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Abstract

South Africa's trade barriers are still relatively high compared to other emerging market economies, and its industrial policy still preferentially treats certain industries. Based on a static GTAP model, we estimate the economic impact of further trade liberalization on the South African economy. We particularly take into account core NTB's on tradable commodities and the costs imposed by cross-border trade facilitation, which is particularly inefficient in South Africa. Our results indicate that a full liberalization package, including a reduction of core NTB's as well as a substantial increase in the efficiency of cross-border trade facilitation to the levels of Singapore, would cause the South African GDP to rise by up to 4.51 per cent. This implies an increase in aggregate welfare of up to 21 billion US Dollars. This sum is the equivalent of what should be given to the South African economy in order to leave citizens as well off as after the implementation of a full liberalization package, given South African policy-makers abstain from further trade liberalization policies.

JEL Classification: D58, K2, L5, F1, F17

Keywords: South Africa, trade policy, international trade, non-tariff trade barriers, GTAP

1. Introduction

During the worldwide financial and economic crisis following the Lehman crash in 2008, the world kept surprisingly cool with respect to trade protection measures. Different from the period of the Great Depression, countries did not resort to protection measures to a great extent, although some measures were taken (GTA 2013). However, these measures were mostly in line with the world trade order as laid down in the WTO framework. South Africa has moderately increased a few tariffs during the post-crisis phase.

This reaction is embedded in an outspoken industrial policy stance. South Africa also is applying heavy regulations of network industries, which provide important input for the South African economy. High administrative costs and corruption additionally make international trade unnecessary expensive. These obstacles to trade increase unemployment, inducing the government to advocate and pursue so-called strategic industrial policies with the aim to pick winners and create jobs. Some industries are in the focus of support by the SA government, both via trade protection and other forms of industrial policy. This support imposes costs on other industries.

These policy measures stand in contrast to the enormous efforts of the South African government to reintegrate the country into the world economy after the end of Apartheid. It joined the WTO in 1995 and decreased its trade barriers substantially and unilaterally, still being on a rather high level. In sum, there is still a huge welfare gain to be expected from further dismantling of barriers to trade.

Based on a static GTAP model this paper looks at the economic effects that may arise from further trade liberalization in the overall South African economy. Essentially the paper evaluates the economic impact from an elimination of tariffs of tradable commodities and non-tariff barriers on goods and services.

The paper is organized as follows. Section two briefly explains the different measures of trade policy in South Africa. In section three we present the methodology and underlying assumptions used to calculate the potential economic gains that would result from trade liberalization measures in South Africa. Section four presents our main findings. In light of our results, in section five we discuss policy options against the background of the costs of protection and the trade and industrial policy initiatives. Section 6 concludes.

2. South African Trade Policy: Measures and its Potential Costs

a) Tariffs in South Africa and Related Costs

South African trade barriers are systematically reported in the WTO Trade Policy Review on SACU from November 2009 (WTO 2009). We start with tariff protection. According to Draper and Biacuna (2009), the South African tariff structure and rates have declined

remarkably since 1994. There are less tariff bands (1994: 723, 1998: 275; 2007: 102), less tariff lines (1994: 11,231; 1998: 7,773; 2007: 6,667) and lower applied tariff rates (simple average 1994: 23 per cent; 2006: 6.7 per cent) than at the end of Apartheid (see also DTI 2010b, pp. 14). Nevertheless, the average tariff is still twice as much as in the European Union. In other words, there is still potential to reduce tariff rates. In 2008, some of the applied tariffs increased again to use the water in the tariff structure (Draper and Biacuana 2009).

In addition to comparably high tariff rates, the tariff structure is spread. Some goods are much higher protected than others. The ten most protected goods are not technology intensive. At the top, we find textile & clothing and footwear, which have tariff rates of above 20 per cent on average. Food, beverages, raw hides follow straight. Transport equipment is one of the few highly protected medium tech industries. The automotive industry is particularly protected. It is also interesting to note that there is a differentiation within the product group concerning the bound tariff. The maximum bound tariff in food is about 130 per cent, but even products in the machinery industry have bound tariff protection to up to 30 per cent.

This protectionism does not come without costs for South Africa, as simple theoretical considerations make clear intuitively before we start a closer examination. High tariffs reduce the demand for foreign exchange and thereby increase the price for Rand in foreign currency; this is the exchange rate channel. Exporters suffer. If the tariff is higher than in other countries, this effect is stronger than elsewhere, everything else being equal. Since South Africa practices tariff escalation, the exchange rate effect is mitigated for industries importing a high share of inputs.

