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# The potential impact of the Doha Development Agenda on the South African economy: liberalising OECD agriculture and food trade

B Nyhodo, C Punt & N Vink<sup>1</sup>

## Abstract

*This article reports the results of a static computable general equilibrium (CGE) model on the possible liberalisation of agriculture and food trade in the OECD countries. Liberalisation of trade was simulated assuming a reduction in import tariffs, the tax rate on factor use and export subsidies in four steps of 25% points each. Such simulations were run in the GLOBE model then adjusted and used as a policy shock to the PROVIDE model. The results show that the weighed average world price (adjusted) changes will range between -19.6 to +3.8% for imports and between -3.0 and +29.7% for exports at 75% liberalisation. The results from the single country CGE model show that the South African economy would respond positively to the world price changes, with government and macro variables showing minimal but positive responses. Household consumption expenditures generally show positive changes, implying increased factor incomes. Not all sectors will be positively affected even though the overall effect is positive.*

**Keywords:** Doha Development Agenda (DDA); computable general equilibrium model (CGE); liberalisation

## 1. Introduction

The Doha Development Agenda (DDA) is the ninth round of multilateral trade negotiations, and the first round to explicitly put development at the core of its business and also focus strongly on agricultural liberalisation (Hertel & Keeney, 2007). The two issues have made the negotiations complex and sensitive, since these are issues of political importance to all trading nations.

The DDA follows the Uruguay Round (UR), which marked a historical turning point in agricultural trade liberalisation. One of the most celebrated

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<sup>1</sup> Bonani Nyhodo is a postgraduate student in the Department of Agricultural Economics at the University of Stellenbosch and Senior Economist at the National Agricultural Marketing Council; E-mail: bonani@namc.co.za. Cecilia Punt is the project leader for the PROVIDE project, Western Cape Department of Agriculture; E-mail: ceciliap@elsenburg.com. Nick Vink is the Chair of the Department of Agricultural Economics at the University of Stellenbosch; E-mail: nv@sun.ac.za.

achievements of the UR was the conversion of all non-tariff barriers into their tariff equivalents. It is worth noting that prior to the UR, agricultural trade formed part of the trade in goods, but was not subjected to any reduction commitments because of the prevailing notion that agricultural trade was an issue of domestic importance only.

In this study, the effects of a reduction in support or protection under the three 'pillars' of the agricultural trade negotiations on world prices are investigated, as is the welfare impact on the South African economy, using the global model (GLOBE model<sup>2</sup>) and a single country static computable general equilibrium or CGE model (PROVIDE model). This study links the global and single country models.

The rest of this paper is organised as follows. A brief literature review on trade theories and an overview of possible effect of the possible liberalisation of OECD countries trade to the world is provided in section 2. In sections 3 and 4 explanations of the methodological tools used to quantify the effects of liberalising agriculture and food trade in the OECD on the economy of South Africa are provided. The analysis of the results from the two models used is provided in section 5 and 6. Section 7 concludes.

## **2. Literature review**

The potential impact of liberalising of agriculture and food trade in the OECD countries on the economy of South Africa links well to trade literature. This link is associated with the attributes outlined in trade literature regarding free trade in comparison with protection/support. Before discussing the procedure used in quantifying the effects such a policy change to South Africa, it is therefore desirable to indicate how trade literature is associated with a possible liberalisation of agriculture and food trade globally. Such an overview of the links comes in the form of the evolution of trade thought from Adam Smith. Secondly, it is also important to highlight the implication of this potential liberalisation on developing countries. This provides a perspective on the implications for the poor economies of the world.

### **2.1 Trade theory and its evolution**

The development of the standard theory of free trade can be traced back to the late 1700s and early 1800s. The standard theory argues that free trade will benefit trading nations, and was built around the basic proposition that free

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<sup>2</sup> The GLOBE (CGE) model is global model that was developed and published by McDonald et al. (2007). This model uses the GTAP database but, in contrast to GEMPACK, which is used to run the GTAP model, GLOBE runs in GAMS.

trade is better than no trade or protection (Sen, 2005; Lindert & Pugel, 1996). The earliest example of free trade theory was the theory of absolute advantage<sup>3</sup> of Adam Smith, complemented by David Ricardo's theory of comparative advantage. These two theories challenged the mercantilist justification for protectionist policies (Sen, 2005).

They were further complemented by the Heckscher-Ohlin (H-O) theory, which justified free trade using the Pareto criterion, and were carried forward by Marshall and the Australian school, who moved away from justifying comparative advantage on the basis of labour productivity alone (Sen, 2005). The H-O model was followed by the factor endowment, factor price equalisation, as well as the Stolper and Samuelson theories. However, the fundamental assumptions of the classical and neo-classical trade theories were not changed (Lindert & Pugel, 1996). This resulted in the development of the new trade theory.

The major contribution of new trade theory is its ability to relax some of the unrealistic assumptions<sup>4</sup> of the classical and neo-classical trade theories. It is argued that the introduction of economies of scale increased the predictability and extent to which countries will benefit from free trade (Sen, 2005; Stewart, 1991). Some of the contributions of the new trade theory include the development and justification of intra-industry trade and the influence of foreign direct investment on technology diffusion and product differentiation. This resulted in the development of what Brander and Spencer (1985) called strategic trade, which needs to be supported by industrial policy (Sen, 2005; Stewart, 1991).

Shafaeddin (2000) argues that in most instances free trade theories are misunderstood. He pointed out that free means that free trade between countries is better than no trade; hence liberalisation is the best in that situation. This study looks at the arguments in favour of liberalisation of trade (agriculture and food trade in this instance). This is done by quantifying the effects of liberalising agriculture and food trade in the countries of the OECD on the welfare of South African economy.

It is vital to highlight that in spite of the advantages of liberalisation not all countries or sectors within each country will benefit (Facchini & Willmann, 1999). The section to follow looks closely at subsidies in the OECD countries and their implications on selected countries.

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<sup>3</sup> A situation where one country has an absolute advantage over the other country in the production of the two products traded between them.

<sup>4</sup> Especially the assumptions of perfect competition, absence of economies of scale, and zero transport costs.

## 2.2 Agricultural trade liberalisation in the developed countries of the OECD

The current question of interest in the international trade fraternity has been *“what are the effects (good or bad) of subsidies/support given to agriculture and food industries in the OECD countries on the economies of developing and least developed countries?”* In attempts to address this question, there are two groups of economists with different opinions regarding this issue.

According to Oxfam (2005), the first group includes economists such as Bhagwati and Panagariya. They believe that rich country subsidies are actually good for developing countries, arguing that these subsidies keep world food prices low and are a form of food aid to developing countries, i.e. the higher the subsidies in the developed countries the better is the situation in net importing developing countries.

The second group of economists, such as Ray and De la Torre (cited in Oxfam, 2005), argues that subsidies are a symptom of a deeper problem. They argue that low prices of agriculture and food commodities are caused by corporate concentration and oversupply of the world market. The cause of overproduction is argued to have resulted from a lack of supply management. The interventions by governments were an attempt to shield farmers from declining farm incomes.

