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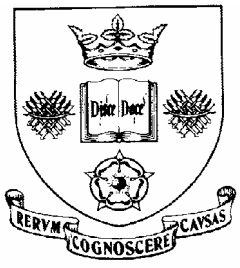

Scott McDonald* and Terrie Walmsley

Preferential Trade Agreements and the Optimal Liberalisation of Agricultural Trade

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* Corresponding author

Department of Economics
University of Sheffield
9 Mappin Street
Sheffield
S1 4DT
United Kingdom
www.shef.ac.uk/economics

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Scott McDonald
&
Terrie Walmsley

Department of Economics,
The University of Sheffield,
9 Mappin Street,
Sheffield, S1 4DT
Email: s.mcdonald@sheffield.ac.uk
Tel: +44 (0)114 22 23407

Abstract

Recent years have seen a rapid growth in the number of preferential trade agreements (PTAs) between developed and developing economies. Typically however many of these PTAs only incorporate a partial liberalisation of food and agricultural trade by developed economies. This paper reports the results from simulations conducted using a global comparative static model CGE model that has been calibrated with data from the GTAP database (version 5). Using the EU RSA FTA as an example the results indicate that the optimal degree of food trade liberalisation by the EU is less than 100 percent, and declines appreciably after the optimum. Qualitatively similar results emerge for South Africa. However, the welfare gains for South Africa increase rapidly with the increasing liberalisation of EU food and agricultural trade, while the welfare gains for the EU increase slowly with the increasing liberalisation of South African food trade. These results indicate that bilateral trade negotiations between developing and developed countries may involve a complex bargaining process, wherein the payoffs from different strategies are neither necessarily intuitively obvious nor are they necessarily consistent with the full liberalisation of food trade by developed economies.

Keywords: Free trade agreement; GTAP; South Africa
JEL classification: C68; F15; O55.

1. Introduction

The analyses reported in this paper take the theory of the second-best (Lipsey and Lancaster, 1956-7) seriously. The theoretical literature on customs unions, e.g., Viner (1950), Lipsey (1957), Mundell (1964), and Lloyd (1982),[1] has consistently identified the fact that any preferential trading agreement (PTA)[2] can produce trade creating and trade diverting effects and that the overall welfare implications will be a result of complex interactions. In a simple one good three country partial equilibrium model it is easy to demonstrate that the overall impact on welfare depends upon the particular circumstances. The more 'complete' general equilibrium models confirm the argument that it is impossible to conclude unambiguously that **all** preferential trade agreements will necessarily be welfare enhancing. However while empirical studies indicate that PTAs are welfare enhancing for the partners, many empirical studies embrace the implicit presumption that the welfare gains from a PTA increase with the degree of trade liberalisation, i.e., the potentially negative effects of trade diversion are not quantified. One consequence of this way of thinking is the implicit conclusion that a reluctance by partners to fully liberalise bi-lateral trade in a PTA is irrational since it implies that the welfare gains are not maximised.

This conclusion is particularly prevalent in the literature on agricultural trade liberalisation. Since the results of the World Bank's study on the Political Economy of Agricultural Pricing Policy and related studies became public (Krueger *et al*., 1988; Anderson and Tyers, 1992; Schiff and Valdes, 1992), there has been a widespread consensus that developing countries would benefit from even unilateral agricultural trade liberalisation. Moreover there is a large body of evidence that the agricultural and agricultural trade policies of the EU, USA and Japan have substantial negative effects on welfare, both within their own countries and globally. Typically this evidence has encouraged commentators to argue that more liberalisation is better than less liberalisation in a PTA; nevertheless developed countries have apparently been reluctant to fully liberalise agricultural trade,[3] while developing countries have been persuaded to accept virtually full liberalisation of agricultural trade in line with the analyses that suggest they gain even from unilateral liberalisation.

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1 Bhagwati *et al*., (1999) brings together many of the major contributions on preferential trade agreements.

2 Throughout this paper a clear distinction will be drawn between a PTA, a Free Trade Area (FTA) and a Customs Union. The former will be defined as a trade agreement wherein the trade barriers between the partners are less than the non-common barriers facing non-members of the PTA; a FTA will be defined as a trade agreement with NO barriers between the partners and non-common barriers facing non-members; and a Custom Union will be defined as a trade agreement with NO barriers between the partners and common barriers facing non-members

3 The EU's 'everything but arms' programme is an exception, although it has involved only a minor liberalisation of trade in competitive agricultural commodities.

The issue of the optimal liberalisation of agricultural trade in a PTA between developed and developing country partners is of increasing importance with the rush to form such PTAs, especially since the late 1990s with the signing of the Cotonou Agreement, whereby the EU committed itself to develop its trade relationships with the ACP (African, Caribbean, and Pacific) countries through PTAs. With the EU, USA and Japan's long record of reluctance to liberalise agricultural trade it might be expected that any PTAs formed by these countries are likely to include only a partial liberalisation of agricultural trade by them, but that at the same time that they are likely to seek greater liberalisation of trade in other commodities. It appears to be accepted 'wisdom' that such a partial liberalisation of agricultural trade is unlikely to be (economically) rational.

Using the example of the EU Republic of South Africa (RSA) Free Trade Agreement[4] (EU RSA FTA), which is arguably the first manifestation of the policy thinking behind the Cotonou Agreement, the analyses reported in this paper indicate that neither party – the EU or the RSA – has an unambiguous incentive to fully liberalise agricultural trade. Moreover it is demonstrated that the optimal degrees of agricultural trade liberalisation for both parties are interdependent, which indicates that the determination of the optimal degree of agricultural trade liberalisation will involve a complex bargaining process.

The rest of this paper is organized as follows. The next section briefly reviews the basic arrangements of the EU RSA FTA. The data and model used for the analyses are described in the two sub-sections of section 3, with descriptions of the policy experiments and comments on the results appearing in section 4. Section 5 provides a discussion of the implications of the analyses for policy makers and concluding comments appear as section 6.

2. The EU Republic of South Africa Free Trade Agreement

After the democratic elections of 1994 the RSA applied for membership of the Lomé Convention, which the EU declined. Instead the EU offered associate membership, with exclusion from Lomé's trade and aid provisions, GSP status (in 1995) and negotiations for bilateral agreements. The latter resulted in the EU RSA FTA in 1999, which came into operation on 1st January 2002. In light of the Cotonou Agreement, and the subsequent commitment by the EU to seek regional trade agreements (RTA) with ACP (African, Caribbean and Pacific) countries and other developing countries, whilst phasing out the preferential commodity

[4] Although the agreement is referred to as a 'free trade agreement' it is strictly speaking a 'preferential trade agreement' since it does not provide for complete free trade between the partners.

agreements, the EU RSA FTA can be regarded as a prototype RTA of the kind envisaged by the Cotonou Agreement.

The EU RSA FTA covers the majority of commodities; although there are a number of contentious issues remaining, particularly with respect to the EU retaining protection for certain 'sensitive' agricultural products and South Africa retaining some restrictions upon trade in manufactured products, especially vehicles. In effect the EU agreed to phase out trade barriers with the RSA over 10 years while the RSA reciprocated over 12 years; except for the retention of trade barriers for some 'sensitive' food and agricultural commodities by the EU, and for some 'sensitive' manufactured commodities by the RSA. The programme of liberalisation includes a banding of products according to the stage in the liberalisation process at which the trade barriers would be reduced; details are available in EU (1999). Overall the FTA will liberalise trade on virtually all manufactured commodity exports by RSA to the EU and nearly 90 percent of EU exports to RSA, while only some 60 percent of RSA agricultural exports to the EU will be liberalised and over 80 percent of EU agricultural exports to RSA. Moreover the rate of liberalisation for manufactured commodities is more rapid than for agricultural commodities.

One stylised representation of the EU RSA FTA might be presented as an agreement wherein bilateral non-food trade was fully liberalised and bilateral agricultural trade was partially liberalised.[5] Such a representation could be construed as an analytical framework within which a stylised view of the EU's attitude towards food trade could be evaluated under the presumption that the EU had been successful in achieving an objective of fully liberalising non-food trade. Thereafter the issue becomes one of determining the extent to which food trade is liberalised. An alternative stylised representation might start from the full bilateral liberalisation of food trade and thereafter seek to determine the extent to which non-food trade is liberalised.

3. Data and Model

The data and model are derived from the GTAP project (see Hertel, 1997, for details). The data used are a straightforward aggregation of the GTAP global database (see below), but the model contains variations from the standard GTAP comparative static model (see below) and the choice of closure rules is important (see below).