Despite the dampening effect of cheaper inputs, a tariff increases the costs for those industries depending on imported inputs; this can be labeled input demand channel. Except for transport equipment, the typical inputs for downstream industries, such as minerals, chemicals, base metals, machinery, and specialized equipment are protected below the average. In addition, the South African government runs a rebate scheme for import tariffs paid by some industries, e.g., the automotive industry and the textile and clothing industry. Approximately 10 per cent of the imports have benefited from these rebates on average between 2003 and 2007 (WTO 2009, pp.196-298). Thus, the input demand channel is not working as strongly as theory suggests. Nevertheless, the rebate scheme is judged as arbitrary and intransparent (ibid.).¹

Finally, the losses of consumers due to tariffs reduce their purchasing power. This purchasing power channel is responsible for decreased demand for other goods and services. In the South African case, this channel is substantial, since many final products with low price elasticities, such as food and textiles are heavily protected. Thus, quantitative demand for them will not increase much after their liberalization, leaving

¹ See also SARS (2010) for an overview about the paperwork related to rebates.

more purchasing power in the hands of South Africans. Thus, the demand for other traded and non-traded goods is likely to increase when tariffs for basic goods are reduced. For South Africa, this can be demonstrated very well in a simple calculation on textiles & clothing and food, beverages & tobacco. Under the assumption of an inelastic demand for food and clothing, the share of purchasing power spent on these goods would be reduced by almost 2.5 per cent, which then could be spent on other goods and services (Freytag, 2011).

b) Non-tariff Barriers in Services

However, not only tariffs play a role. There are substantial non-tariff barriers, in particular in services trade. The OECD Report of 2008 suggests that in particular the organization of network industries causes high costs for downstream industries. Electricity as well as telecommunication networks are still run by state owned incumbents; in case of electricity there is a monopoly which is protected from internal as well as foreign competition; concerning telecommunications South Africa has not signed the Fourth Protocol of 1997.² The consequences are high prices and poor quality.

In case of electricity, it is difficult to compare the prices in South Africa and other countries. A rather incomplete international comparison of 68 countries by the US Energy Information Agency (2010) suggests that the electricity price for business in South Africa was at the bottom of the list in 2010. However, the prices are calculated for an average service in US-dollar, so that the comparison suffers from exchange rate fluctuations. A purchasing power effect is hence difficult to calculate and compare. The study of the US Energy Information Agency shows a strong increase of the dollar-denominated electricity price from 2002 onwards, which is in line with information about the development of the prices in real terms, given by the South African incumbent Eskom. Real prices for electricity have increased enormously since the beginning of this decade. They were almost 40 per cent higher in 2008 than in 2002 and increased most between 2003 and 2008.³ In 2009, Eskom increased the average electricity price by 31 per cent. It asked for an even higher increase until 2013, but was only approved an annual price rise of about 25 per cent for a period of three years by the regulator (South Africa Web 2010). This is still a high increase, which raises costs for industries substantially. High prices for electricity adversely affect exporters and import competing firms.

A more precise international comparison is possible for the costs of telecommunication, another crucial problem for South African customers (OECD 2008). For a local call at

² For an overview see Fredebeul-Krein and Freytag (1997).

³ This is remarkable. The reason prices are increasing may have to do with (1) production capacity constraints, (2) the associated build programme, (3) Eskom's need to fund this programme and (4) high net capital inflows since 2003, which causes the prices for non-tradable goods to rise (Draper and Freytag 2008).

peak time, price data in PPP US-dollar is available for 118 countries (WEF and INSEAD 2010), of which South Africa in 2009 ranks 106th. Many competing firms in foreign countries face much lower telephone costs, in particular those located in emerging economies. Telecommunication prices are well comparable as the same service and PPP Dollars are used; the data are available. South Africa's telephone rates for peak time calls (0.43 PPP US Dollars per 3 minutes) are well above the average, which is about 0.20 PPP US Dollars. In addition, the calculated average price for telecommunication services is misleading. Due to a few outliers, the median of 118 countries is only 0.065 PPP US-dollar. This implies that telecommunication in South Africa is much more expensive than in most other countries, which causes competitive disadvantages for the firms located in the country (regardless of whether they export, compete with imports or produce non-tradables). Accordingly, all three channels identified by theory apply here. The protection of a (state) oligopolist leads to high cost compared to the world market.

c) The Role of Hidden Barriers

Apart from official trade policy measures, there are hidden barriers such as waiting time at borders, bottlenecks in transport and policy implementation uncertainty. The World Bank' Doing Business Report (World Bank 2013) shows very clear that South African international business is suffering from high cross-border-costs. The overall ranking in the "Ease of Doing Business" of the country is number 39 out of 185 economies, which is not so bad. However, with respect to "Trading Across Borders" the country ranks 115 in 2012, which is limited progress compared to 2007 when the country was ranked 134 out of 178 countries (DPC & Associates 2008).

The category "Trading Across Borders" includes a count of the documents necessary to trade, the time to export and import (including paperwork) and the trade related costs, weighting them one third each. A number of assumptions is made to compare all countries in the ranking (World Bank 2009, pp. 86). It turns out that it requires on average 6 documents, 16 days and 1,620 US Dollars per container⁴ to export and 7 documents, 23 days and 1,940 US Dollars per container to import respectively. Compared to African nations, South Africa is in the midfield. Compared however to its peer group, i.e., other emerging market economies, the country performs poorly, see the selection of countries outlined in Table 1. In each of the six categories, South Africa scores poorly (except for Botswana, which however, is landlocked). Although South Africa has recently made progress in the reduction of time to export, time to import is still particularly high compared to good performers such as South Korea, Malaysia and Singapore.

⁴ More than half of this sum is required for port charges, which are the tenfold of Chinese port charges (Powels 2009).