It is clear that there are differing views about agricultural support. It becomes important to look at the total financial implications of subsidies in the countries of the OECD on taxpayers and consumers. Agricultural incomes in the OECD countries rely heavily on government subsidies. These subsidies are costing taxpayers and consumers more than US\$330 annually. Total agricultural support given in the OECD countries amounts to around 1.3% of GDP, and agricultural support is five times more than development assistance given to developing and least developed countries (Beghin & Aksoy, 2003).

Against this background it also is important to note that comparative advantage in developing countries is seen to lie in agriculture. The protectionist agricultural policies of the OECD countries are, therefore, often criticised for excluding developing countries from the benefits of world trade (Hertel *et al.*, 2003; Global Economic Prospects, 2004; Bureau *et al.*, 2005). It has become apparent that the consequences of agricultural liberalisation are complex, and that the impact will differ between developing countries and different economic agents within countries. Secondly, if liberalisation of agriculture in the form of reduced subsidies coincides with the erosion of preferential market access, some developing countries will lose. Furthermore,

the elimination of support from the OECD countries will affect consumers negatively (on the demand side) and affect producers positively (supply side) because the expected world price of agricultural commodities increases as a result of liberalising agricultural trade (Hertel *et al.*, 2003).

According to Diao *et al.* (2005), elimination of subsidies only in developed countries will benefit most of the developing countries to the total value of about US\$4 billion. In their results the only countries that will be affected negatively, to the value of US\$1.9 billion, are Morocco, Algeria, Egypt, Libya, Tunisia and countries of the Middle East (aggregated). They further argue that elimination of trade distortions will result in increases of GDP of about US\$8.6 billion for all developing countries as a group. The agricultural value added in developing countries will increase by US\$20.3 billion per year without productivity effects, to almost US\$23 billion with productivity effects. The impact is higher for the countries of Sub-Saharan Africa (excluding South Africa) (3.1% with no productivity effect and 3.4% with productivity effect).

The impact on trade shows an increase of net trade or trade balance (= exports – imports) of developing countries from about US\$20.4 billion in the base year to about US\$60 billion when developed countries liberalise agricultural trade. The developing countries achieve this through increases in exports (from US\$147 billion to US\$184 billion) and substitution of import by own production to the value of about US\$3 billion. In short, all developing countries either increase their trade balance or reduce the negative values compared to the baseline (Diao *et al.*, 2005). The effects of liberalising trade in the developed countries of the OECD will have an effect on food security. Diao *et al.* (2005) show that such a policy change will be desirable to developing countries.

Sandrey and Jensen (2007), on the other hand, argue that trade liberalisation will not result in big global welfare gains (diminishing gains from liberalisation of world trade). This argument of diminishing gains can further be found some recent studies such as Ackerman (2005) and Anderson and Martin (2005). These studies argue that global welfare gains as a result of trade liberalisation are not as huge as expected. That argument comes from most recent models results (from new version of models). Another important point from these studies is that welfare gains from trade liberalisation to be accrued to developing countries are shrinking as well. The reasons behind such results from these models are; a number of assumptions in these models have been revised (such as the unrealistic assumption of full employment) and flexibility of the models to incorporate the EU expansion and China's accession into the WTO.

In spite of the differing views about the likely outcomes of liberalised world trade, the effects of liberalising agriculture and food trade in the developed countries of the OECD countries on the economy of South Africa are simulated in this study. The section to follow presents the tools used in quantifying such a policy change.

### **3. The GLOBE CGE model and data**

The GLOBE model is a global model that runs in GAMS. The model was developed and applied by McDonald *et al.* (2007) and McDonald (2005). Detailed results of the GLOBE model were made available to the authors, for purposes of this study, to estimate the impact of changes in world prices as a result of liberalising trade in the OECD countries, on the economy of South Africa. This study therefore attempts a link between global models and single country CGE models.

The GLOBE model's data are based on revised GTAP data that are presented as a series of SAMs, as opposed to the input-output tables used in GTAP (McDonald *et al.*, 2007). The GLOBE model dataset used to study OECD liberalisation, included 28 commodities (11 agricultural, five food commodities and 12 non-agricultural, non-food commodities); 28 activities (11 agricultural, five food and 12 non-agricultural, non-food activities); four factors (land, capital, unskilled labour and skilled labour) and nine trading regions. The international trade regions are European Union, Rest of Europe, countries included in the North American Free Trade Agreement, South Africa, Rest of SADC, Rest of Africa, Japan, Asia and the rest of the world. The GLOBE model, with its multiple trade partners, distinguishes it from the single country PROVIDE model with only one rest of the world account which captures all international trade. As an output from the GLOBE model changes in world prices of both exports and imports and their respective changes in quantities traded were used to derive weighted average changes in world prices, which were used as policy shock to the PROVIDE model.

Two broad categories of closure rules were adopted in the GLOBE model. Closure 1 assumes a flexible exchange rate; a fixed share of investment expenditure in the total value of domestic final demand; a fixed share of government absorption in the total value of domestic final demand; a flexible tax rate to households; and fixed government savings. Land, skilled and unskilled labour and capital are mobile and fully employed. The consumer price index (CPI) is a numeraire. Closure 2 assumes the same situation as closure 1, except that unskilled labour is assumed to be fully mobile and partially unemployed. This indicates that, even though unskilled labour is not fully employed, it is mobile between sectors. GLOBE model results using

closure 2, was used to derive shocks for the PROVIDE model. This is because closure 2 is more representative of the South African situation of substantial levels of unemployment, especially when looking at unskilled labour.

The GLOBE model results on changes in commodity trade prices and volumes between South Africa and various trading partners were used to calculate the weighted average prices of imports and exports faced by South African industries. These price changes were used as shocks into the PROVIDE model.

#### **4. The PROVIDE project single country CGE model and data**

Single-country models, in contrast to global models, focus in more detail on the domestic economy, following changes in trade policies. These models combine other markets or regions in a single account (the rest of the world), and focuses on the impact of changes on the structural characteristics of a country and addressing the distributional impact of trade with respect to the domestic economy. The PROVIDE CGE model is a Social Accounting Matrix (SAM) based model (PROVIDE, 2005). The PROVIDE project's CGE model runs in General Algebraic Modelling System (GAMS) software.

The model can be briefly outlined in four stages. The first stage consists of the behavioural relationships that govern how the model's agents will respond to exogenously determined changes. An explanation of the quantity and price system used in the model forms the second stage. Lastly, a description is presented of the default and optional closure rules that can be found within the model (for full description of the models see PROVIDE, 2006).

For the purposes of this study, it is important to show how imports and exports are treated with the model.

##### **4.1 Constant elasticity of transformation (CET) for exports**

As the world prices of exports are used to shock the PROVIDE model, it is necessary to show their association with the CET. The CET function is used to differentiate domestically produced goods according to the markets concerned, in order to overcome the problem of perfect substitution. The CET is specified in the model in order to show the relationship between domestic production (QXC), production for domestic market (QD) and exports (QE) of agricultural commodities.

$$QXC = at * (\gamma * QE^{\rho} + (1-\gamma) * QD^{\rho})^{1/\rho} \dots\dots\dots(1)$$

where:

$\rho$ ..... is the elasticity of transformation,

$\gamma$ .....is the share parameter,

$at$  .....is the shift parameter.