[5] Indeed such a stylised representation might be applied to the history of multilateral trade negotiations where the rate of liberalisation of agricultural trade has, at the very least, lagged behind the rate of liberalisation of non-agricultural trade.. For instance consider how trade in manufactured goods was substantively liberalised during the GATT rounds while agricultural protection, especially by developed countries, was left largely in place.

Data

The data are from the Global Trade Analysis Project (GTAP) database, which contains a fully articulated record of trade transactions and duties between different regions for a range of commodities (see Gehlhar *et al*., 1997). Version 5 of the GTAP database divides the world into 66 regions and records all commodity transactions by way of 57 aggregate commodities; nearly all research using the GTAP data uses an aggregation of the full database. For these analyses a 17 region by 18 commodity aggregation of the GTAP 5 database was used. The choice of commodity aggregation was driven by the need to provide a balanced representation of trade relationships between the EU and RSA with sufficient detail about food and agricultural trade. Similarly the choice of aggregate regions was designed to provide a balanced view of global trade relations while providing sufficient detail on African regions to capture the external effects of the simulations upon the RSA's neighbours in southern Africa. But the RSA is not identified as a separate region in the GTAP database, rather it is grouped the Southern African Customs Union (SACU) members except for Botswana.[6] For convenience when referring to the GTAP region the Rest of SACU the term South Africa will be used in the text, and when referring to the political entity of the Republic of South Africa the term the RSA will be used.

Table 1 Aggregate Regions and Commodities

Regions	Commodities
*Rest of SACU/South Africa	Cereals
*Botswana	Animal Agriculture
*SADC	Other Agriculture
*Rest of Africa	Fuels
European Union	Minerals
North America	Animal Products
*Mexico	Other Food Products
Japan	Textiles
China	Wood and Paper
*MERCOSUR	Petroleum
Cairns Group excl. Chile	Metals
*Chile	Vehicles
Rest of Europe	Engineering
*Rest of Americas	Utilities
*Turkey	Construction
*South and East Asia	Trade and Transport
*Rest of World	Services and activities
	Government services

The tariff rates for Botswana and the Rest of SACU in the GTAP databases are not the same. This is an error in the database rather than a consequence of the aggregation used. Equal tariff

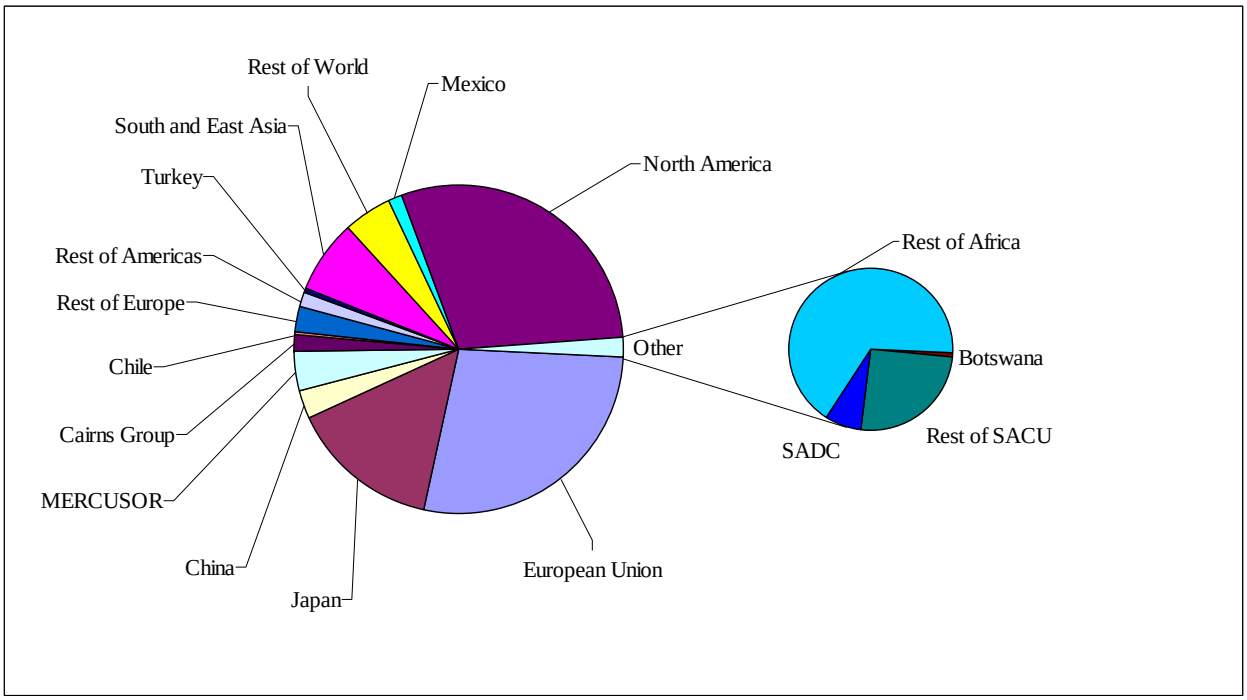
6 The members of SACU are Botswana, Namibia, Lesotho, Swaziland (BLNS) and the Republic of South Africa.

rates were imposed and the database was then shocked, using the 'altertax' closure due to Malcolm (1998), to impose common tariff rates and to obtain the actual shares of tariff revenue received by Botswana and South Africa under the revenue sharing formula. The 'altertax' closure and parameter files are designed so as to minimise the effect of the shock on the database.

Descriptive Statistics[7]

The data aggregation identifies several important features about the global economy. Global GDP is dominated by North America (30 percent of global GDP), the EU (27.5 percent) and Japan (14.7 percent GDP), Africa accounts for 1.9 percent of global GDP, and South Africa accounts for 0.5 percent of global GDP and 25 percent of African GDP (Figure 1). Hence the EU RSA FTA is an agreement between two economies that are vastly different in size – the EU's GDP is 57 times the size of the South Africa's GDP, while the EU's imports and exports are, respectively, 74 and 69 times greater than those of South Africa (see Table 2). While it may be reasonable to assume that South Africa may have the characteristics that mean it can be modeled reasonably as a small open economy, it is appropriate to assume that the EU is a large economy, and hence that its decisions might impact upon global prices.

Figure 1 GDP by Model Regions



Source: GTAP5 Database

7 The descriptive statistics use the GTAP database after the adjustments imposed by the 'altertax' closure.

Table 2 Trade Structure and Relations for South Africa and EU

	South Africa				EU			
	Total Imports	**Share of Imports from EU**	**Total Exports**	**Share of Exports to EU**	**Total Imports**	**Share of Imports from S Africa**	**Total Exports**	**Share of Exports to S Africa**
Cereals	142	22.3%	238	1.7%	7,295	0.1%	7,872	0.4%
Animal Agriculture	89	26.3%	218	59.3%	10,517	1.2%	8,896	0.3%
Other Agriculture	240	10.4%	1,119	60.1%	57,300	1.2%	32,941	0.1%
Fuels	1,458	21.0%	2,345	51.8%	91,451	1.3%	16,821	1.8%
Minerals	120	9.9%	1,518	42.6%	13,087	4.9%	4,764	0.2%
Animal Products	320	36.5%	165	50.9%	38,959	0.2%	45,122	0.3%
Other Food Products	1,027	24.6%	1,252	40.0%	83,450	0.6%	94,633	0.3%
Textiles	1,697	19.6%	1,136	28.8%	156,618	0.2%	132,201	0.3%
Wood and Paper	943	54.6%	1,501	40.5%	101,486	0.6%	109,659	0.5%
Petroleum	4,481	53.7%	2,769	17.7%	318,971	0.2%	377,653	0.6%
Metals	1,664	41.4%	11,840	28.7%	155,632	2.2%	162,596	0.4%
Vehicles	3,377	39.4%	1,222	28.7%	239,903	0.1%	284,150	0.5%
Engineering	10,530	53.7%	3,799	41.4%	586,185	0.3%	645,231	0.9%
Utilities	14	51.9%	395	42.5%	11,109	1.5%	10,421	0.1%
Construction	31	40.4%	16	17.5%	19,073	0.0%	18,135	0.1%
Trade & Transport	2,708	33.3%	3,092	39.2%	207,762	0.6%	184,266	0.5%
Services	1,692	46.4%	1,268	32.5%	176,535	0.2%	199,230	0.4%
Government services	461	20.7%	463	26.3%	28,808	0.4%	25,553	0.4%
Total	30,994	43.6%	34,356	34.7%	2,304,140	0.5%	2,360,142	0.6%
Food	1,819	24.7%	2,992	46.5%	197,521	0.7%	189,464	0.2%
Fuels and Minerals	1,578	20.2%	3,863	48.2%	104,538	1.8%	21,585	1.5%
Manufactures	22,692	48.2%	22,267	30.3%	1,558,795	0.4%	1,711,489	0.6%
Other	4,906	36.7%	5,233	36.6%	443,286	0.4%	437,604	0.4%

Source: GTAP5 Database

Moreover trade relations between the EU and South Africa are also characterised by substantial differences in the patterns of trade between the two economies. On a simplistic level the disparity in the size of the two economies is reflected in the fact that the EU provides 44 percent of South Africa's imports and receives 35 percent of her exports, while South Africa provides only 0.5 percent of the EU's imports and receives only 0.6 percent of the EU's exports. However there are substantial asymmetries in the patterns of imports and exports, especially for South Africa – a crude overview indicates that South Africa is appreciably more reliant on the EU as a source of manufactured commodities than food commodities and equally more reliant on the EU as a destination for food commodity exports than manufactured commodity exports. But trade by South Africa in manufactured commodities is substantially greater than trade in all other

commodities, as is the case for the EU, although this is potentially a misleading categorisation since South Africa exports are dominated by metals, which includes gold.

