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PROVIDE PROJECT

The Provincial Decision-making Enabling Project

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Costs and Benefits of Higher Tariffs on Wheat Imports to South Africa – A General Equilibrium Analysis

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PROVIDE PROJECT

The Provincial Decision-making Enabling Project

Overview

The Provincial Decision-Making Enabling (PROVIDE) Project aims to facilitate policy design by supplying policymakers with provincial and national level quantitative policy information. The project entails the development of a series of databases (in the format of Social Accounting Matrices) for use in Computable General Equilibrium models.

The National and Provincial Departments of Agriculture are the stakeholders and funders of the PROVIDE Project. The research team is located at Elsenburg in the Western Cape.

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Costs and Benefits of Higher Tariffs on Wheat Imports to South Africa – A General Equilibrium Analysis [1]

Abstract

Low international wheat prices caused by tariffs and subsidies in developed countries have been blamed for causing financial difficulty to local farmers. While the indignation at these unfair trade practices may be valid, it does not follow that protection of the local industry is necessarily the best course of action. This paper uses a static general equilibrium model to describe and quantify the effects of increased tariffs (by up to 25 percentage points) on the local wheat industry, other affected industries, particularly downstream industries, and the economy at large. Additionally, the effects on factors, households and the government are also analysed. The results show that the benefits to the wheat industry are highly concentrated and smaller than the loss of income caused in other sectors. Welfare is negatively affected, especially for low-income households, for whom the effects are exacerbated by food prices becoming somewhat more expensive relative to other prices.

[1] The main authors of this paper are Scott McDonald, Cecilia Punt, Lillian Rantho and Melt van Schoor.

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Executive Summary

The South African wheat industry is currently struggling to earn enough revenue for many of the farms to be financially feasible. International prices are low and producers blame this mainly on tariff protection and production subsidies in developed countries. Consequently, revenue streams to many farmers do not cover their costs, particularly where farms are undiversified and where drought conditions result in low yields. If current conditions prevail, it is likely that the industry will suffer a degree of collapse.

South African wheat producers have argued that subsidies and protection in developed countries is unfairly affecting their relative competitiveness and have lobbied government to impose protective tariffs on the industry. While this argument may be valid, it does not necessarily imply that tariff protection is the best course of action from a national welfare point of view, Standard (static) neoclassical trade theory predicts higher welfare even if trade liberalisation is one-sided (unilateral). This implies that the imposition of a tariff may induce an overall loss in welfare.

In this study we simulate the effects that a higher tariff on wheat imports could have in South Africa, using comparative static analysis based on results from a computable general equilibrium (CGE) model. The PROVIDE social accounting matrix (SAM) for South Africa for 2000, which is used as a basis in this study, includes detail on agricultural and food production, as well as land as a production factor. A structural analysis of the SAM reveals that The Western Cape and Free State provinces are the sources of most (53%) of wheat used in South Africa, while imports account for a further 11%. The majority of winter cereals (82%) is used by the grain milling industry, while a significant portion (6%) is also used by the animal feeds industry.

The primary experiment seeks to gauge the effects of a 25 percentage points increase in the tariff rate[2] on winter cereal[3] imports under a set of modelling assumptions that are chosen to approximate our beliefs of what might actually happen assuming other aspects of policy are maintained. All prices and price changes given are relative to a fixed numeraire, the consumer price index (CPI).

The direct effect of the increase in the tariff is to increase domestic prices for winter cereals. The market price increases by 11%, while the price received by producers increases by 9.3%. The increase in import prices leads to a strong decline (29.8%) in the quantity of winter cereals imported. Some of this shortfall is made up by increased (2.5%) domestic production but quantity demanded by the domestic market is still lower (2.5%) than in the base case, which confirms our expectations given that its marketed price is higher.

[2] Expressed in ad valorem terms.

[3] Winter cereals are used as a proxy for wheat in this study.

Since price and quantity of domestically produced winter cereals both increase, the value of domestically produced winter cereals increases by 12.1%, or R 384.4 million. This translates into higher income earned in agricultural regions that have a relatively high share of winter cereals in their output. In the Western Cape province, value added income increases in the Ruens (and surrounding) areas (2.3%), Swartland (4.7%) and Clanwilliam (0.8%), in the Free State province in Boshof (5.4%), Bloemfontein (2.6%) and Bethlehem (2.2%), in the Northern Cape province in Hopetown (2.5%), Prieska (6.5%) and Hartswater (7.9%) and in the Brits area (2.2%) in North West province.

A number of other markets are affected by the tariff. Products dependent on winter cereals show price increases due to increases to their intermediate input costs: grain mill product prices increase by 2.3%, animal feeds by 0.7% and bakeries and confectionary by 0.4%. Aggregate food prices increase by 0.3% relative to other prices[4], suggesting possible adverse effects to low-income households who spend proportionally more on food. Imports of downstream products, namely grain mill products, animal feeds and bakeries and confectionary increase, mainly because these products have become more expensive to produce locally. There are small increases in the demand for pesticides and fertilizers due to the expansion of agricultural activity in winter cereal producing areas.