Problems related to trade finance are less clearly concentrated on importers, but relevant for both importers and exporters. Thus, one would expect that governments are eager to decrease these costs and facilitate trade at any rate. Trade finance costs in South African costs are moderate (Draper 2009). In the Doing Business Report (World Bank 2013), the country is ranked 1 with respect to “Getting credit” for private firms. Accordingly, we will not consider them as a problem, but take a closer look at administrative burdens.

Table 1: Trading across borders - South Africa vs. other emerging economies

	Botswana	Brazil	China	India	South Korea	Malaysia	Singapore	South Africa
Rank	59	130	91	132	8	12	1	39
Exports								
Documents to export ¹	6	7	8	9	3	5	4	6
Time ²	27	13	21	16	7	11	5	16
\$/Container	2,945	2,215	580	1,120	665	435	456	1,620
Imports								
Documents to import ¹	7	8	5	11	3	6	4	7
Time ²	37	17	24	20	7	8	4	23
\$/Container	3,445	2,275	615	1,200	695	420	439	1,940

Source: World Bank 2013.

These administrative costs are also highlighted in the study by Mthembu-Salter (2008), who discusses trade costs of South African trade with Zimbabwe. The results are similar to the World Bank’s Doing Business Report. Again, it is difficult to estimate the costs of South Africa’s poor performance. An assessment by Djankov, Freund and Pham (2006) may help to judge the costs: they estimate the effects of time in a gravity model of international trade and come to the conclusion that each day delay reduces trade by about 1 per cent. In other words, if South Africa reduced the time required to trade by half, a trade increase of more than 15 per cent would statistically occur (ibid.). This can be taken as a proof of high costs of indirect trade barriers due to the weak transport network (OECD 2008). A further number is provided by Hummels (2001), who estimates the cost of one day delay in time to trade across the border to be equivalent to an additional ad valorem equivalent (AVE) of 0.8 percentage points for manufactured goods.

On the same token – and probably documented in the enormous time used to trade – there may be a substantial uncertainty about the validity of rules, combined with corruption. According to the Investment Climate Enterprise Survey of the World Bank

(Hallward-Dreimer, Khun-Jush and Pritchett 2010), the average South African firm uses about 6 per cent of its overall management time capacity for negotiations and conversation with government officials; this is exactly the African median. The share of firms bribing officials is at the African bottom, 17.5 per cent of the firms pay bribes to officials. The correlation of data on “Time to bring imports through customs” between the “Investment Enterprise Survey” and the “Doing Business” Report for Africa is high, which shows that legal uncertainty plays a major role.

d) Cumulative Costs of Protection are Remarkable

Thus, we intuitively come to the result that the current state of protection for certain sectors in the South African economy causes non-trivial costs for the economy, particularly for those industries that are not protected. Import protection in South Africa turns out to work as export taxation, but also imposes costs on the producers of non-tradables. All channels identified work via tariffs, non-tariff barriers and administrative burdens. The structure of the protected industries further suggests that high tech industries are taxed more than low-tech industries. The latter may provide more jobs per capital than the former, but certainly generate less innovation. Thus, overall productivity growth may be substantially smaller than it could be under free-trade conditions.

These static and dynamic costs for downstream industries as well as other, particularly export-oriented, sectors are not only diminishing profits for shareholders. They are also the cause for diminishing and less productive employment than compared to a free trade regime. This is particularly problematic against the background of high unemployment in South Africa. Inefficiently employed resources and underperforming saving and investment decisions add to the list of unwelcome effects from the vast number of protectionist measures. One would expect that the government is aware of these problems and is acting to reduce these costs for the economy. However, almost always it is not. Thus, in the following section, we estimate the welfare losses South Africa experiences due to a number of protectionist measures.

3. Simulating Liberalization of South Africa’s Barriers to Trade

a) Theoretical Considerations

In the following section, we estimate the potential GDP effects as well as the welfare gains the South African economy can expect from removing tariffs, NTBs, and from the liberalization of its services sectors.

To understand the effects of liberalization for the economy as a whole, one has to consider more than the affected and protected industry. This industry indeed will lose because open markets increase competition and demand lower prices (unless demand is extremely price elastic). In order to understand how these negative effects are

countered by positive effects for other industries as well as customers, one can distinguish four main channels: the exchange rate channel, the input demand channel, the purchasing power channel and the retaliation channel.⁵ In addition, consumer's choice is increased by trade liberalization. Reduced administrative burdens and trade finance costs may add to the picture. In addition, it is necessary to analyze both the static effects and the dynamic effects resulting from productivity growth.

For the overall economy, the cumulated gains from liberalization translate into higher GDP-growth, more private consumption and job gains. Of course, some jobs are lost at least in the short run. In the long run, most protected jobs will be lost anyway. This can be seen when looking at those industries in developed countries, which have been protected. In general, this protection had to be maintained for a long time, and despite the protection ever more jobs have been lost over time. Examples are the Western European textile and clothing industry, the shipbuilding industry and mass steel production. Most of these industries are labor intensive, and therefore the degree of protection either has to be steadily increased or jobs eventually disappear despite the support.

