03	1.6	-0.55	-3.43	0.02	0.15
Services	1.48	0.31	1.0	0.39	0.41	-0.09	-0.05

Source: GTAP output

Trade

The only item that has been changed in these simulations is the tariffs, both overall by 50% and a 2% proxy for NTB improvements. Therefore trade must be driving the results, and these changes to exports are shown in Table 11. It is instructive to look at Tables 11 (exports) and 12 (imports)

together, as that puts the overall pattern in perspective. Most of the partners increase their exports, although in more than half of the sectors shown the percentage increase in imports is marginally higher than that in the comparable exports (and especially for South Africa and Brazil). For South Africa there are significant increases in sugar and nonferrous metal products, and note that there are also increases in the exports of textiles, clothing and leather. However, the imports in the latter three sectors are significantly higher than the imports in these three sectors. Importantly, clothing imports increase by some 43%, with these imports driving the production losses of 5.44% from Table 10.

Table 11: Changes to exports by GTAP sector (%)

	RSA	China	India	Brazil	Russia	EU	US
Primary agriculture	2.84	4.55	11.35	1.64	54.17	0.21	-0.12
Processed agriculture	0.2	0.8	8.15	6	2.33	0.03	0.18
Sugar	9.13	-0.66	7.72	8.52	-7.43	0.32	-0.3
Natural resources	3.2	6.48	12.67	3.81	-0.35	0.15	0.58
Textiles	3.56	4.74	9.78	0.53	5.35	-0.85	-0.29
Clothing	1.54	1.76	4.91	2.54	9.48	-1.54	0.06
Leather	4.38	3.43	13.27	9.28	0.67	-0.98	-0.41
Lumber	-2.15	0.23	-0.23	0.72	0.3	-0.06	0.32
Paper, book	0.67	0.41	2.18	1.69	5.31	-0.04	-0.08
Petroleum	1.01	2.72	1.2	-1.84	-0.37	-0.24	-0.02
Chemicals, rubber, plastics	5.01	2.85	9.24	2.44	5.56	-0.24	-0.42
Nonmetal	-0.48	1.88	2.3	1.49	-0.44	-0.27	0.01
Iron/steel	4.43	2.12	3.13	2.54	2.14	-0.28	-0.43
Nonferrous metals	16.44	5.4	7.27	0.79	1.81	-0.47	-0.91
Fabricated metals	-0.73	1.23	3.75	2.09	3.13	-0.4	-0.01
Vehicles	3.71	2.22	6.74	3.97	1.49	-0.17	-0.2
Other transport	0.28	3.21	3.23	3.44	4.35	-0.15	-0.74
Electrical goods	-1.01	-0.24	10.42	5.86	8.15	0.17	0.26
Other machinery	0.34	1.52	7.76	5	4.14	-0.5	-0.46
Other manufacturing	11.29	-0.24	2.45	3.81	-0.13	-0.08	-0.28
Services	0.13	-0.74	0.84	0.54	0.36	0.16	0.1

Source: GTAP output

Imports in all sectors except Brazilian nonferrous metals increase for the BRICS, while, conversely, imports decline marginally in all sectors for both the EU and the US.

Table 12: Changes to imports by GTAP sector (%)

	RSA	China	India	Brazil	Russia	EU	US
Primary agriculture	6.65	2.68	7.16	6.5	14.43	-0.24	-0.15
Processed agriculture	4.05	2.55	1.62	3.26	7.86	-0.13	-0.17
Sugar	4.02	1.6	95.56	6.76	41.85	-0.05	-0.29
Natural resources	3.03	1.16	1.84	3.52	3.19	-0.29	-0.14
Textiles	**15.07**	**2.45**	**15.04**	**11.4**	**2.69**	**-0.28**	**-0.13**
Clothing	**43.59**	**2.04**	**8.61**	**24.62**	**9.03**	**-0.26**	**-0.24**
Leather	**26.42**	**4.82**	**2.69**	**20.37**	**3.92**	**-0.27**	**-0.35**
Lumber	10.7	2.3	10.51	7.48	5.17	-0.19	-0.44
Paper, book	3.31	2.1	6.25	1.77	1.1	-0.15	-0.21
Petroleum	3.34	1.18	2.15	1.88	4.73	-0.17	-0.27
Chemicals, rubber, plastics	3.96	2.27	7.7	3.01	2.91	-0.16	-0.15
Nonmetal	8.35	1.81	13.45	8.22	6.21	-0.21	-0.25
Iron/steel	3.44	2.57	12.88	6.74	2.83	-0.18	-0.12
Nonferrous metals	10.11	3.72	5.95	-0.62	4.08	-0.21	-0.15
Fabricated metals	14	2.02	24.3	16.76	8.29	-0.38	-0.54
Vehicles	5.09	1.58	5.65	1.38	1.08	-0.15	-0.11
Other transport	2.71	2.16	3.46	1.97	2.09	-0.22	-0.21
Electrical goods	4.35	0.77	5.94	11.49	2.15	-0.29	-0.46
Other machinery	6.32	1.95	15.45	8.65	3.39	-0.31	-0.38
Other manufacturing	12.83	8.49	5.19	24.59	11.61	-0.54	-0.36
Services	2.39	1.41	1.23	0.96	0.88	-0.15	-0.07