In order for the model to obtain necessary and logical results in line with the profit maximisation assumption, a first-order condition allows the model to determine the level of exports (QE) relative to production for the domestic market (QD) in response to changes in the price of exports (PE) relative to the domestic price (PD) (PE/PD):

$$QE/QD = [PE/PD * (1-\gamma)/\lambda]^{1/\rho-1} \dots\dots\dots(2)$$

The total production value (PXC\*QXC) is expected to equal the value of production for the export market (PE\*QE) plus the value of production for the domestic market (PD\*QD):

$$PXC * QXC = PE * QE + PD * QD \dots\dots\dots(3)$$

The world price of exports (PWE) multiplied by the exchange rate (ER) gives the domestic export price (PE) in the absence of export taxes.

## 4.2 Constant elasticity of substitution (CES) for imports

The treatment of imports in the CGE model can best be described with reference to the CES or Armington function. The Armington assumption, which differentiates products according to their country of origin, is used to model imports. Domestic supply (QQ) consists of a combination of imports (QM) and domestically produced and marketed commodities (QD), according to the CES specification.

$$QQ = ac * (\delta * QM^{\rho} + (1-\delta) * QD^{\rho})^{1/\rho} \dots\dots\dots(4)$$

where:

$ac$ .....is a shift parameter

$\delta$ .....is a share parameter

$\rho$ .....is the elasticity of substitution

An assumption of cost minimisation is made and the value of domestic supply (PQS\*QQ) has to equal the value of imports and domestically produced supply, hence the following two equations:

$$QM/QD = [PD/PM * \delta / (1-\delta)]^{1/(1+\rho_{hoc})} \dots \dots \dots (5)$$

$$PQS * QQ = PD * QD + PM * QM \dots \dots \dots (6)$$

The world price of imports (PWM) multiplied by the exchange rate (ER) plus any import tariffs, gives the domestic import price (PM). A shock to either the world price or exchange rate will therefore influence the domestic price of imports. Also, a decrease in import tariffs associated with domestic liberalisation will translate into decreases in domestic import prices relative to the price of the domestically produced good. The first round effect will be a shift in demand away from the domestically produced good, towards the imported good, causing contraction of the domestic industry.

The subsection to follow present the conditions set in the PROVIDE model. A number of critique of CGE models results is pointed toward the closure rules set by modelers.

### 4.3 Closure rules set in the PROVIDE model

The liberalisation shocks were derived under certain closure rules in the GLOBE model indicated in section 2. For the PROVIDE model the closure rules relate to the external account, the factor market account, the government account and investment-savings accounts, which must all be balanced. Giving a realistic reflection of the economy was an objective in the process of selecting the closure rules, which are discussed below:

- External balance: the current account balance or external balance is fixed, hence the exchange rate is flexible. Changes in the international prices of commodities and tariffs lead to changes in the value of exports relative to the value of imports which typically affect the exchange rate.
- Factor market closure: While the base model contains the assumptions that all the factors are fully employed and mobile, this assumption is relaxed in this study. It is assumed that skilled labour of all race groups is fully employed and mobile, while unskilled labour is regarded as not fully employed. There is only one white labour account in each province, which is assumed to be fully employed. Capital is scarce, mobile and fully employed, which is associated with a long run closure, as it is assumed that there is sufficient time for capital to relocate to other more productive industries. Land is fixed according to agricultural production area.
- Government closure: Government income is generated from transfers and the income from different taxes. Government expenditure includes consumption and transfer payments. The government deficit or surplus

is the difference between government income and expenditure. Two government closures were selected, each with different distribution implications:

- Govt Inter: Government consumption expenditure as a share of total demand in the economy is fixed. Tax rates are kept constant at the base levels. Government deficit reflects all shocks to government income, with the deficit adjusting to maintain fiscal balance.
- Govt Dom: Government consumption expenditure as a share of total demand in the economy is fixed. The government deficit is fixed. Fiscal balance is achieved through adjustments in import tariff rates. For purposes of this study, the Govt Dom is used as it gives an indication of what the response of domestic policy in reaction to international liberalisation should be in order to maintain the fiscal balance.
- Savings-investment closures: The total share of investment expenditure in the final demand remains constant. The volume of investment is allowed to vary, depending on changes in the prices of investment goods and changes in the value of domestic absorption. The savings rate of households and incorporated business enterprises serves as an equilibrating variable for these two sets of accounts. Net foreign savings are fixed.
- Numeraire: The consumer price index (CPI) is set as a numeraire and all prices are relative to the CPI, expressed in relative terms.

#### **4.4 The data**

This paper uses data that are arranged into two groups: a social accounting matrix (SAM) of 2000<sup>5</sup> that records all transactions that take place between agents in the economy, and a series of elasticities that control the models' behavioural functions. A full description of the PROVIDE SAM for South Africa can be found in the PROVIDE (2006). For this study, the SAM is aggregated to match the accounts in the GLOBE model SAMs as closely as possible. The SAM for the study includes 28 commodities (11 agricultural and six food commodities); 31 activities (10 agricultural and six food activities); 41 factors (GOS [capital], land and 23 labour factors by race and provinces); and 32 households. The SAM treats agricultural activities as multi-products firms based on agronomic regions. The implications of this classification are that a range of commodities can be produced by a single agricultural activity and land cannot be transferred from one region to another region.

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<sup>5</sup> The SAM base year.

## **5. Change in the world price of exports and imports- GLOBE model results**

The results show the response of world prices to liberalisation of the OECD countries' agriculture and food trade. Liberalisation was modelled by reducing import tariffs, factor use tax and export subsidies. Simulations one to six looked at stepwise (0%, 10%, 25%, 50%, 75% and 100%) liberalisation of agricultural and food commodities. Simulations 7 to 12 looked at stepwise (0%, 10%, 25%, 50%, 75% and 100%) liberalisation of all commodities. The weighted average world price changes calculated from the GLOBE model results (see below) were used as a policy shock to the PROVIDE model. Changes in the weighted average world price of exports (PWE) range from -3.5 to +45.7% when only agricultural and food commodities are totally liberalised (simulation 6) and between +0.2 and +45.7% for all commodities (simulation 12). Changes in the weighted average world price of imports (PMR) range from -28.5 to +5.0% when only agricultural and food commodities are totally liberalised (simulation 6) and between -30.7 and +6.2% for all commodities (simulation 12).

For purposes of this study the results of simulation 5, i.e. 75% reduction in import tariffs, factor use tax and export subsidies on agricultural and food commodities in OECD countries, are reported. A 75% liberalisation was chosen because it is a big shock to have pronounced implications on the world prices agriculture and food products and the South African economy. A complete (100%) liberalisation was not chosen as it is very much unlikely, in the short to medium term, that agricultural trade will be fully liberalised.