Thus, empirical analyses often concentrate on jobs. An early study for Western Germany using computational general equilibrium (CGE) techniques comes to the conclusion that in 1987 the agricultural protection contributed very much to the level of unemployment. Without agricultural subsidies, the simulation results suggest that German employment could have risen by 850.000 jobs, mainly in export industries. This means that the rate of unemployment, which was 9 per cent in 1987 could have been 5 per cent. Taking into account further industries, the job losses were even higher (Dicke et al 1988). This result assumes the dismantling of all agricultural support and is consequently extraordinarily high. Thus, these figures should not constitute the benchmark for South Africa, but show the potential of liberalization quite powerfully. Moreover, a study simulating an FTA between the US and the southern African Customs Union (SACU) employing the Global trade analysis project (GTAP) model (Adams and Horridge 2004) comes to comparable results. Both employment and GDP in the SACU region can be increased by almost 0.5 per cent by concluding this single FTA.

When applying CGE models, one should keep in mind the enormous information requirements for quantitative studies such as measuring the degree of protection given by different forms of protection, namely: tariffs, NTBs such as regulation and monopolization of network services, cost of trade finance and customs procedures. The calculation of trade-related costs is a heroic attempt.⁶ Thus, many CGE models, including Adams and Horridge (2004) and Narayanan et al (2012), restrict themselves to

⁵ See also sub-section 2a. In this section, we concentrate on import protection. But the effects can be similar in case of export promotion, in particular in case of export subsidies. Only the input demand channel may not hold, but the other channels are relevant.

⁶ For an overview of the methods see UNCTAD (2005) and Mthembu-Salter (2008, pp. 7-10).

tariffs. To conclude, one should not take estimates resulting from CGE models for face value but one can at least acknowledge the tendency, which is generally pointing to welfare gains resulting from trade liberalization.

b) The Model

The model used in this study is GTAP 8, a computable general equilibrium model. The GTAP framework accounts for inter-sectoral linkages between 129 regions while capturing inter-regional trade flows of 57 commodities. The framework thus allows for a general equilibrium analysis of the economic effects resulting from trade liberalization. In this model, regional production is characterized by constant returns to scale and perfect competition. Private demand is represented by non-homothetic consumer demands. The structure of foreign trade is based on the so-called Armington assumption, which implies imperfect substitutability between domestic and foreign goods.

The most recent GTAP 8 dataset, which includes national input-output data as well as trade, tariff, and demand structures, is mainly benchmarked to 2007. Trade data are based on 2004 and 2007 values while the reference year of protection data is 2007 (see Narayanan et al 2012).⁷ Like any applied economic model, this model is based on assumptions. In order to account for recent changes in regional macroeconomic variables, the GTAP 8 dataset on the global economy is extrapolated to 2013. The exogenous variables used for the extrapolation are macroeconomic variables, i.e. total population, total factor productivity and capital endowment as provided by the well acknowledged database of the French research center in international economics (CEPII), which is documented by Fouré et al (2012). We apply the estimates of this set of macroeconomic data in order to calculate the “best estimate” of the global economy in 2013. Preferences and production structures as described by the model’s structural parameters have been left unmodified.

The model we use in this study is a static one. This model does not account for further productivity growth and may thus under-predict welfare effects, economic growth and increases in trade flows that result from trade liberalization.⁸ The interdependence between, on the one hand, productivity growth and, on the other hand, exports, imports and investment is often neglected in such models.

⁷ For further information on original data and model components see Hertel and Tsigas (1997).

⁸ The static GTAP 8 model does not account for the effects of trade liberalization on domestic industries’ productivity growth. Trade liberalization, however, causes productivity to rise. See, e.g., Thanguvalu and Gulasekaran 2004 who study export and import led productivity growth in developing countries. The authors find empirical evidence that increasing imports have a positive effect on long-term output growth.

c) Modeling of Non-tariff-barriers (NTBs)

NTBs are policy interventions other than border tariffs that cause distortions of trade in goods and services, and do distort the allocation of factors of production. NTBs raise the costs of importers (and exporters) at the border and thus induce a protectionist effect in the importing (exporting) country.⁹ A company exporting to a specific market will have higher costs of production due to border measures, e.g., resulting from altering manufacturing or additional administrative costs allowing the company to comply with certification requirements (Fugazza and Maur, 2008). These costs can be fix or marginal in nature, e.g., gathering information about any specific regulation, or periodic adjustments of products/services' required attitudes (Baldwin, 2000).

Like tariffs, NTBs drive a wedge between the world price and the domestic market price. Thus, by creating an artificially high price, NTBs induce scarcity in both the domestic and the foreign market. The NTB effect can be measured as the difference between the price of the imported good and the price of the domestic substitute.¹⁰ For this reason, according to Andriamananjara et al (2003), a straightforward way to incorporate NTBs in a CGE model is to model them as tariff equivalents separately and beyond the actually applied tariffs. Removing the tariff equivalent would then improve the resource allocation of the liberalizing country. Since pre-tariff prices increase due to increasing import demand, however, terms of trade (TOT) are expected to deteriorate. Protection rents arising from rent seeking activities can be captured by applying this methodology. The effect is qualitatively equivalent to the government's revenue from levying tariffs – the rectangle in a static equilibrium analysis.¹¹

A second way that is suggested by Andriamananjara et al. (2003) is treating NTBs as export tax equivalents. This approach builds on the fact that NTBs restrict the ability of exporters to ship their goods and services abroad.¹² Contrary to the tariff equivalent approach the elimination of export taxes is expected to improve resource allocation and terms of trade in the liberalizing country. Terms of trade improve because the country is supplied by imports at a lower “no-tax” price.