Source: GTAP output

7. Alternative scenarios

Analysis to date has highlighted two important outcomes from the simulations. One is that reducing South African tariffs on clothing and footwear has a major impact on the South African domestic industries. The other is that the reduction in Indian tariffs on nonferrous metal products (probably gold) has a very large impact for South Africa. We have concerns about this result. In order to assess just how important these two effects are we have run alternative simulations, with the results as shown in Tables 13 and 14 for welfare changes and production by GTAP sectors. These alternatives are as shown on the top lines of the two tables:

A. the base simulation of 50% reduction plus 2% NTB proxy;

B. as in A but with no reductions for textile, clothing and footwear;

C. as in A but no reductions in the Indian nonferrous metal tariff for South African (SACU) imports.

The differences in welfare results shown in Table 13 for scenario B (in other words, that of not including textile, clothing and footwear duties in the PTA) against the base scenario of reducing these tariffs by a blanket 50% are surprisingly positive (but low). It is the difference between $6,365 million in A (reducing tariffs by 50%) and $6,421 million in B (not changing the tariffs), or an increase of $56 million in total. This would seem to support recent efforts to protect these sectors in South Africa.

Scenario C is an important one for South Africa as the GTAP simulation in C confirms that reductions on Indian gold tariffs are a major contribution to the overall welfare results. The GTAP database reports these tariffs to be 'only' 15%, but it must be kept in mind that India is a large importer of gold while South Africa is major global exporter. The welfare outcome for South Africa reduces to $3,847 million, a reduction of $2,518 million (over $2.5 billion). India also loses in welfare terms (from $24,947 million to $24,252 million, a much smaller loss, relatively speaking, than South Africa's). In Table 14 we see that the nonferrous metal sector's gain declines from the base simulation but still remains strongly positive. We are more comfortable with this result.

Note that non-inclusion of the clothing sector in the PTA decreases the overall welfare gains for China by almost $1.5 billion and those for India by almost $350 million. This result is to be expected as these two economies are large clothing producers and exporters to South Africa.

Table 13: Alternative scenarios – welfare results in $ (million)

EV $ (million)	A	B	C
	Original simulation with overall 50% & 2% NTB	Same but protection for clothing excluded in PTA	Same but no reduction on RSA gold tariffs into India
South Africa	6,365	6,421	3,847
Botswana	27	35	49
Namibia	94	83	113
Lesotho-Swaziland	28	23	27
China	28,335	26,715	28,656
India	24,947	24,612	24,252
Brazil	7,950	7,807	7,977
Russia	10,191	10,415	10,369
Rest of world	-19,040	-18,711	-18,095
EU	-18,248	-17,674	-18,010
US	-8,788	-9,126	-8,549
Global	30,412	29,258	28,143

Source: GTAP output

From Table 14 we conclude that overall employment in South Africa increases when protection is given to the clothing sector. Overall, there is an increase in both unskilled and skilled labour of 0.38% when the sector is protected (this is a higher increase than the comparable base scenario increases of 0.31% and 0.32% for unskilled and skilled labour respectively when there is no protection to the sector). With this protection clothing and footwear sector output losses in the base scenario are actually replaced by small sector gains. This is a surprising result from the simulation, and suggests that any possible costs to the economy of not having access to cheaper imported clothing is more than compensated for by keeping employment levels up in a sector that is not necessarily internationally competitive. It is counter-intuitive to the perceived wisdom that protecting uncompetitive sectors results in a welfare loss to the economy and reinforces that getting people into the workforce is crucial for South Africa. Note, however, from Table 14 that there is a cost to the vehicle sector from protecting the clothing sector, as the increase in vehicle production is less than half that of the base scenario result.