Nevertheless food trade is important for South Africa. Food exports are substantial and it is reasonable for South Africa to expect that with a liberalisation of food trade the relative importance of food exports would increase. More surprising perhaps is the extent to which South Africa imports food commodities from the EU, since the EU might be regarded as a relatively high cost producer, although this may in part be a consequence of the extent to which the EU supports its agricultural industry.

Model[8]

Associated with the GTAP database is the GTAP model (see Hertel and Tsigas, 1997), which is a comparative static computable general equilibrium (CGE) model that incorporates one possible specification of behavioural relationships that are consistent with the data.[9] The analyses reported in this paper use a variant of the GTAP model. Since the GTAP model is well known the comments here are limited to the changes in the model and the specific closure rules adopted for this study.

The standard GTAP model allocates all tariff revenues 'earned' by a country directly to that country. But the RSA is a member of SACU, which means that the RSA does not receive the revenue directly; rather the revenue is pooled and distributed according to a revenue sharing formula. Hence there are intra-country transfers of tariff revenues, which are not recorded in the database, and that change with changes in tariff rates (McDonald and Walmsley, 2001, demonstrate that the operation of the customs revenue pool has substantive implications for the distribution of welfare gains within SACU). Hence a tariff revenue pool was created in the model; this gathered together all SACU tariff revenues then distributed them using the revenue sharing formula.

Second, the standard GTAP model contains the presumption that the substitution elasticities for the CES import aggregation (Armington) functions are identical for all regions. While this may be an acceptable assumption when the focus is on changing trade relationships between developed economies it was deemed inappropriate in this instance. Consequently the model was modified to allow for different import substitution elasticities according to region and commodity. Furthermore the import substitution elasticities reported in the GTAP database were

8 The model and associated data are available from the authors as a version of RunGTAP.

9 The GTAP model is implemented in GEMPACK and hence solved in rates of change. Lewis *et al*., (2001) use a CGE model that is solved in terms of levels using the GAMS software. Rutherford (2000) has produced a specification of the GTAP model that is solved using the GAMS software.

deemed to be overly large for developing economies (see Thierfelder and Robinson, 2002, for a recent discussion of the impact of import substitution elasticities on the performance of CGE models). Consequently the elasticities of import substitution used in these analyses differ appreciably from those used in a standard GTAP application (see Appendix 1 for the elasticities used). However the simulations were also run using the 'standard' elasticities; the results indicate that although the changes alter the magnitude of some of the results the general patterns are unaffected.

Closure

The choice of closure rules is often critical to the operation of the CGE model (see Pyatt, 1998; Kilkenny and Robinson, 1990). Three fundamental changes were made to the closure rules; see Appendix 2 for full details of the closure rules imposed.

1) Developing countries are typically characterised by underemployment of unskilled labour; hence it was assumed for all developing country regions (those marked with an * in Table 1) that the wage rates were fixed exogenously and the supplies of labour were endogenised.
2) For all African and Latin and South American regions except Mexico the ratios of the trade balance to (national) income were fixed.
3) The final group of changes relate to restrictions placed upon specific sectors for Botswana, which is in a customs union with the RSA. These restrictions were necessary to avoid unrealistic responses by Botswana, and involved fixing the volume and price (fob) of diamond ("minerals") exports to all regions; fixing the total volume of cereal ("cereals") exports; fixing the volume of meat ("animprod") exports to the EU; and fixing the volume of vehicle ("vehicles") production and exports.

5. Empirical Analysis

Policy Experiments

The policy experiments are designed to examine the incentives to liberalise food trade, where food trade is defined as trade in agricultural products and processed food products, in a bilateral trade agreement. Hence they confront the argument, implicit in much of the trade policy and political economy literature, that a reluctance to liberalise food trade by developed economies is either irrational or inspired by rent seeking behaviour. The analyses are carried out in the context of a bilateral trade agreement between the EU and the RSA. This decision could be justified on the grounds that the EU RSA FTA is one of the first fruits of the changes in EU policy towards

developing countries associated with the Cotonou Agreement and/or that much of the current debate about preferential trade agreements is concerned with bilateral agreements between developing and developed economies. Ultimately however the choice remains somewhat arbitrary since there are a substantial number of potential PTA partnerships that could be modelled used the GTAP 5 database.

A difficult first decision is the base case. For these simulations the base case is defined as full liberalisation of all trade policy instruments for all non-food trade between the EU and the RSA while all other global trade barriers are unchanged. Thereafter the policy simulations seek the 'optimal' degrees of liberalisation of trade policy instruments for food trade by each partner for given rates of food trade liberalisation by the other partner. One possible approach would be to reformulate the model so that the degrees of bilateral trade liberalisation were variables and then solve the model so as to maximise welfare in the two regions. Over and above the difficulty of defining a simple variable that captures the degree of bilateral food liberalisation, the main difficulty with such an approach is that it provides no information on the welfare implications of different degrees of liberalisation. Since such information is useful for an understanding of the implications of different trade regimes, and hence the nature of the incentives facing the partners during negotiations, a simple optimisation experiment would only reveal point estimates of the optimal strategy rather than substantive insights into the underlying relationships. Hence the simulations reported here rely on a series of experiments that examine the range of alternatives available to the partners. If all possible combinations of percentage reductions in trade barriers for the 5 food commodities identified in the aggregation were used the number of simulations required would be enormous; even if only integer percentage reductions were considered.[10] Hence only equiproportionate reductions in trade barriers for food products by each partner were evaluated and the proportionate reductions in trade barriers were implemented in 10 percentage point steps; i.e., a matrix of simulations was conducted.

Results

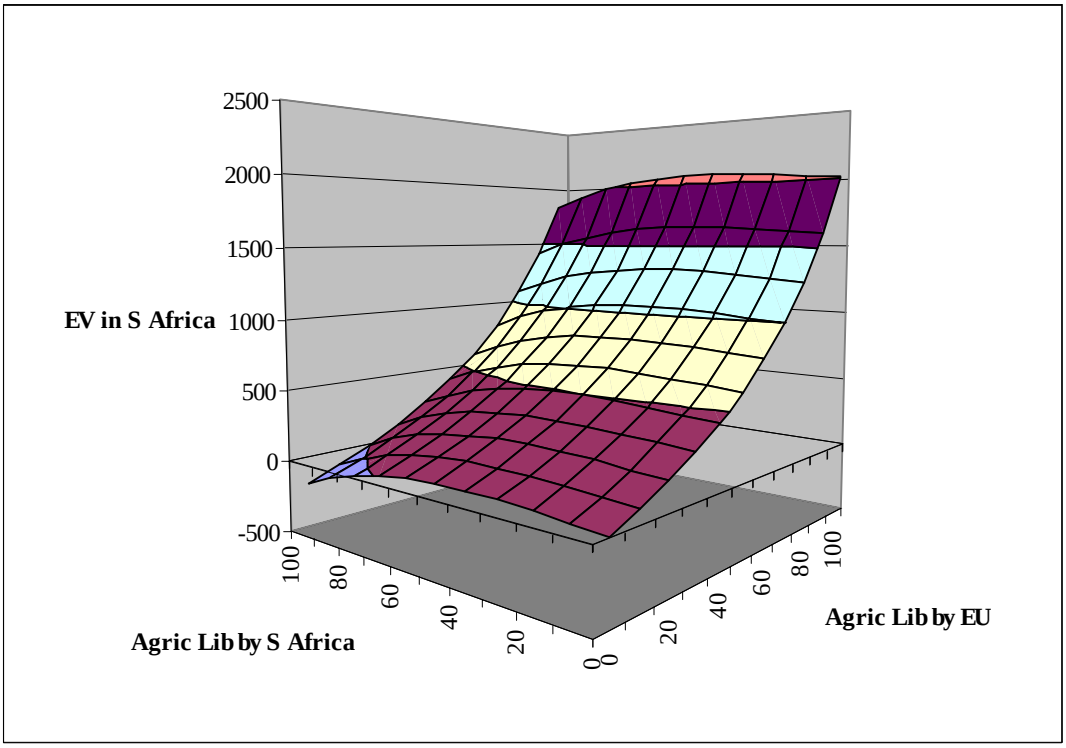
One problem with conducting this type of policy experiment with a global model, even with the degree of disaggregation used here, is the quantity the results generated. Consequently the results presented in this paper are, by necessity, limited.[11] Assuming that the primary concern of policy makers is the welfare implications of any bilateral agreement the analyses of the results starts from a simple summary of the welfare effects for the PTA partners, Figures 2 and 3, the globe,

10 An additional complication is that neither the GEMPACK software nor the RunGTAP programme is designed to allow the simulations to be carried out using 'loops'.