A third way to model NTBs is the so-called “sand-in-the wheels-approach”, also known as “iceberg-tariff-approach”. This methodology builds on the fact that institutional frictions create economic efficiency losses and are not generating economic rents. The

⁹ However, NTBs are not established to cause protection effects per se. Government authorities may also consider social or administrative objectives when regulating a certain market. Authorities might refer to a wide spectrum of policy interventions other than pure tariffs (Beghin, 2006).

¹⁰ Note that this perspective is a rather simplistic view since foreign and domestic products may not be perfect substitutes for each other. Hence prices might even differ in absence of NTBs. However, NTBs further increase such price gaps.

¹¹ Note, however, that a correct interpretation of the rents created from NTBs needs knowledge about the size of a rent of this type and knowledge of who captures these rents. The government (the public sector) might also benefit from NTBs through certification revenues. See, e.g., Fugazza and Maur (2008).

¹² This approach can also be applied for an analysis of voluntary export restrictions (VER's).

price differential thus is assumed to be entirely explained by efficiency losses due to NTBs. Efficiency losses of this type arise, e.g., from time waiting to cross the border, uncertainty of the import administration process, and other burdensome customs. In addition to the increased time exposure and the loss of money for exporters, cross-border trade inefficiencies cause welfare losses for the entire economy due to distortions of sourcing and consumption decisions (Fox et al, 2003; Francois et al, 2005). Removing efficiency losses of this type would improve resource allocation while at the same time terms of trade are expected to deteriorate due to rising world prices of the goods imported from abroad.

As it is one aim of this paper to illustrate how South Africa's economy can benefit from eliminating NTBs on imports, we partially follow the methodologies proposed by Andriamananjara et al. (2003) and Fugazza and Maur (2008), i.e., we separately apply two of the above mentioned shocks to our model. For core NTBs, we apply the tariff equivalent approach, which captures rents created by NTBs. For trade facilitation inefficiencies, we apply the "sand-in-the wheels" approach. The latter enables us to remove "iceberg tariffs", which in this analysis is the partial elimination of cross-border frictions. We opt for this approach mainly for two reasons: first, import tariff equivalents as well as export tax equivalents would be a second best solution, since cross border frictions only cause "dead weight" inefficiency losses for exporting and importing countries, i.e., for the government no revenues exist per se. Second, GTAP directly allows for increasing the efficiency of bilateral trade flows by applying an efficiency-enhancing shock that causes effective import prices to fall for a specific industry (Hertel and Itakura, 2001) without affecting the import/export tax revenues of the government of the regions concerned. Applying both shocks separately allows us to compare the results in a sensitivity analysis.

The challenge we face is not only to find the most appropriate shock for our simulations, but also the application of the right numbers. Our baseline scenario is based on two calculations. First, we apply the aggregated core NTB figures estimated by Kee et al (2009). This study provides estimates of the impact NTBs have on the price of imported goods, i.e., AVEs for a large set of countries. For core NTBs, the estimated average AVE value of all tariff lines in South Africa is 3.2 per cent.¹³ It turns out that this number is significantly lower than other countries' average core NTB estimates (see bottom row of table 2 for a selection of countries).

Our second NTB measure is based on the work of Hummels (2001) who studies time exposure as a trade barrier. In this study, AVEs are calculated by estimating a model of bilateral trade flows from various world ports to the US. Hummels' (2001) estimates suggest that for manufacturing categories each single day saved in shipping time is equal to a 0.8 percentage point AVE. This estimate is related to mere shipping time.

¹³ Core NTBs comprise all measures intended to protect domestic producers. Non-core NTBs are generally intended (argued) to protect local consumers.

Hummels' argument is twofold: 1) time to trade systematically and strongly affects a country's selection of trading partners and 2) time may also affect the composition of trade. These findings are of particular relevance for the case of South Africa. Having in mind the figures provided by the 2013 Doing Business Report, time to export from South Africa takes 16 days on average. The time to import takes even longer, i.e., 23 days. Table 2 illustrates that South Africa scores poorly compared to cross-border trade times of other emerging market economies. For the selected set of countries presented in table 2, time to export from South Africa takes on average 4 days longer, time to import to South Africa takes even 10 days longer on average. Based on corresponding AVEs, South African exports bear an additional average AVE of 3 percentage points (additional 8.8 percentage points higher relative to Singapore). The price of South African imports, on the other hand, is on average 8 percentage points higher (15.2 percentage points higher relative to Singapore).¹⁴

By adding up the AVE estimate of Kee et al (2009) for core NTBs and our own calculations for AVEs due to time to export figures based on Hummels (2001), we get a clue of the impact of NTBs on prices of tradable goods in South Africa. While the first number, i.e. the number for core NTBs, rather reflects preponderance of standards, the second estimate reflects an additional cost component due to South Africa's substantial inefficiencies in trade facilitation.