Conversely, Table 14 also shows that when South Africa is blocked from the reduced BRIC tariffs in the nonferrous metal imports to India the South African employment gains are sharply reduced to levels little more than one-third of those from the base scenario. Thus, a surprising result for South

Africa from the two alternative scenarios is that, on the one hand, protecting the South African clothing sector makes little difference to the overall gains despite increasing employment while, on the other hand, blocking preferential access for nonferrous metals into India makes a large difference to South Africa.

Table 14: Production changes (%) by GTAP sector from the alternative scenarios for South Africa

	A	B	C
	Base 50% & 2% NTB	**Protection for clothing excluded from PTA**	**Protection for RSA gold to India – no protection for RSA clothing**
Unskilled labour	0.31	0.38	0.12
Skilled labour	0.32	0.38	0.13
Textiles	-5.4	-0.36	-4.93
Clothing	-5.44	0.57	-5.54
Leather	-4.51	0.06	-4.15
Nonferrous	16.29	15.13	6.07
Vehicles	0.94	0.41	0.96

Source: GTAP output

8. When elephants dance does the grass get trampled?

Even though the east African economies are not part of the BRICS preferential trade agreement that we have modelled in this paper they nonetheless suffer collateral damage. The welfare changes for these countries are all negative (losses), and these results are shown in Table 15. This table duplicates Table 5 above and shows the overall welfare changes from a 50% tariff reduction plus a 2% NTB proxy within the BRICS on their intra-BRICS trade. These welfare changes reflect back on the east African economies through second and subsequent round effects as they are not directly involved in the first round effects. Reading the table for Tanzania in the third row, for example, welfare in Tanzania reduces by $92 million, with some $70 million of this is from the 50% reduction with the remaining 22% from the 2% non-tariff measures (NTM) improvements within the BRICS 'club'. The big loser is Egypt with losses of over half a billion US dollars. When these losses are expressed as a percentage of welfare as used in the paper, Egypt (-0.237%) and Malawi (0.23%) are the biggest loser, and these are significant losses for this type of trade model when the economies are not directly involved.

Table 15: Results from a 50% tariff reduction plus 2% NTB, US dollars (million) at 2025

Welfare (EV)	Total $ (million)	EV as % of GDP	Contribution from ($ million)	
			50% tariff	2% across board
Kenya	-92	-0.151	-70	-22
Tanzania	-49	-0.088	-34	-15
Uganda	-41	-0.148	-25	-15
Rwanda	-11	-0.101	-8	-4
Egypt	-542	-0.237	-431	-111
Angola/DRC	-64	-0.052	31	-94
Ethiopia	-54	-0.078	-38	-16
Madagascar	-13	-0.11	-11	-2
Malawi	-20	-0.23	-17	-3
Mauritius	-18	-0.164	-13	-5
Mozambique	-56	-0.218	-32	-24
Zambia	-26	-0.092	-13	-13
Zimbabwe	-6	-0.085	-2	-4

Source: GTAP output

Table 16 extends the analysis and duplicates Table 6 above by showing a matrix for the changes in welfare for the east African non-participating countries broken down by the participating BRICS economies. Note that the decomposition data shows the contribution from the 50% tariff reduction only, and in most cases this is at 70% or above of the total loss. The exceptions in the 50% to 60% loss from tariff reductions are Uganda, the rest of East Africa, Mozambique, Zambia and Zimbabwe, while the Angola-DRC aggregation has a different result in that given its close association with Brazil it actually gains from tariff reduction but losses from the 2% NTB improvement within the BRICS lead to an overall loss from the combined scenario.

As discussed above, for those partner countries in a trade agreement gains can accrue from (a) gains to the country's own economy through better efficiencies resulting from removing some distortions and (b) gains through other countries removing some of their constraints and inefficiencies; but for these economies not directly involved the changes are likely to be trade diversion and terms of trade costs. Some $660 million of the total loss is from the BRICS directly, with the major contribution ($484 million) from Indian trade liberalisation. This is followed by China's $145 million. While many of the economies shown gain from a more prosperous South Africa and the Angola-DRC

aggregation gains from a modestly rejuvenated Brazil overall, the grass is indeed trampled as the welfare losses show. Not shown is that a high percentage of the losses are in primary agriculture.