11 Full copies of the results are available from the authors in the format used by ViewSol.

the rest of the World and the rest of SADC, Figures 4, 5 and 6. The presented results then go on to investigate the sources of the reported aggregate welfare effects by examining their components.

Figure 2 **Welfare (EV) Effects for South Africa** ($(US)m 1997 prices)



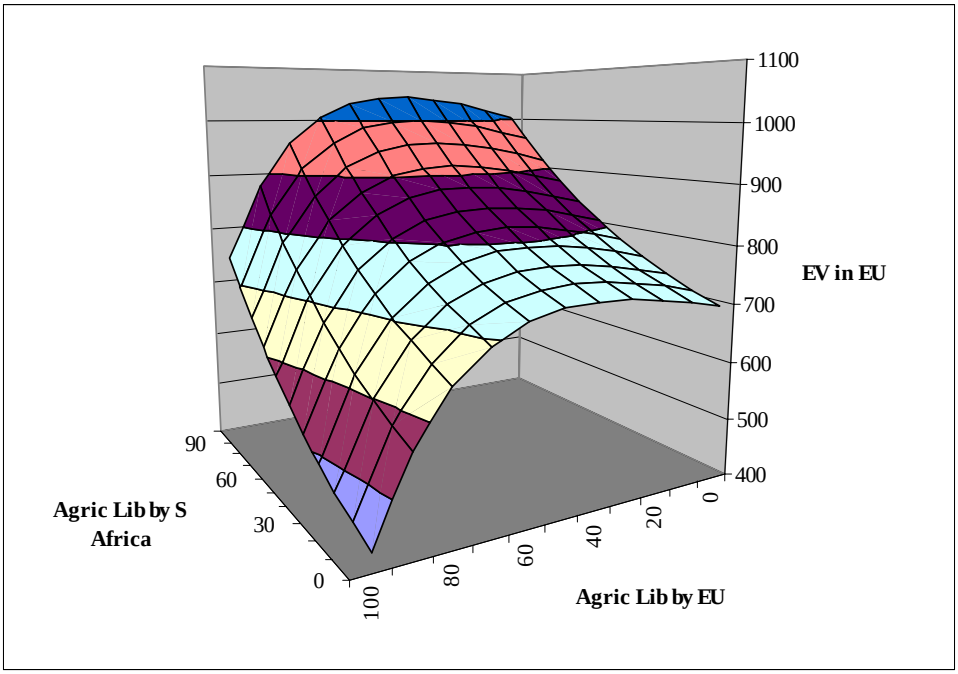
Source: Simulation results.

Aggregate Welfare Effects

The welfare effects of progressive bilateral liberalisation of food trade on South Africa (Figure 2) indicate that for any given degree of liberalisation by South Africa the greater the reciprocal liberalisation by the EU the greater the welfare gains. Hence South Africa faces a strong incentive to seek the largest possible liberalisation by the EU. For any given degree of liberalisation by the EU, South Africa 'optimises' its welfare gains by restricting its reciprocal liberalisation of food trade to about 40 percent; hence there is an incentive for South Africa to seek the maximum bilateral liberalisation of food trade by the EU, and the marginal (negative) benefits to South Africa from liberalising its food trade with EU by more than some 40 percent are small. It is important to note that if South Africa is not able to induce the EU to liberalise food trade that the welfare benefits of any trade agreement are very small whatever the degree of food trade liberalisation by South Africa; hence the conclusion that the agreement on food trade

liberalisation is a primary concern for South Africa, indeed it is arguable that all the welfare benefits to South Africa from a trade agreement with the EU arise from food trade.

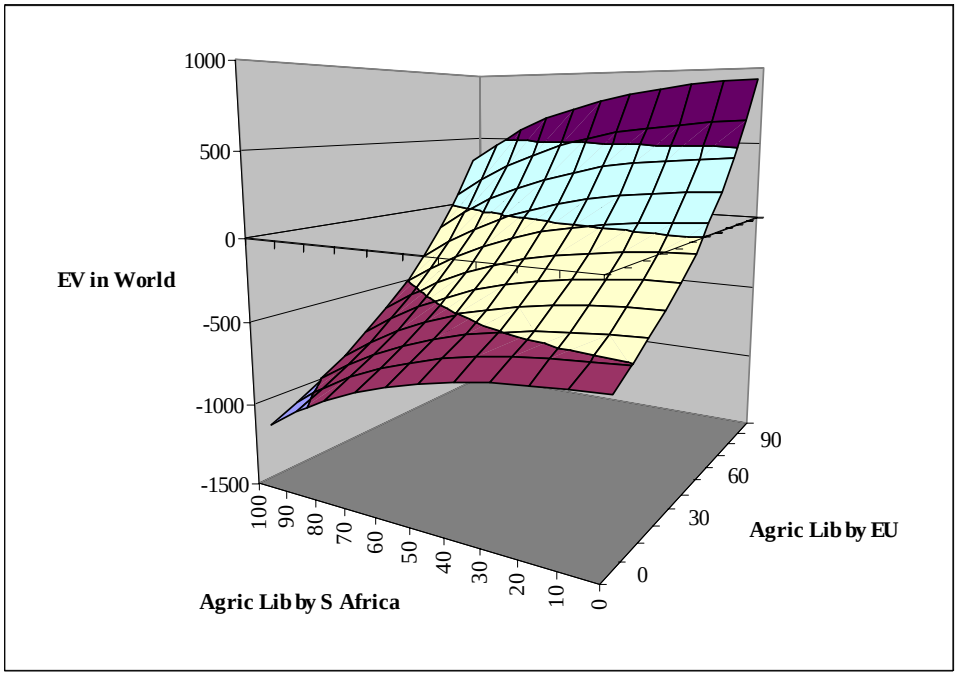
Figure 3 **Welfare (EV) Effects for EU** ($(US)m 1997 prices)



Source: Simulation results.

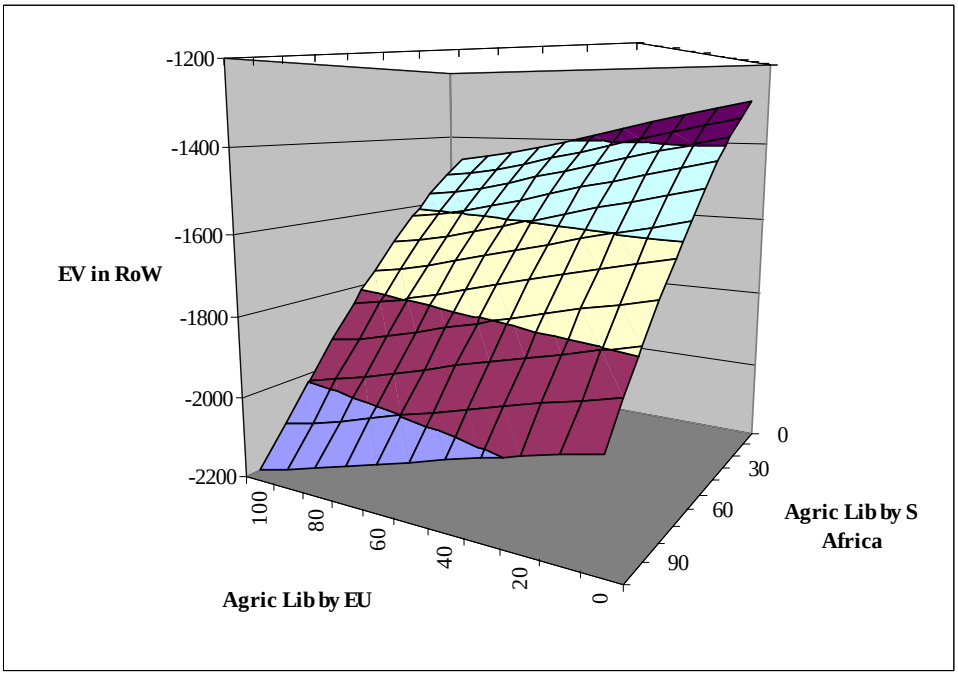
On the other hand the welfare effects for the EU (Figure 3) are much more pronounced. First, it is immediately apparent that the EU gains substantially from a trade agreement with South Africa even if food trade is excluded from the agreement ($700m). Second, that liberalisation of bilateral food trade by South Africa substantially increases the welfare gains to the EU; by some $300m irrespective of the degree of liberalisation of food trade by the EU. And third, that the welfare benefits to the EU from a reciprocal liberalisation of food trade with South Africa only yields positive marginal welfare gains for relatively low rates of liberalisation; and that after about a 40 percent liberalisation the marginal welfare benefits become rapidly negative. Indeed, full bilateral liberalisation of food trade only produces a very small welfare gain for the EU ($40m) over zero liberalisation of food trade. The welfare implications for the EU and South Africa from different degrees of food trade liberalisation indicate clearly that it would be reasonable to expect the parties to place appreciable differences of emphasis on food and non-food trade barriers when entering into negotiations.