We opt for adopting a set of simulations in order to calculate the economic effects and the effects on welfare resulting from a gradual elimination of NTBs. For the purpose of illustrating the effects from a reduction of applied tariffs, we first apply a 50 per cent reduction as well as a full elimination of tariffs on all tradable commodities. We then recalibrate the initial aggregated GTAP dataset in order to incorporate core NTB import tariff equivalents for South African trade relations.¹⁵ Accordingly, we proceed with simulating the reduction of core NTBs imposed on South Africa's imports. For exports, however, we do not consider reductions of core NTBs since South Africa's leverage for altering the NTBs of its trading partners (which are relatively high) is rather restricted.

¹⁴ This methodology is also applied by Fox et al (2003). Note, however, that the AVE estimate of Hummels (2001) is calculated for manufactured goods only. For reasons of simplicity, we apply this measure to the model for all traded commodities including agricultural products.

¹⁵ The applied shock is *tms*, which also captures potential rents resulting from core NTBs. For trade facilitation the shock applied is *ams*. View for instance Fox et al (2003) and Fugazza and Maur (2008).

Table 2: South Africa's additional cost of cross-border trade due to shipping time

	Botswana	Brazil	China	India	South Korea	Malaysia	Singapore	South Africa
Time to Export in Days	27	13	21	16	7	11	5	16
Time to Import in Days	37	17	24	17	7	8	4	23
Δ Time to Export in Days	- 11	+ 3	- 5	0	+ 9	+ 5	+ 11	Ø = +4
Δ Time to Import in Days	- 14	+ 6	- 1	+ 6	+ 16	+ 15	+ 19	Ø = +10
Additional AVE relative to benchmark (Singapore) based on Hummels (2001), Exports, in percentage points	17.6	6.4	12.8	8.8	1.6	4.8	0	8.8
Additional AVE relative to benchmark (Singapore) based on Hummels (2001), Imports, in percentage points	26.4	10.4	16	10.4	2.4	3.2	0	15.2
AVE based on Kee et al (2009), Core NTB's all lines, in percentage points	na	18.8	6.3	14.7	na	31.9	na	3.2

Source: own calculations.

Note: average deviation numbers provided for South Africa are calculated as the difference between the simple average of other emerging market economies' time to export/import (with the exemption of Botswana).

Since it is unlikely to facilitate a full elimination of time barriers to trade, we apply different shocks to the model allowing us to study the impact of gradual liberalization measures as well as the impact of successive progress in making trade facilitation more efficient. Accordingly, NTBs resulting from inefficient trade facilitation are lowered gradually for all tradable commodities with the exception of services: 1) by bringing them down to levels of Malaysia, i.e., lowering time to import by 5 days which is equivalent to a 4 percentage point reduction of AVEs, and 2) by bringing down time to import to the level of Singapore (best practice), i.e., lowering time to import by 11 days which is equivalent to a 8.8 percentage point decrease of the very AVE.

A similar methodology is applied to barriers affecting South African exports: 1) bringing them down to the level of Malaysia, i.e., lowering time to import by 15 days which is

equivalent to a 12 percentage point reduction of AVEs, and 2) bringing down time to import to the level of Singapore, i.e., lowering time to import by 19 days which is equivalent to a 15.2 percentage point decrease of the applied AVE. The results are presented in table 3.

In order to take account of Africa's scheduled free trade agreement (African Union 2012), we also apply the methodology described above to trade flows between South Africa and the rest of African economies only.¹⁶ These results are presented in table 4.

d) Modeling Services Sector Trade Liberalization

When services sectors trade is hampered by government regulation, prices, production and investment decisions are distorted. In addition, domestic regulations raise the cost of entry for foreign suppliers. Prices and production is mainly distorted by two channels: the cartel effect and the cost inefficiency effect (Konan and Hawaii, 2004). While the first effect hampers competition and artificially strengthens market power of domestic firms the latter relates to higher marginal costs in a regulated environment due to the exclusion of low-cost foreign suppliers.

In GTAP, services sector trade liberalization can be modeled by implementing an import-augmenting technical change variable. This approach is similar to the "sand-in-the-wheels-approach" described above and takes into consideration cost inefficiencies due to services sector regulation.

Regarding South Africa's services sectors, we focus on trade liberalization of telecoms and electricity. Accordingly, we have subsumed their liberalization and deregulation (more important) as NTB reduction. However, according to the dataset underlying GTAP, South African imports of these services are negligible low. Thus, the full liberalization package (see table 3 below) would cause GDP to rise only by 0.1 to 0.16 per cent. Therefore, we neglect service liberalization in the following discussion.