For a 75% reduction in import tariffs, factor use tax and export subsidies on agricultural and food commodities in OECD countries, the world price of exports (PWE) range from -3.0% to +29.7%, while changes in world price of imports (PMR) range from -19.6 to +3.8%. However, when the three most highly affected commodity prices are not included, the price changes are more modest, ranging from -3 to +3%, for exports and between -0.2 and +1.5% for imports. The increase in world export prices, at 75 % liberalisation, of the three most affected commodities are:

- Wheat: 29.7%
- Other cereals: 8.4%
- Sugar: 10.0%

On the other hand, the changes in world import prices, at 75 % liberalisation, of the three most affected commodities are:

- Other cereals: 3.8%
- Dairy products: 2.6%
- Sugar: -19.6%

The weighted world prices of exports and imports for all the commodities were used to shock the PROVIDE model. The results from the PROVIDE model are discussed in the next sections.

## 5.1 GLOBE model results adjustment

The GLOBE model produces estimates of changes in quantities of exports and imports between South Africa and seven other trading regions, as well as changes in world prices of imports and exports faced by South African producers. All weighted average world price adjustments used as shock in the PROVIDE model were based on the results (prices and quantities) of the GLOBE model.

The procedure used to calculate the weighted average world price of imports and exports is as follows:

The weighing process was done to ensure that the weighted average world prices of both exports and imports derived gives a true reflection of world trade partner's share of world trade. Presented in this sub section is the procedure in its sequential way that was used to derive the weighted average world price changes.

The results (new levels, not percentage changes) from the GLOBE model were used to calculate the value of exports (VE) with each trading partner, by multiplying the world price of exports (PWE) by the quantities of world exports (QE) for each trading partner (w):

$$VE(w) = PWE(w) * QE(w) \dots\dots\dots (7)$$

where PWE(w) - price of exports for trading partner w; and  
QE(w) - the volume of exports to trading partner w.

In order to calculate a weighted average world price, it is necessary to determine the value share of exports to each trading partner, i.e. the value of exports to each trading partner divided by the total exports from South Africa.

$$weightVE(w) = PWE(w)*QE(w)/(\sum(PWE(w)*QER(w)) \dots\dots\dots (8)$$

The weighted average price is the price of exports for each trading partner

multiplied by the share of that trading partner's exports in total exports from South Africa.

$$\text{weightedPWE} = \sum(\text{weightVE}(w) * \text{PWE}(w)) \dots\dots\dots (9)$$

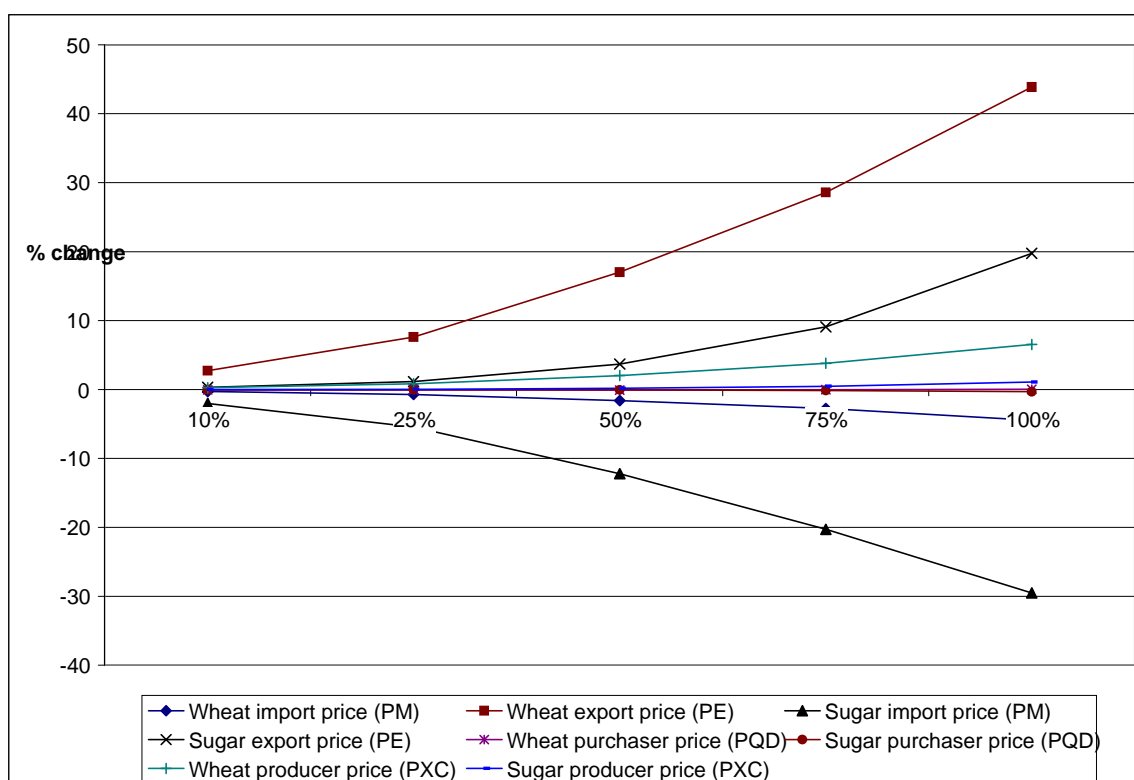
Changes in these weighed average world prices were calculated by expressing the difference in the base level prices and the levels of prices after simulating the liberalisation, as percentage of the base level values. These weighted average world price percentage changes were then implemented in the PROVIDE model.

## **6. Effect of world price changes on South African economy – PROVIDE model results**

### **6.1 The domestic prices and quantities of agricultural and food commodities**

As a starting point price changes are presented, as price changes lead to other changes in the economy. Domestic import and export prices will change as world prices of imports and exports change.