Figure 4 **Global Welfare (EV) Effects** ($(US)m 1997 prices)



Source: Simulation results.

Figure 5 **Welfare (EV) Effects for the Rest of the World** ($(US)m 1997 prices)

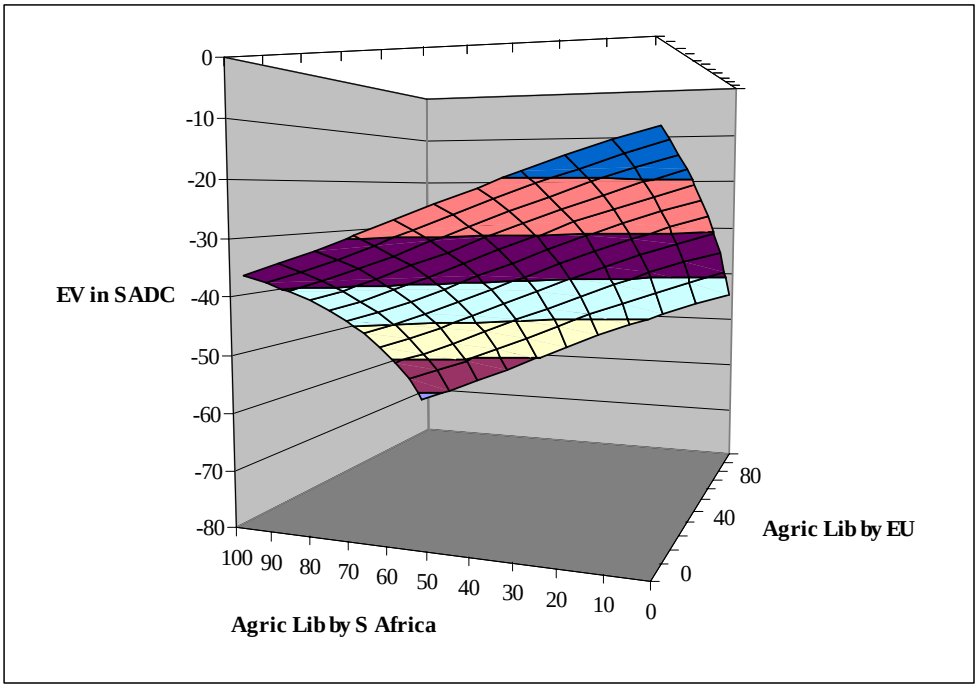


Source: Simulation results.

The aggregate welfare effects of an EU RSA FTA are unambiguously negative for the rest of SADC, although they are small. What is of interest however is the fact that the marginal welfare

effects for the rest of SADC are negative for progressive liberalisation of food trade by both the EU and South Africa, with the negative marginal effects being slightly larger for EU liberalisation than South African liberalisation. Figures 4, 5 and 6 indicate that the externality effects of an EU RSA FTA are welfare decreasing and that the FTA has 'beggar-thy-neighbour' effects upon the South Africa's partners in SADC.

Figure 6 **Welfare (EV) Effects for the Rest of SADC** ($(US)m 1997 prices)



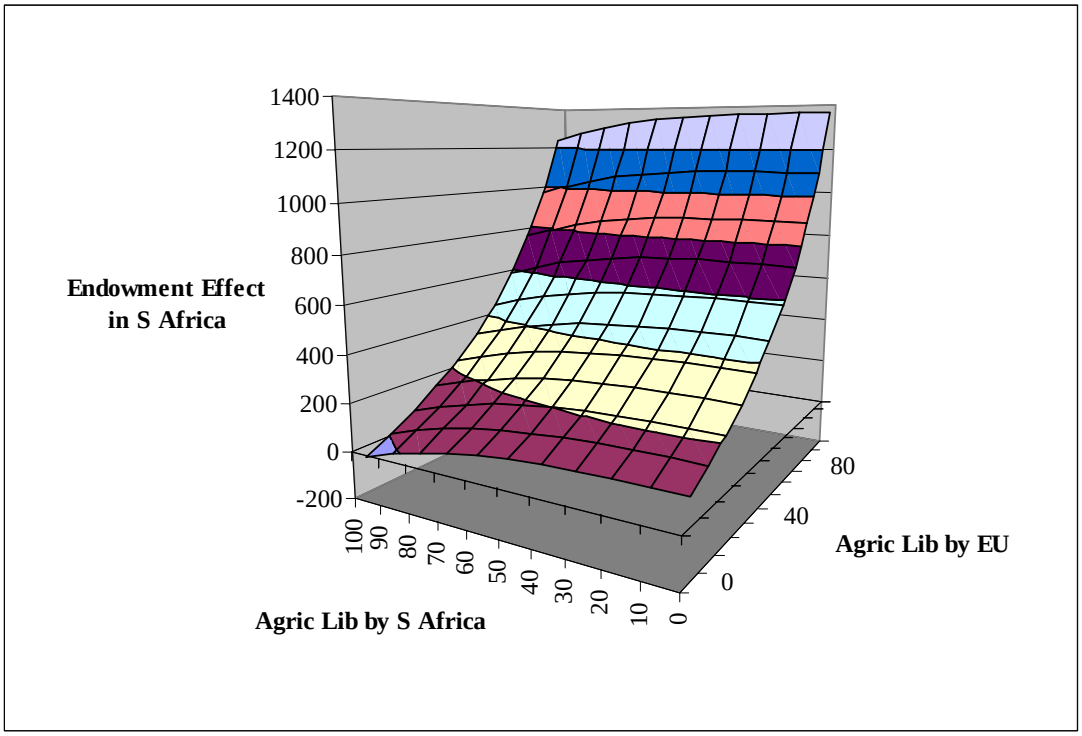
Source: Simulation results.

The impact on Global welfare of bilateral food trade liberalisation between the EU and South Africa depends upon who liberalises trade in food products. The marginal impact of liberalisation by the EU is unambiguously positive whatever the degree of liberalisation by South Africa, while the marginal impact of bilateral food trade by South Africa is unambiguously negative. But this is a somewhat misleading representation since it does not separate out the effects upon the EU and South Africa from those on the Rest of the World; this is done in Figure 5. This demonstrates that the negative impact of the bilateral liberalisation of non-food trade upon the rest of the World is increased unambiguously by bilateral food trade liberalisation, irrespective of which partner liberalises food trade. Particularly interesting is the extent to which food trade liberalisation by South Africa negatively impacts upon welfare in the Rest of the World while impacts for EU liberalisation are more muted.

Welfare Effects for the RSA

The aggregate welfare results for South Africa indicate competing forces – those that contribute to increasing welfare as the EU liberalises food trade, and those that imply that South Africa has only limited incentives to engage in reciprocal food trade liberalisation. Using a disaggregation of the aggregate welfare effects due to Huff and Hertel (2001) and extended by Hanslow (2000) it is possible to get greater insights into the causes of these differences.