4. Results: Substantial Welfare Gains to be Expected

a) Tariffs and NTBs

As discussed above, we apply a gradual reduction of tariffs and barriers to trade. Table 3 presents welfare effects and GDP growth effects resulting from eliminating tariffs, core NTBs, and NTBs from inefficient trade facilitation. Welfare effects can be interpreted as

¹⁶ NTBs, in particular truck travelling times, constitute a serious obstacle for African trade in general. According to South Africa's Deputy Transport Minister, Jeremy Cronin, policy and infrastructure issues constitute the highest barriers to trade: delays at border posts, for example, reduce the average travelling speed of trucks carrying goods from Malawi to South Africa from 60 km/h to 12 km/h (Cronin 2011). A stated objective of the African Union Action Plan (African Union 2012) is to reduce the numerous trade facilitation constraints, particularly the harmonization and simplifications of customs and transit procedures, documentation and regulations.

follows: allocative efficiency effects reflect a change in the allocation of productive resources. Terms-of-trade effects reflect changes in the prices of South Africa's exports relative to the prices of South Africa's imports. Welfare effects from savings and investment arise from changes in capital accumulation. Mainly by summing up these individual components, total equivalent variation estimates the amount of money that should be given to (or taken from) the economy to leave its citizens as well off as after implementing a certain policy change – in this section for most of the part measures aiming for the reduction of NTBs.

The potential effects on GDP that result from reducing or even eliminating applied tariffs on global imports are relatively low, reaching from 0.14 to 0.28 per cent GDP growth. Welfare effects arising from the gradual elimination of applied tariffs are slightly negative, mainly due to negative terms of trade effects. Similarly, the elimination of South Africa's core NTBs exerts relatively small changes on GDP growth. This result can be ascribed to a small core NTB level effect: South Africa's core NTBs as estimated by Keen et al (2009) are rather low relative to its international trading partners. The reduction of these core NTBs, however, would lead to welfare gains up an amount equivalent to 7 million USD.

By comparison, the gradual elimination of NTBs from trade facilitation induces substantial welfare effects and significant effects on GDP. As expected, under above mentioned assumptions, the potential benefits turn out to be larger for stronger reductions of NTBs that are induced by cross border trade inefficiencies. Bringing import time to trade down to the level of Malaysia would cause South Africa's GDP to rise by 1.27 per cent. At the same time, it would induce welfare effects equivalent to 3.4 billion USD. An even larger rationalization that would bring import time to trade down to the level of Singapore would more than double GDP effects to 2.79 per cent and induce welfare gains of an amount equivalent to 7.6 billion USD.

Bringing down export time to trade to the level of Malaysia would cause South Africa's GDP to rise by 0.68 per cent. Welfare gains would be equivalent to 9.5 billion USD. Lowering export time to trade to the level of Singapore would cause a rise in GDP of 0.86 per cent. The welfare gains are up to an amount equivalent to 12.0 billion USD.

It is striking that reductions of NTBs on exports exert higher welfare gains and higher GDP growth effects than reductions of NTBs on imports. This is due to the nature of the shock applied to the model. Due to the reduction of time to import barriers most of the welfare gains arise from (constructed technological) efficiency improvements in South Africa due to the shock. For a reduction of time to export barriers most of the gains in welfare arise from terms-of-trade improvements since the efficiency improving shock virtually occurs at the inner border of South Africa's trading partners.

Table 3: South Africa's gains from eliminating core NTBs and NTBs from inefficient trade facilitation

	Static Effects on South Africa's economy				
	Effects on GDP in per cent	Allocative Efficiency Effect in Million USD	TOT Effect in Million USD	Investment and Savings Effect in Million USD	Total Welfare Effect (EV) in Million USD
Reduction of tariffs on tradable commodities by 50 per cent	0.14	399	-427	-52	-80
Full elimination of tariffs on tradable commodities	0.28	799	-854	-104	-159
Elimination of Core NTB's on imports	0.14	32	-23	-2	7
Reduction of time to import by 5 days corresponding to levels of Malaysia	1.27	487	-140	-42	3,440
Reduction of time to import by 11 days corresponding to the level of Singapore	2.79	1,071	-308	-92	7,568
Reduction of time to export by 4 days corresponding to levels of Malaysia	0.68	1,940	7,315	276	9,531
Reduction of time to export by 11 days corresponding to the level of Singapore	0.86	2,457	9,266	349	12,072
Full liberalization package: Reduction of Core NTB's on imports, time to import, and time to export corresponding to the corresponding levels of Malaysia	2.61	3,871	6,261	130	13,843
Full liberalization package: Reduction of Core NTB's on imports, time to import, and time to export corresponding to the corresponding levels of Singapore	4.51	5,014	8,110	157	21,161

Source: GTAP 8, own calculations.

Table 4: South Africa's gains from eliminating core NTBs and NTBs from inefficient trade facilitation with African countries only

	Static Effects on South Africa's economy				
	Effects on GDP in per cent	Allocative Efficiency Effect in Million USD	TOT Effect in Million USD	Investment and Savings Effect in Million USD	Total Welfare Effect (EV) in Million USD
Reduction of tariffs on tradable commodities by 50 per cent	0	3	-29	-2	-28
Full elimination of tariffs on tradable commodities	0	7	-58	-4	-55
Elimination of Core NTB's on imports	0	11	-45	-3	-37
Reduction of time to import by 5 days corresponding to levels of Malaysia	0.14	27	-1	-1	398
Reduction of time to import by 11 days corresponding to the level of Singapore	0.31	59	-3	-3	876
Reduction of time to export by 4 days corresponding to levels of Malaysia	0.21	601	1,459	63	2,123
Reduction of time to export by 11 days corresponding to the level of Singapore	0.27	761	1,848	80	2,689
Full liberalization package: Reduction of Core NTB's on imports, time to import, and time to export corresponding to the corresponding levels of Malaysia	0.35	634	1,400	58	2,466
Full liberalization package: Reduction of Core NTB's on imports, time to import, and time to export corresponding to the corresponding levels of Singapore	0.58	826	1,788	73	3,510

Source: GTAP 8, own calculations.