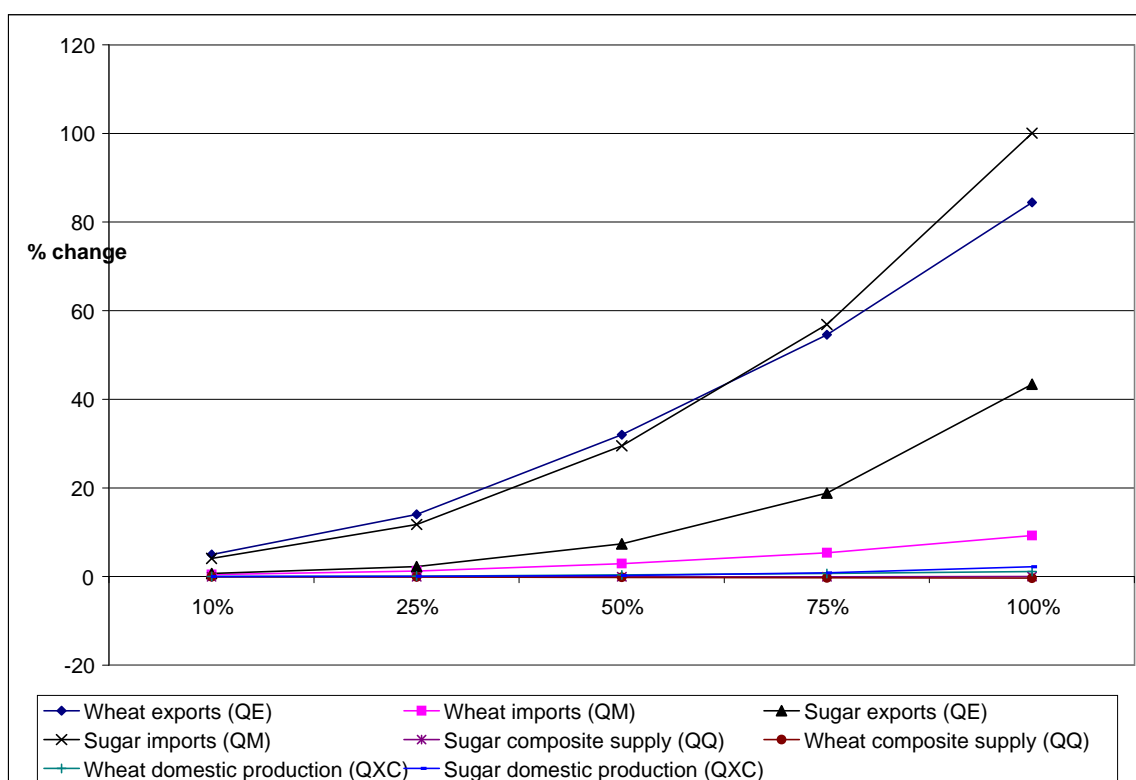
Selected results are presented for reductions, ranging between 0% and 100%, in import tariffs, factor use tax and export subsidies on agricultural and food commodities in OECD countries. Changes in the domestic prices of imports and exports for wheat and sugar are presented in Figure 1. The domestic export prices (PE) of wheat and sugar increases by 28.6% and 9.1%, respectively, for 75% liberalisation. The domestic price of domestic supply (PD) (not shown here) increases by only 1.63 % for wheat and decreases by 0.04% for sugar. The increases in producer price (PXC) (wheat 3.8% and sugar 0.47%), which is a weighted average of the domestic export price (PE) and the price of domestic supply (PD), therefore shows much smaller increases than the domestic export price (PE). The decrease in the purchaser price (PQD) of wheat (-0.02%) and sugar (-0.13%) is the weighted average price of domestic supply (PD) and the domestic import prices (PM), which decreases by 2.75% for wheat and by 20.3% for sugar.



**Figure 1: Wheat and sugar price effects**

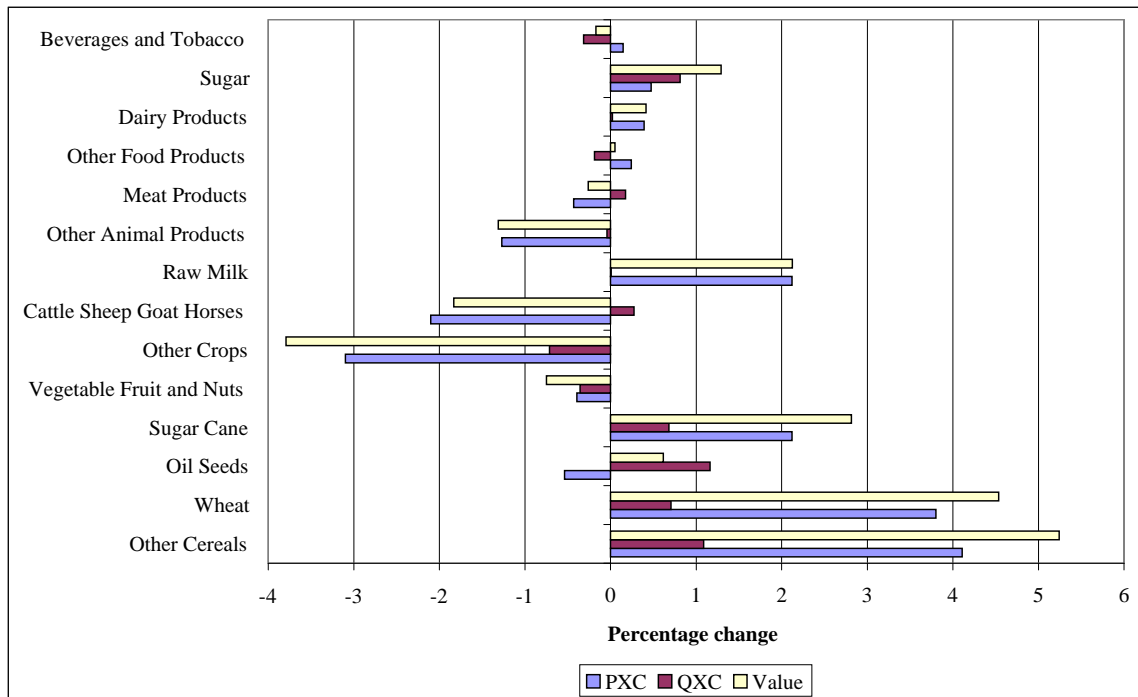
Figure 2 shows the quantity changes caused by changes in prices, with an upward trend being shown in all quantities identified for wheat and sugar. The producer price increases are larger than the quantity increases. This may indicate that the supply of agricultural commodities is relatively inelastic, caused by a fixed amount of land being available to agricultural production.

Under the 75% liberalisation scenario, import quantities show substantial increases for sugar (56.9%) and wheat (5.4%) following the decrease in domestic import prices. There are also substantial increases in volumes of exports for both sugar (18.8%) and wheat (54.6%) as a result of the increases in domestic export prices. The production for the domestic market (QD) of wheat and sugar decreases by -3.47% and -0.22% respectively (not shown here). The quantity of the composite (domestically produced, regardless the market) good (QXC) still shows increases for wheat (0.7%) and sugar (0.8%), but these increases are much smaller than the increases in export volumes (QE). The increases in production (QXC) follow the increases in the producer prices (PXC) for wheat and sugar shown above and indicate that more resources will be devoted to their production. There is a decrease in the composite (domestically produced and imported) supply (QQ) of both wheat (0.3%) and sugar (0.03%) in response to the decrease in the composite price PQD described above.