Figure 7 **Endowment Welfare (EV) Effects for South Africa** ($(US)m 1997 prices)

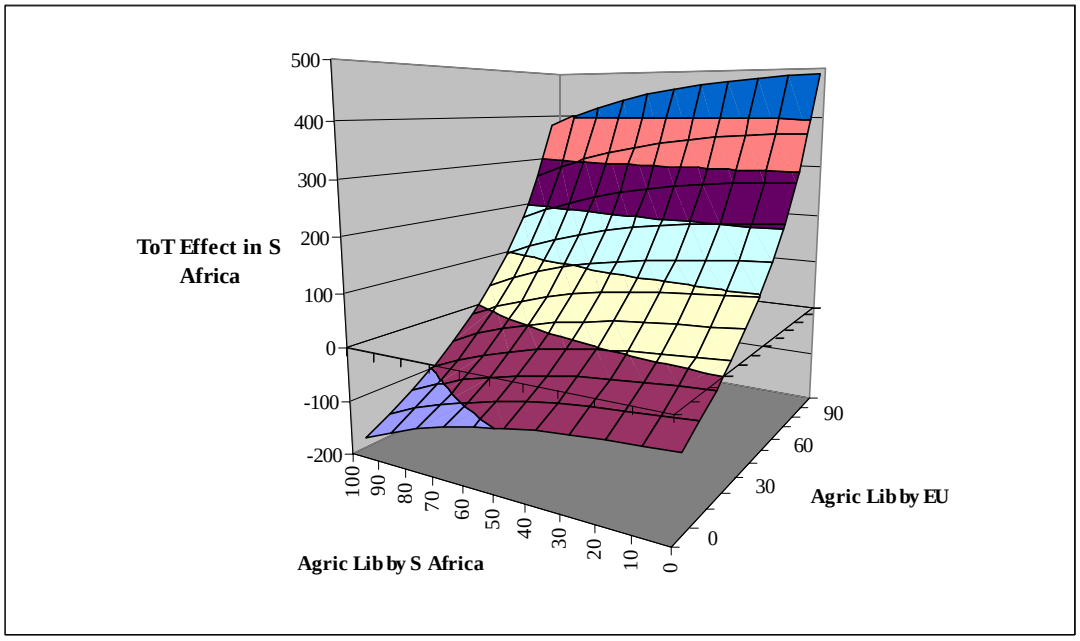


Source: Simulation results.

In South Africa the more the EU liberalises bilateral food trade the greater the endowment effect, Figure 7, which comes from an expansion in the employment of unskilled labour in South Africa. But the endowment effect is consistently increasing for liberalisation by the EU and consistently decreasing for liberalisation by South Africa. Hence it is unlikely that the endowment effect provides more than part of the explanation for the reversal of the total welfare effects for South Africa. A similar, although less strong, pattern emerges for the terms of trade effect, which sees increasing welfare gains as the EU liberalises food trade and decreasing welfare as South Africa liberalises food trade; as the EU liberalises food trade so the welfare gains for South Africa move from negative (ranging from -$67 to -$180 according to South

Africa's degree of bilateral food trade liberalisation) to positive (from $380 to $490), irrespective of South Africa's degree of bilateral food trade liberalisation..

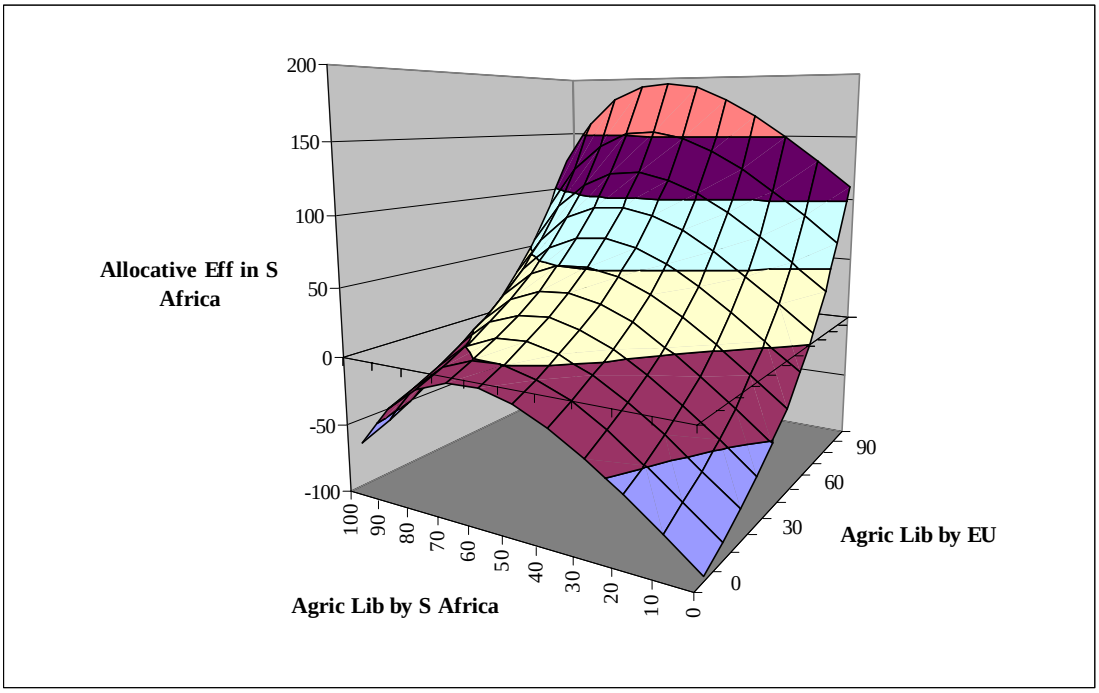
Figure 8 **Terms of Trade Welfare (EV) Effects for South Africa** ($(US)m 1997 prices)



Source: Simulation results.

But neither the endowment nor the terms of trade effects provide an explanation for why South Africa's aggregate welfare increases over only part of the range of food trade liberalisation by the RSA. This is a consequence of the allocative efficiency welfare effects, Figure 9. These indicate that over a substantial proportion of the range of bilateral food liberalisation by the EU and South Africa the allocative efficiency welfare effects are negative; indeed without food trade liberalisation the allocative efficiency welfare effects are unambiguously negative for South Africa, but that as the EU liberalises food trade with the RSA the allocative efficiency effects become positive. Moreover, as South Africa liberalises bilateral food trade so are the marginal allocative efficiency affects positive until approximately 70 percent liberalisation, but thereafter they become negative. Hence the shape of the cross-sections of the aggregate welfare surface for South Africa are explained by initial dominance of the positive allocative efficiency effects over the negative terms of trade and endowment effects, followed by a dominance of the negative terms of trade and endowment effects over the positive allocative efficiency effects and finally the combined negative impact of all three effects.

Figure 9 **Allocative Efficiency Welfare (EV) Effects for South Africa** ($(US)m 1997 prices)



Source: Simulation results.

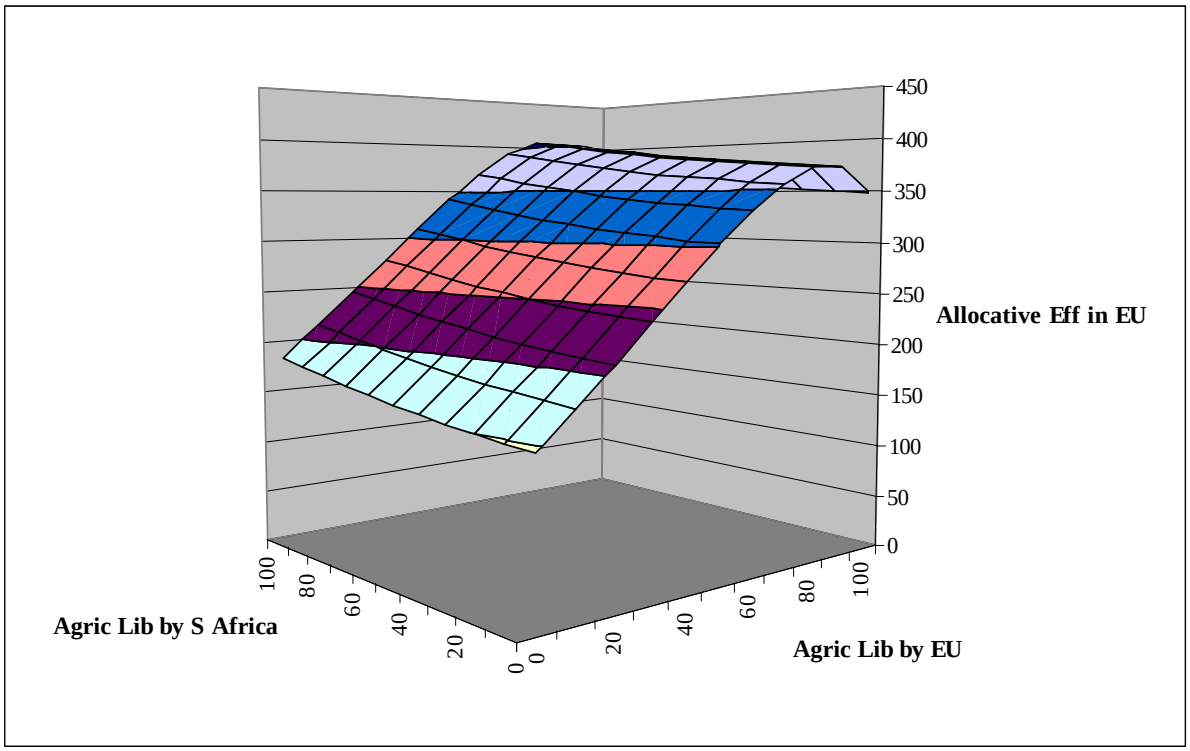
These results demonstrate the importance of the allocative efficiency effects for South Africa. The explanation is a classic illustration of the concepts of trade creation and trade diversion, which in this case appear to be non linear functions of the degree of bilateral food trade liberalisation by South Africa. Initially the marginal (welfare) benefits from trade creation exceed the marginal (welfare) costs from trade diversion, but as the degree of food trade liberalisation increases so the marginal costs of trade diversion increase relative to the marginal benefits of trade creation. Ultimately this produces the situation where the net welfare effects of further food trade liberalisation become negative. Note however that the net welfare effects of bilateral liberalisation are always positive irrespective of the degree of reciprocal liberalisation by the EU.