Table 16: Individual country welfare changes by source of that change, $ (million)

	50% + 2%	50% tariff reduction only - contribution from				
	Welfare	**RSA**	**China**	**India**	**Brazil**	**Russia**
Kenya	-92	7	-14	-53	-4	-6
Tanzania	-49	6	-10	-20	-1	-10
Uganda	-41	4	-17	-8	-3	0
Rwanda	-11	0	-2	-3	-3	0
Egypt	-542	-11	-44	-326	-8	-40
Angola/DRC	-64	10	-17	-5	32	10
Ethiopia	-54	-4	-4	-17	-3	-10
Madagascar	-13	0	0	-9	0	-1
Malawi	-20	-14	-2	-1	0	0
Mauritius	-18	-7	-3	1	-1	-2
Mozambique	-56	29	-17	-27	-3	-15
Zambia	-26	13	-10	-14	0	-3
Zimbabwe	-6	6	-5	-2	0	0
Subtotal	-992	39	-145	-484	6	-77

Source: GTAP output

Note: Contributions from 50% tariff reduction only are shown in the breakdown data – they therefore do not reconcile with the second column which includes the changes from the 2% NTM effects.

References

Badri, N.G. and Walmsley, T.L. (eds.). 2008. *Global trade, assistance, and production: The GTAP 7 Database*. Purdue University, Center for Global Trade Analysis.

Bouet, A., Decrex, Y., Fontagne, L., Jean, S. and Laborde, D. 2005. *A consistent, ad-valorem equivalent measure of applied protection across the world: The MacMap-HS6 database.* CEPII No 2004, 22 December (updated September 2005). http://www.cepii.fr/anglaisgraph/workpap/pdf/2004/wp04-22.pdf.

Fouré, J., Bénassy-Quéré, A. and Fontagné, L. 2012. *The Great Shift: Macroeconomic projections for the world economy at the 2050 horizon*. CEPII Working Paper 2012-03, February.

Francois, J.F., McDonald, B.J. and Nordström, H. 1996, *Liberalization and capital accumulation in the GTAP Model*. GTAP Technical Paper No. 7, July. Purdue University.

Hertel, T., Hummels, D., Ivanic, M. and Keeney, R. 2007. How confident can we be of CGE-based assessments of Free Trade Agreements? *Economic Modelling* 24(4): 611-635.

Hertel, T.W. and Tsigas, M.E. 1997. Structure of GTAP. *In* Hertel, T.W. (ed.), *Global trade analysis: modeling and applications*. Cambridge: Cambridge University Press.

Huff, K.M. and Hertel, T.W. 2000. *Decomposing welfare changes in the GTAP Model*. GTAP Technical Paper No. 5. Purdue University.

Jensen, H.G. and Sandrey, R. 2013. *A new approach to a regional Free Trade Agreement in east Africa: 'willing participants'*. Stellenbosch: Trade Law Centre.

Jensen, H.G., Sandrey, R. and Vink, N. 2012. The welfare impact of a Free Trade Agreement: 'Cape to Cairo'. *Agrekon,* 51 (4).

Sandrey, R. and Jensen, H.G. 2008. SACU, China and India – the FTAs. *In* Sandrey, R. et al... *South Africa's way ahead: looking east*. Stellenbosch: tralac. Chapter 4.

Sandrey, R., Jensen, H.G., Vink, N. and Fundira, T. 2007. *South Africa's way ahead: trade policy options*. Stellenbosch: tralac. www.tralac.org.

Sandrey, R., Jensen, H.G., Vink, N., Fundira, T., Meyer, F., Hughes, C., Nyhodo, B. and Smit, L. 2008. *South Africa's way ahead: looking east*. Stellenbosch: tralac. www.tralac.org.

Sandrey, R., Jensen, H.G., Fundira, T., Denner, W., Kruger, P, Nyhodo, B. and Woolfrey, S. 2010. *South Africa's way ahead: shall we samba*? Stellenbosch: tralac. www.tralac.org.

Sandrey, R., Jensen, H.G., Vink, N., Fundira, T. and Viljoen, W. 2011. *Cape to Cairo: an assessment of the Tripartite Free Trade Area*. Stellenbosch: tralac. www.tralac.org.

Sandrey, R., Fundira, T., Vink, N., Jensen, H.G., Viljoen, W. and B. Nyhodo. 2011. *BRICS: South Africa's way ahead?* Stellenbosch: tralac. www.tralac.org.

WTO. 2012. *Trade Policy Review*. Report by the Secretariat, East African Community, WT/TPR/S/271, 17 October.

- - -