**Figure 2: Wheat and sugar quantity effects**

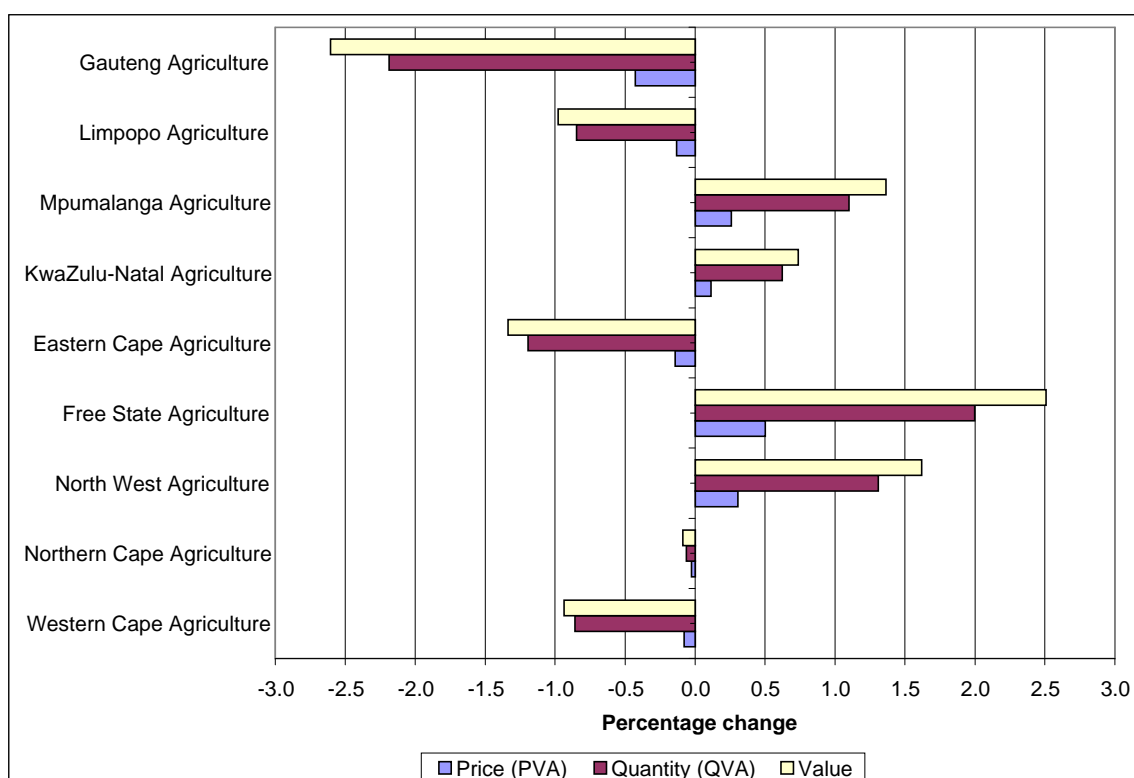
Figure 3 shows the prices, quantities and value of production of domestically produced commodities for agricultural and food products. The world price analysis showed that the price increases of agricultural commodities led to an increase in agricultural production. With the significant decrease in the producer prices of Other Crops, the quantity produced decreases. Other cereals (4.10%), wheat (3.82%) and sugar cane (2.11%) show notable price increases, which are followed by quantity increases that result in their value of production being substantially increased. The value of production of aggregate agricultural and food commodities increase by 0.31%, indicating a net positive effects on production of agricultural and food commodities. The value of production of non-food commodities increase by 0.03% indicating a marginally positive indirect impact on the rest of the economy.



**Figure 3: Agricultural producer price (PXC) and quantity (QXC) effects and values at 75 % liberalisation**

## 6.2 Effects on agricultural production

Agricultural production regions are identified on a provincial level in the model. The changes in value added for agricultural production in each of the provinces is shown in Figure 4. The main sugar producing provinces (KwaZulu-Natal and Mpumalanga) and the main wheat producing provinces (Western Cape, North West and Free State) show expansion in production as measured by quantity of factors used, or value added (QVA), by between 0.6 and 2%. The dominant enterprises in the other provinces are horticulture and livestock and these production areas show contraction, ranging from 0.1% for the Northern Cape and 2.2% for Gauteng. Production therefore follows price incentives, which in general decrease for horticulture and livestock and increase for grains as shown in Figure 3.

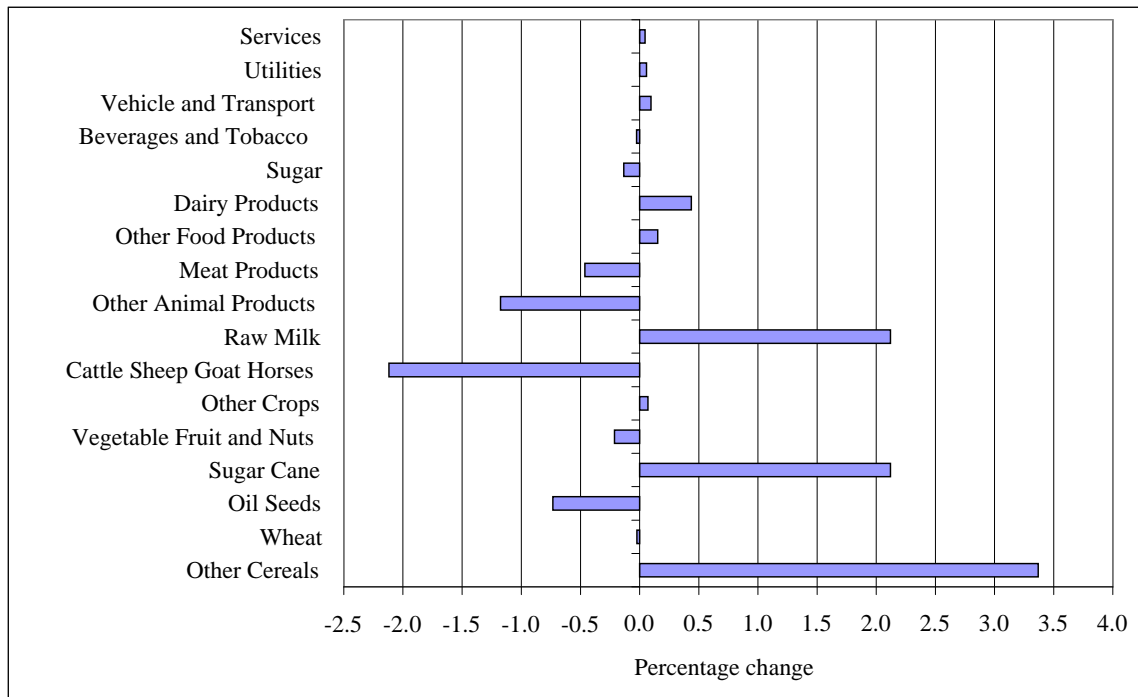


**Figure 4: Value added during agricultural activities at 75% liberalisation**

### 6.3 Other commodity prices

Food prices react differently (increase or decrease) to world price changes, and therefore those have different implications for the different households, depending on their expenditure patterns.