Welfare Effects for the EU

The combination of welfare effects for the EU is very different. The allocative efficiency effects have the same general shape; the positive marginal benefits from trade creation dominate initially as food trade liberalisation proceeds but ultimately the negative marginal welfare effects of trade diversion dominate, and hence beyond a certain degree of liberalisation – about 90 percent in this case – the net welfare effects of further liberalisation becomes negative. But as with South Africa,

the net welfare effect of the allocative efficiency gain is always positive irrespective of the degree of liberalisation by the bilateral partner.

Figure 10 **Allocative Efficiency Welfare (EV) Effects for the EU** ($(US)m 1997 prices)

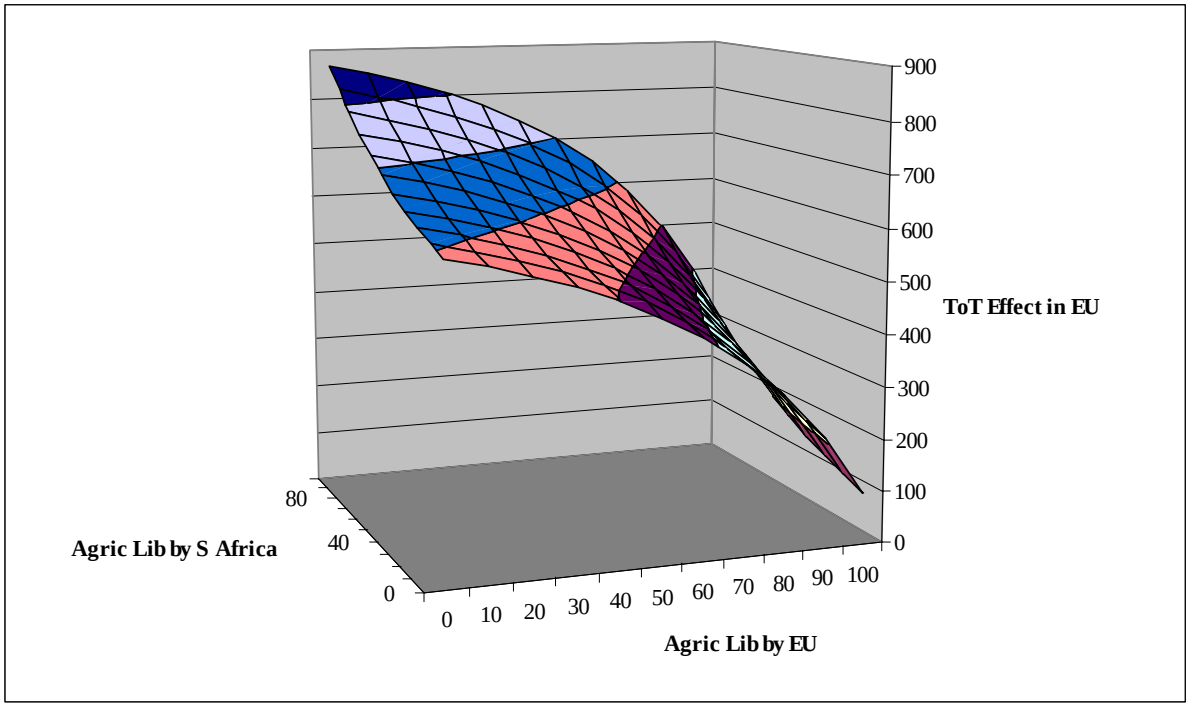


Source: Simulation results.

The welfare implications of the terms of trade effect are more complex, and clearly more substantial.[12] As South Africa liberalises bilateral food trade so the terms of trade effects increase for the EU, reaching a peak when South Africa fully liberalises food trade but the EU does not reciprocate with any liberalisation. But as the EU liberalises bilateral food trade the marginal welfare effects are negative, and the more the EU liberalises so does the marginal impact of the terms of trade effect for the EU become more negative. Hence the shape of the aggregate welfare surface for the EU; initially the positive marginal benefits from the allocative efficiency effects are sufficient to produce positive net effects, but the increasing negative marginal welfare effects from the changing terms of trade rapidly come to dominate and the marginal aggregate welfare effects begin to decline at an increasing rate.

12 There is no endowment effect for the EU because of the presumption of full employment in the EU.

Figure 11 Terms of Trade Welfare (EV) Effects for the EU ($(US)m 1997 prices)



Source: Simulation results.

6. Discussion

A review of the theoretical literature on the general equilibrium implications of customs unions indicates that the welfare implications of bilateral trade agreements are likely to be complex and are unlikely to yield simplistic rules of thumb to guide negotiations. Consequently, it may be argued, the results produced in these analyses are not necessarily surprising, but the magnitude of the terms of trade effects may be considered a matter for concern. Hence this discussion proceeds in two stages; the first takes the results at face value and then considers their implications, and the second considers the possible issues raised by the terms of trade effects.

The Results

If these results are taken at face value they raise a number of important questions concerning apparently accepted wisdom, and hence may have relevance to the development and understanding of bilateral trade negotiations.

Trade theory suggests that among the implications of changes in trade regime it would be surprising if some sectors had not expanded and others contracted. In the context of these simulations the results indicate the extent to which the EU would seek the bilateral liberalisation

of non-food trade while the RSA would seek the liberalisation of food trade; this implies that much of the bargaining between the potential partners would cut across the interests of different ministries within the partner regions. BUT there are clearly substantially different forces driving the costs and benefits of an agreement for the two partners – the EU's negotiating position will inevitably be affected by the fact that there are large country effects that will feed through the terms of trade effects producing optimal tariff considerations, while the RSA will be looking strongly to the potential welfare gains from employment growth.

More importantly however these results challenge the simple rule of thumb that implies that more liberalisation is necessarily welfare enhancing for both partners, especially food trade liberalisation. Recognising that complete bilateral trade liberalisation may be in neither partners' interest may substantially alter the approach taken to the negotiations since it would involve an explicit recognition of the partner's reaction function. In this case recognition by the EU of the extent to which the RSA would gain from the EU's liberalisation of food trade might impact upon the negotiations over non-food trade, while recognition of the adverse implications for the EU of food trade liberalisation might damp down expectations within the RSA. Where this becomes important is likely to be in the separation of the welfare (economic) benefits from a PTA from the political economy benefits.

Finally, these results indicate that any suggestion that the EU will be behaving irrationally by restricting the degree of food trade liberalisation resulting from bilateral agreements with small countries is probably misleading. The EU's reaction function is clearly heavily influenced by the large country optimal tariff effect, which indicates that short of global liberalisation there are likely to remain disincentives to the EU to engage in full liberalisation of its agricultural trade policies. Moreover it would appear likely that these disincentives are primarily a consequence of the combined policies of the OECD countries as a whole, especially the EU, USA and Japan, rather than the policies of any single region. Moreover the results indicate that developing countries might not be best served by fully liberalising food trade while the developed countries retain their current food trade policies.