An implementation of the full liberalization package, i.e., simultaneously eliminating core NTBs and NTBs on facilitating South African imports and exports would cause the strongest effects on GDP and domestic welfare. South Africa's GDP would rise by 4.51 per cent and total welfare gains are estimated to be up an equivalent of 21.1 billion USD, which is roughly 400 USD per capita.

Regarding the liberalization of South Africa's trade with other African countries only (see table 4) the estimates broadly confirm the tendency of previous results. Yet, as expected, the results exhibit significantly lower level effects. Tariff reductions and reductions of core NTBs do not exert a significant impact on GDP and aggregated welfare. Nevertheless, particularly fully rationalizing trade facilitation with other African countries causes the South African GDP to rise by 0.58 per cent and welfare gains are estimated to be 3.5 billion USD.

b) Discussion of the Results

Our simulations demonstrate that delays at the border induce substantial welfare losses for the South African economy. Reducing or even eliminating NTBs would also induce substantial welfare gains. However, there is still a set of caveats to be addressed:

1) The GTAP model is comparative static by nature, it does not tell anything about the time required to reach new equilibria after the imposition of certain trade liberalization measures; in other words, when precisely GDP effects and welfare gains will be realized remains an open question.

2) Since the model is static, it does not account for dynamic effects such as further productivity gains from trade liberalization and investment decisions (see footnote 8). From this perspective, the results presented in this paper might underestimate GDP and welfare gains. However, we have chosen a technology augmenting shock (which is suitable for the reduction of the effective price of tradable goods and services imports, see Hertel and Itakura 2001). Since we fully incorporate the derived costs induced by NTBs on the price of tradable commodities, the effects on GDP and welfare might be overestimated. This is due to the fact that efficiency gains cause non-discriminating positive effects on all imports and exports, and therefore on the overall economy.¹⁷ Thus (as a general matter), the results calculated by GTAP have to be interpreted with caution.

3) The efficiency gains from rationalizing trade facilitation tend to be very sizable in our study. Fugazza and Maur (2008) argue that efficiency gains due to an augmenting technology shock are likely to outperform negative terms-of-trade effects. It might thus be appropriate to make use of a technology driven shock for small numbers only.

¹⁷ Note that in general NTBs resulting from inefficient trade facilitation do not discriminate among the international origin of imports or the domestic origin of exports.

However, since South Africa's time barriers to trade are substantial by international comparison, it might be adequate to apply the "rock-in-wheels-approach" rather than the "sand-in-the wheels-approach".

4) Applying the average AVE figure provided by Hummels (2001), we assume additional costs of time to trade to be equal for all tradable commodities. Additional cost of time to trade may be lower for agricultural commodities. Since South Africa's imports are for the most part manufactured products, this generalization might be justified. South African exports, on the other hand, are commodity driven. Hummels' (2001) AVE estimate for nonferrous metals is 0.5 percentage points and thus only slightly lower than the number applied to our simulations. Hence the GTAP results from reducing export time to trade might only marginally overestimate the effect on GDP and total welfare.

To sum it up: the figures resulting from our simulation are only indicative by nature. The true outcomes – practically difficult to observe in reality – might differ from the numbers estimated using the GTAP model. However, it is important to note that all measures of trade liberalization that we applied to our study end up with significantly positive effects on South Africa's GDP, and reducing time barriers to trade should be on top of the policy agenda on trade liberalization.

5. Conclusion

In this paper, we have studied the economic impact of further trade liberalization in South Africa. After arguing that South Africa's trade protection measures are still relatively high compared to other emerging market economies and that industrial policy still preferentially supports certain industries, we estimate the potential economic effects that would result from further trade liberalization measures.

Based on a static GTAP model, our analysis particularly focuses on the elimination of existing core NTBs and NTBs resulting from considerably inefficient cross-border trade facilitation in South Africa. Although the results should not be taken for face value, the numbers clearly demonstrate that the South African economy would benefit considerably from a reduction of core NTBs on tradable commodities and from a significant increase in the efficiency of cross-border trade facilitation. The economic impact of a further reduction or elimination of applied tariffs on tradable commodities only is comparatively low.

Our results indicate that a full liberalization package, which includes a reduction of core NTB's as well as a substantial increase in the efficiency of cross-border trade facilitation corresponding to the levels of Singapore would cause the South African GDP to rise by up to 4.51 per cent. Regarding aggregated welfare, total equivalent variation numbers point to the amount of up to 21 billion US Dollars that should be given to the economy to

leave its citizens as well of as after the implementation of the full liberalization package, given that South African policy-makers abstain from these liberalization measures.

Our results also demonstrate that a reduction of NTBs on exports induces a higher positive impact on GDP and aggregate welfare than a reduction of NTBs on imports. Although substantially smaller by order of magnitude, liberalizing South Africa's trade with other African countries confirms the tendency of the results, pointing to GDP gains of up to 0.58 per cent and welfare gains of up to 3.5 billion US Dollars.

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