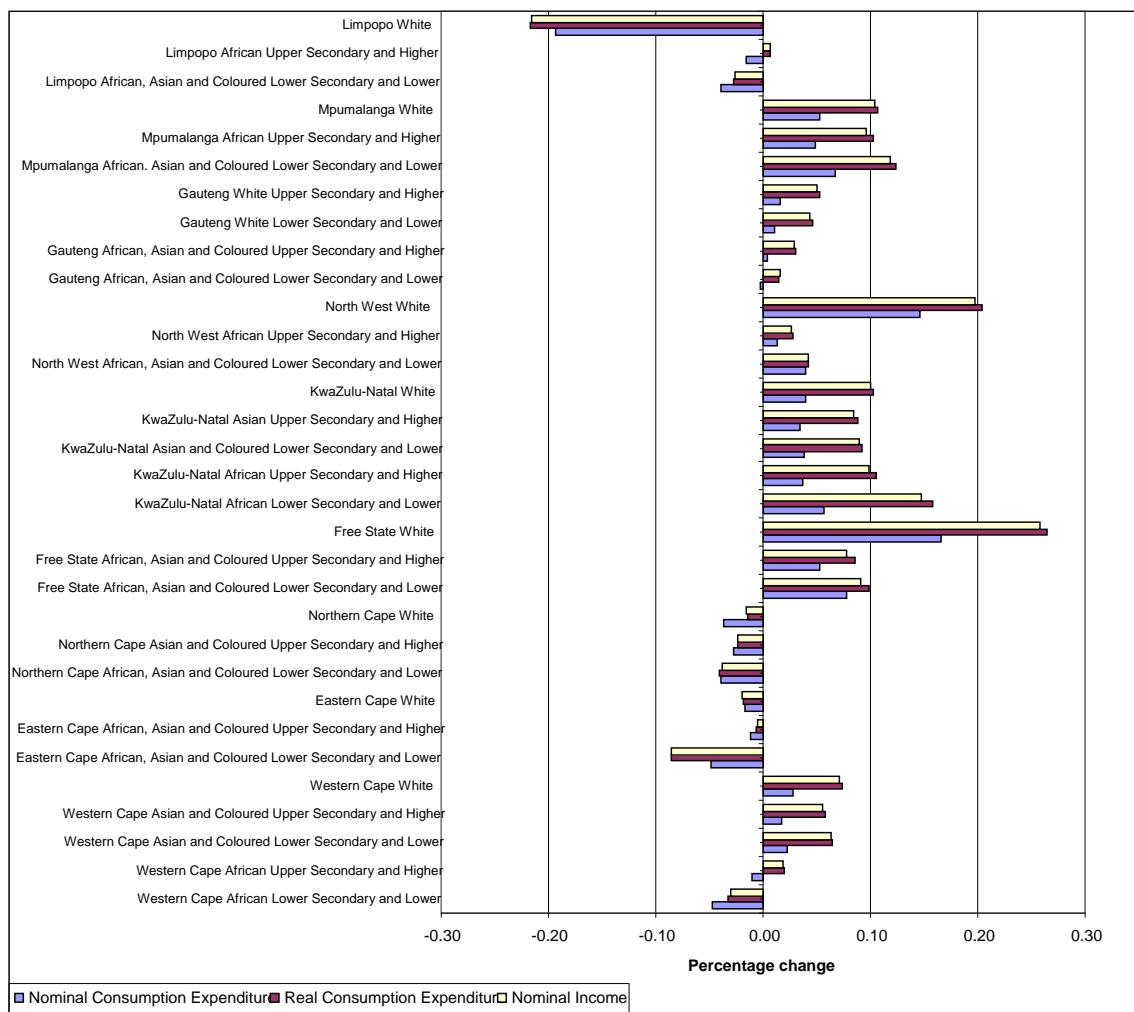
The agricultural and food price increases range from 0.13% for 'other crops' to 0.44% for dairy products at 75% liberalisation (Figure 5). An increase in prices for dairy and other food products may negatively affect poor households, as a larger share of the budget is spent on food purchases, suggesting that an increase in the income of the poor may be absorbed by increases in food prices. The price of live animals and meat products decreases significantly, followed by oil seeds, vegetables, fruit and nuts, and, lastly, sugar. A decrease in the prices of these commodities is explained by an increase in their supply.



**Figure 5: Changes in purchaser prices for selected commodities at 75% liberalisation**

#### 6.4 Household income and expenditure

The household incomes and expenditures effect show mixed reactions as presented in Figure 6. Households are categorised by province of residence, population group and education level of the head of household. The incomes of white households in six provinces increase, reflecting the combined effects of increased wages (due to factor relocation), capital, and income accrued from land ownership. In the Northern and Eastern Cape all households are negatively affected, while white households are less negatively affected, compared to the other groups. In KwaZulu-Natal, the Free State and North West Provinces, all households are positively affected. The differences between real and nominal consumption expenditure for the household categories are minimal.

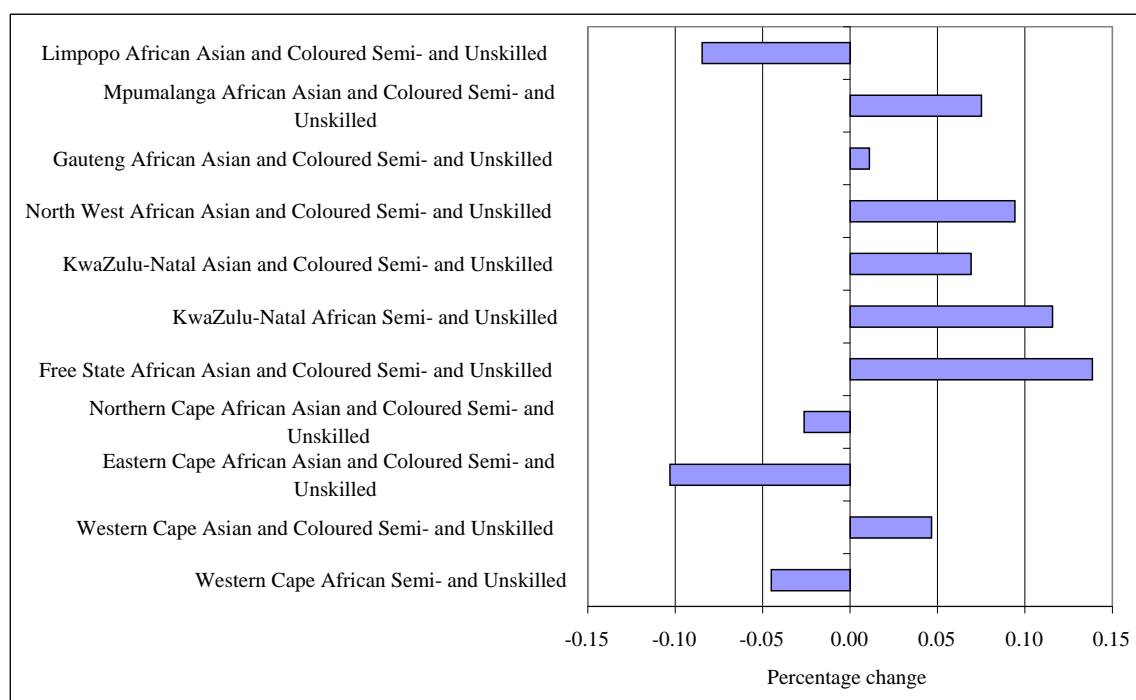


**Figure 6: Changes in per capita household income and consumption expenditure at 75% liberalisation**

## 6.5 Employment and wage effects

Activities that provide employment to various labour groups determine the extent to which they are affected. Unskilled and semi-skilled workers are assumed not to be fully employed. The employment effects on unskilled labour are shown in Figure 7.

Africans, Asians and Coloured unskilled and semi-skilled workers lose employment opportunities in Limpopo, Northern Cape and Eastern Cape; as do Africans in the Western Cape. The Eastern Cape shows the largest employment decrease compared to the other provinces.



**Figure 7: Change in employment at 75% liberalisation**

Employment increases for unskilled and semi-skilled workers from other provinces. The three labour groups that are affected substantially (at 75%) are the KwaZulu-Natal African semi- and unskilled (12%), and the Free State African, Asian and Coloured (14%) workers. As full employment of white and all skilled labour groups is assumed, an increase in demand for these labour groups will push wage rates upward. The big wage increases (not shown here) at 75% liberalization go to Free State (0.24%) and North West white labour groups (0.25%). All other skilled labour groups are affected positively except for Limpopo white (-0.26%), Northern Cape white (-0.08%) and Eastern Cape white (-0.02%).