Terms of Trade Effects[13]

The terms of trade effects have taken a prominent position in previous studies of trade agreements. Early studies of the Tokyo round (Deardorff and Stern, 1981; Whalley, 1982 and 1985) report results that indicate that the terms of trade effect had an appreciable impact upon the distribution of the (small) welfare gains, with the consequence that the Rest of the World region

13 The authors are grateful for the comments by Tom Hertel and Sherman Robinson that encouraged them to examine these issues more closely.

lost out (Whalley, 1982, p 353, and Table 4, pp 354-355). The impact of the terms of trade effect was found to be particularly strong in studies of the FTA between Canada and the USA (Brown and Stern, 1987; Wigle, 1988), whereby Canada could suffer a decline in welfare from a FTA due to the terms of trade effects.[14] Similarly a range of 'bilateral' agreements were shown to produce substantial terms of trade effects that had a critical impact upon the policy implications of trade reforms (Whalley, 1984; Hamilton and Whalley, 1985).

Brown (1987) analysed the cause of these relatively large terms of trade effects in both theoretical and computational terms. Her analyses indicated that a the terms of trade effects were an inevitable consequence of the Armington assumption, with its CES specification for substitution between domestic and imported commodities, and the implicit presumption that each region has a degree of monopoly power associated with its nationally differentiated commodities. Although the argument is persuasive and consistent, it is not clear that it is necessarily appropriate to conclude that "[W]hile the CES specification has great advantages, it has very substantial disadvantages in the lack of realism it produces in these respects" (Lloyd and MacLaren, 2002). Such a conclusion verges upon requiring that all results from global CGE models should be discarded. Rather it is argued that the conclusions from Brown's analyses require closer attention to the implications of model specification.

The Armington assumption is essentially a pragmatic solution to the practical problem of modelling trade polices in the presence of crosshauling/intra-industry trade. The fact that any region within the model is large, in the sense that its policy choices can influence the results, is not necessarily a problem. Indeed it is arguable that no region truly satisfies the conditions of standard trade models for a 'small' country; hence it would be reasonable to expect to find some evidence of terms of trade effects. The most important consideration is therefore the extent to which the terms of trade effects are excessive as a consequence of model specification.

7. Concluding Comments

The results of these analyses raise doubts about the common presumption that developed countries are behaving irrationally when they seek to limit the degree of food trade liberalisation in a preferential trade agreement with a developing country. They indicate that there is a potential asymmetry between the interests of the negotiating partners that is likely to result in a complex bargaining process, wherein the trade offs between the interests of the partners are unlikely to be identified using simple rules of thumb. In particular there is evidence to suggest that developing

[14] Markusen and Wigle (1989) extended the analyses using ideas drawn from the bargaining literature to explore the 'optimal' tariff rates in a Canada-USA customs union. The Nash equilibrium identified in that study involved cuts in Canadian tariffs and increases in US tariffs (pp 380-1).

countries need to be aware of the extent to which the negotiating positions of developed countries are influenced by the adverse impact of a deterioration of the terms of trade upon the welfare gains. Consequently it may be that seeking full liberalisation of food trade may not be an optimal strategy for a developing country.

However these analyses raise more questions than they answer, if only because they are based on a single preferential trade agreement. In particular it is pertinent to ask whether preferential trade agreements are good for developing countries individually and as a whole, and what the incentives are for developed countries. It seems likely that in a world characterised by large numbers of distortions that the answers to these questions may be case specific and that simple rules of thumb to guide negotiations may be inadequate. Moreover there is some evidence to suggest that the impact of the interactions between trade agreements may be a relevant consideration, e.g., if the EU is seeking a SADC wide agreement, to which the agreement with the RSA is a stepping stone, then the optimal degree of food trade liberalisation will be greater.

A testable hypothesis that emerges from these analyses is that the liberalisation of food trade between developed and developing countries will depend primarily upon the liberalisation of food trade between the developed countries. This arises because the developed economies dominate world food trade and until they liberalise food policies the large country effects on welfare are likely to dominate the welfare gains for developed economies. If correct this indicates that the future of the Doha agreement is intimately related to the futures of the agricultural policies in the OECD countries, and hence food trade liberalisation between developed and developing countries is a secondary issue.

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Appendix 1 Import Substitution Elasticities

	xsc	bwa	sad	xaf	eur	naf	mexico	japan	china	mer	cairns	chile	xeu	xam	turkey	asia	xwo
Cereals	2.75	0.75	0.75	1.2	0.75	0.75	0.75	1.7	0.75	0.75	0.75	0.75	1.2	1.7	0.75	0.75	1.2
Animal Agriculture	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.2	0.75	0.75
Other Agriculture	3	0.75	0.75	0.75	1.7	1.2	0.75	1.7	0.75	0.75	0.75	0.75	1.7	0.75	0.75	0.75	0.75
Fuels	2.2	1.2	0.75	0.75	3	2.2	0.75	3	1.2	1.7	1.2	3	1.7	0.75	3	3	0.75
Minerals	0.75	0.75	0.75	0.75	2.5	0.75	0.75	2.2	0.75	0.75	0.75	0.75	1.7	0.75	1.2	0.75	0.75
Animal Products	1.2	0.75	1.2	2.2	1.2	0.75	0.75	1.7	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.2	1.7
Other Food Products	2.75	0.75	0.75	1.2	1.2	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.2	0.75	0.75	1.2	1.7
Textiles	3	1.7	1.7	1.2	2.2	1.7	1.2	1.7	1.2	0.75	1.7	1.7	2.2	1.7	1.2	1.2	1.7
Wood and Paper	3	0.75	2.2	1.2	1.2	0.75	1.2	0.75	1.2	0.75	0.75	0.75	1.7	1.2	0.75	1.2	1.2
Petroleum	3	1.2	2.2	1.7	1.7	0.75	1.7	0.75	1.2	0.75	1.7	1.7	1.7	1.7	1.7	1.7	1.2
Metals	3	0.75	2.2	1.7	1.7	1.2	1.7	0.75	0.75	0.75	0.75	0.75	1.7	1.7	1.7	1.7	1.2
Vehicles	3	1.7	3	3	1.7	1.7	1.7	0.75	1.2	1.2	2.2	3	2.2	3	2.5	1.7	2.2
Engineering	3	2.75	3	3	1.7	1.7	2.2	0.75	1.7	1.7	3	3	2.2	3	3	2.2	2.2
Utilities	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Construction	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Trade and Transport	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Services and activities	0.75	0.75	1.2	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.2	0.75	0.75
Government services	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75

Appendix 2 Closure Rules

The following extract, from the closure page of the RunGTAP programme used for these experiments, provides a precise definition of the closure rules used for these experiments.

```
exogenous
pop
psaveslack pfactwld
profitslack incomeslack endwslack tradslack
ams atm atf ats atd
aosec aoreg avasec avareg
afcom afsec afreg afecom afesec afereg
aoall afall afeall
au dppriv dpgov dpsave
to tp tm tms tx txs
qo(ENDW_COMM,REG)
DTRANS
prop
rms rm rxs rx
cgdslack ;
Rest endogenous;
swap DTBALR("bwa") = cgdslack("bwa") ;
swap DTBALR("xsc") = cgdslack("xsc") ;
swap DTBALR("sad") = cgdslack("sad") ;
swap DTBALR("xaf") = cgdslack("xaf") ;
swap DTBALR("mer") = cgdslack("mer") ;
swap DTBALR("chile") = cgdslack("chile") ;
swap DTBALR("xam") = cgdslack("xam") ;
swap qo("unsklab","bwa") = ps("unsklab","bwa");
swap qo("unsklab","xsc") = ps("unsklab","xsc");
swap qo("unsklab","sad") = ps("unsklab","sad");
swap qo("unsklab","xaf") = ps("unsklab","xaf");
swap qo("unsklab","mexico") = ps("unsklab","mexico");
swap qo("unsklab","mer") = ps("unsklab","mer");
swap qo("unsklab","chile") = ps("unsklab","chile");
swap qo("unsklab","xam") = ps("unsklab","xam");
swap qo("unsklab","turkey") = ps("unsklab","turkey");
swap qo("unsklab","asia") = ps("unsklab","asia");
swap qo("unsklab","xwo") = ps("unsklab","xwo");
! Minerals
swap qxs("minerals","bwa",REG) = rxs("minerals","bwa",REG);
swap pfob("minerals","bwa",REG) = rms("minerals","bwa",REG);
! Fix Exports of cereals by Botswana
swap qxw("cereals","bwa") = rx("cereals","bwa");
! Vehicles
swap qxw("vehicles","bwa") = rx("vehicles","bwa");
swap qo("vehicles","bwa") = to("vehicles","bwa");
! Fix bwa exports of meats to Europe
swap qxs("animprod","bwa","eur") = rxs("animprod","bwa","eur");
```