At 75% liberalisation the total number of people employed would increase by 2 973. Eastern Cape employment loss of 752 persons will be experienced at 75%. KwaZulu-Natal and the Free State are the two provinces expected to experience employment increase of 794 and 1 192 persons respectively.

## 6.6 Total factor income

As a result of world price changes, employment levels, wages, and factor allocations in South Africa change, which, in turn, results in changes in the total income accumulated by these factors. Table 1 show that total factor incomes increase by 1.43%. Changes in total factor incomes illustrate a substantial change in returns to land, as a result of the land specificity found in each province.

**Table 1: Changes in factor income (at 75% liberalisation)**

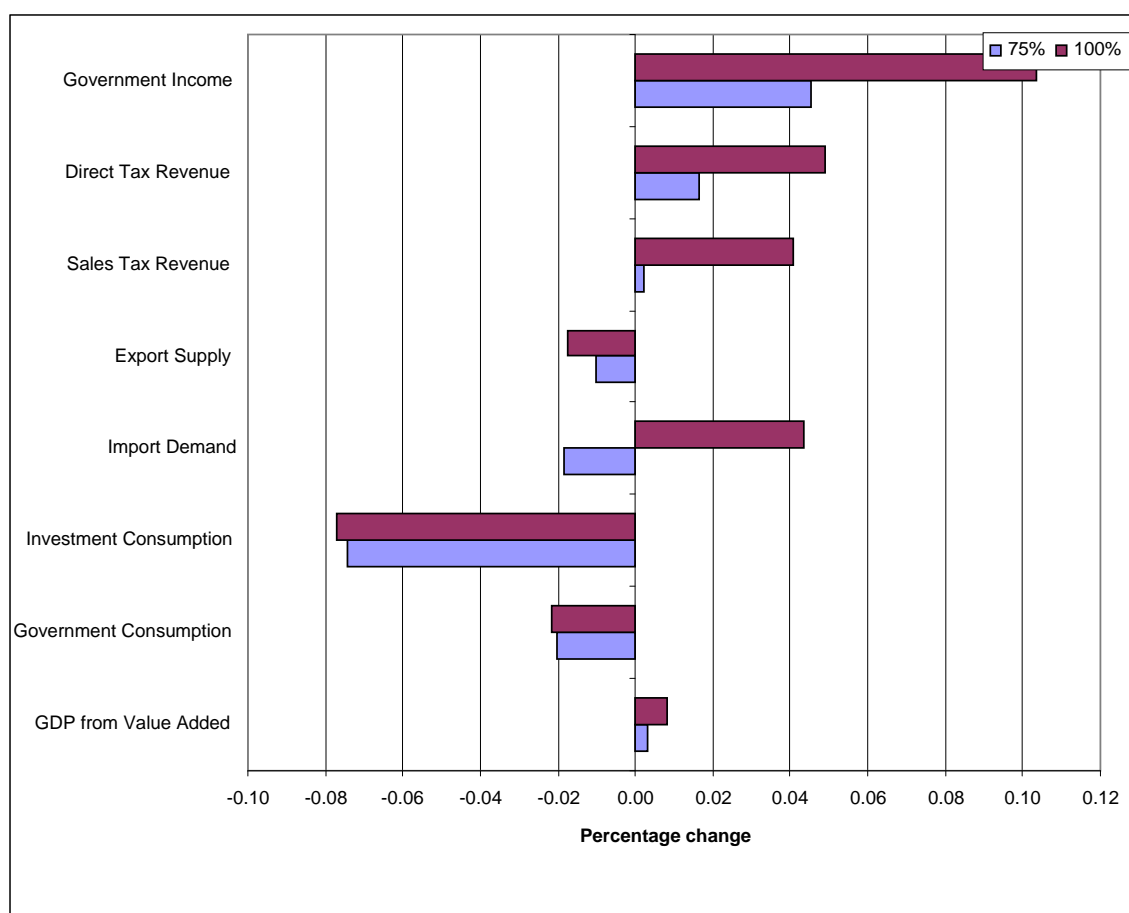
Province	Labour				
	White	African, Asian and Coloured		Land	Capital
		Skilled	Unskilled		
Western Cape	0.02	0.06	0.02%	-1.13	
Northern Cape	-0.02	0.02	0.01%	-0.13	
North West	0.15	0.04	0.06%	2.01	
Free State	0.19	0.04	1.06%	3.03	
Eastern Cape	-0.04	0.03	-0.11%	-1.64	
KwaZulu-Natal	0.08	0.10	0.15%	0.90	
Mpumalanga	0.07	0.05	0.10%	1.64	
Limpopo	-0.13	0.02	-0.01%	-1.24	
Gauteng	0.03	0.01	0.01%	-3.15	
All					0.01

Provinces experience mixed responses with regard to the income accrued. Of the nine provinces, four show increases in returns to land: the Free State (3.03%); North West (1.95%); Mpumalanga (1.64%); and KwaZulu-Natal (0.89%). Gauteng (3.14%), Eastern Cape (1.64%), Limpopo (1.19%), Western Cape (1.15%) and the Northern Cape (0.09%), show decreasing returns to land.

## 6.7 Macroeconomic and government effects

The effects of OECD liberalisation, expressed in world price changes on a number of government and macro-economic variables, are shown in Figure 8. At 75 and 100% liberalization, the GDP from value added increases by 0.003 and 0.01% respectively, and government consumption and investment consumption decreases by 0.07 and 0.02% respectively.

The government income increase of 0.05 and 0.10% is explained by an increase in direct tax and sales tax revenues. Furthermore, the change in (real) value of both imports and exports exceed the changes in GDP, causing the value of the local currency to appreciate by 0.8%. Investment and government consumption expenditures decrease, with investment consumption decreases exceeding the decrease in government consumption by a substantial margin. Finally, changes in government and macro-economic variables are small (less than 0.1%).



**Figure 8: Government and macroeconomic effects at 75% liberalisation**

## 7. Conclusions

This study reports the effects of the liberalisation of agricultural and food trade of the OECD countries on the South African economy. Results from a global model, GLOBE, which reports changes in world prices of exports and imports following liberalisation of agricultural and food trade of the OECD countries, were taken and used as a policy shock to a single country computable general equilibrium model (PROVIDE model). The results show that if the Doha Development Round led to 75% liberalisation of agricultural and food trade in OECD countries, weighted average world prices of exports facing South African producers would change between -3.0 to +29.7%, while changes in world price of imports would range between -19.6 to +3.8%.

Results from the single country CGE model for South Africa indicates that the domestic prices of agricultural grain crops tend to increase, whereas prices of horticultural crops and livestock decrease. Changes in agricultural production depends on the composition of production per province, hence when horticultural crops and livestock are the main enterprises, aggregate production for the province will contract, while production in the main sugar

and wheat producing provinces will expand. There is also a net positive effect on non-agricultural and food sectors in terms of volumes produced. The net expansion in the economy is also reflected by the increase in employment. Net factor incomes increase both in terms of wage increases and in the number of persons employed. Household consumption expenditure will increase, and the macroeconomic impact, although minimal, tends to be positive.

In short, world price change resulting from the liberalisation of agricultural and food trade of the OECD countries stands to benefit the South African economy.

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