Most sectors in the economy, including agricultural sectors that do not benefit from the tariff, experience a small decrease in their incomes, which in total outweighs the gains mentioned above: total value added income in the economy declines by 0.03%, or R 254 million. This decline is firstly the result of decreased trade: there is an exchange rate appreciation of 0.3%, which hurts exporters. Secondly, scarce factors of production (capital and skilled labour) become invested in winter cereal production due to the incentive effect of the tariff, where their true returns are lower than it would have been had they been invested elsewhere in the economy.

Introducing higher tariff rates on winter cereals has the predictable effect of increasing employment in the production of winter cereals in the Northern Cape, Free State and Western Cape. However, employment decreases in all other sectors (including non-agricultural sectors), which strongly suggests that the result would be an increase in unemployment overall.

Factor income for all skilled labour decreases on average by 0.04%. The returns to capital decrease slightly, by 0.03%. The rate of return on land as a primary production factor increases by 0.2% overall, with diverging trends in different regions: increases in winter cereal producing regions and decreases elsewhere (up to 1.4%). The decreases in other regions are explained by lowered international trade, lower aggregate demand and also because scarce factors (capital and skilled labour) relocate from these regions towards winter cereal producing regions due to the incentive effects of the tariff.

4 I.e. relative to the CPI numeraire.

Out of 162 household groups in the model, only seven (five in the Northern Cape and two in the Free State) show increases in expenditure following the increase in tariffs on winter cereals. This suggests that the beneficiaries are those directly involved in winter cereal production, but nobody else. A household expenditure based welfare measure that takes into account price changes suggests that the impact of the tariff increase is mildly regressive, likely an outcome of the food price increase. Total household expenditure decreases by R 170 million. Welfare is presumably further diminished by the decrease in government consumption expenditure of R 52 million and a R 44 million decrease in total investment.

While government is largely unaffected, overall revenue decreases slightly due to lowered trade (total tariff revenue actually declines) and lowered aggregate demand which reduces direct and indirect tax revenue.

That the imposition of a higher tariff on an imported product lowers overall welfare is not at all surprising given the static neoclassical nature of the model. The results shown in this study can be seen as the identification and quantification of the static economic costs, should policymakers wish to apply tariffs for strategic, humanitarian or any other purpose.

1. Introduction

The South African wheat industry is currently struggling to earn enough revenue for many of the farms to be financially feasible. International prices are low and producers blame this mainly on tariff protection and production subsidies in developed countries. Consequently, revenue streams to many farmers do not cover their costs, particularly where farms are undiversified and where drought conditions result in low yields. If current conditions prevail, it is likely that the industry will suffer a degree of collapse.

South Africa imports substantial quantities of wheat to meet the difference between domestic consumption and production. While wheat is generally not imported directly from developed countries, subsidies in these countries effectively lower the price at which exporters in countries like Argentine are willing to export to South Africa. This in turn affects wheat prices in South Africa, fairly directly as it turns out, and in so doing lowers the revenue to domestic wheat producers.

South African wheat producers have argued that subsidies and protection in developed countries is unfairly affecting their relative competitiveness and have lobbied government to impose protective tariffs on the industry. While this argument may be valid, it does not necessarily imply that tariff protection is the best course of action from a national welfare point of view, Standard (static) neoclassical trade theory predicts higher welfare even if trade liberalisation is one-sided (unilateral). This implies that the imposition of a tariff may induce an overall loss in welfare.

In this study we simulate the effects that a higher tariff on wheat imports could have in South Africa, using comparative static analysis based on results from a computable general equilibrium (CGE) model. The CGE model is particularly useful in this context because we can look at the effects on wheat as well as other industries, particularly downstream industries such as grain millers and bakeries. In addition, the effects on other agents in the model, such as households (who are consumers of food) and the government (who obtains tariff revenue) can be investigated.

2. Computable General Equilibrium Model

2.1. The Computable General Equilibrium Model

The PROVIDE Project standard computable general equilibrium (CGE) model is a member of the class of single country computable general equilibrium (CGE) models that are descendants of the approach to CGE modelling described by (Dervis, de Melo et al. 1982)[5]. More specifically, the implementation of this model, using the GAMS (General Algebraic Modelling System) software, is a direct descendant and development of models devised in the late 1980s and early 1990s, particularly

[5] This section provides a very brief summary; for a detailed description, see (PROVIDE 2003).

those models reported by (Robinson, Kilkenny et al. 1990), Kilkenny (1991) and (Devarajan, Lewis et al. 1994). Following Pyatt (1998), the model is calibrated using a Social Accounting Matrix (SAM). The SAM serves to identify the agents in the economy and provides the database with which the model is calibrated. It also serves an important organisational role since the groups of agents identified by the SAM structure are also used to define sub-matrices of the SAM for which behavioural relationships need to be defined. Analysis is comparative static.

Households are assumed to choose the bundles of **commodities** they consume so as to maximise utility where the utility function is a Stone-Geary function that allows for subsistence consumption expenditures, which is an arguably realistic assumption when there are substantial numbers of very poor consumers. The households choose their consumption bundles from a set of 'composite' commodities that are aggregates (using the Armington constant elasticity of substitution (CES) specification) of domestically produced and imported commodities. Changes in relative prices between domestic produce and imports cause partial (as opposed to total) substitution, resulting in realistic adjustments in the model.

Domestically produced commodities are produced by **activities**, each activity being able to produce multiple commodities (using a fixed-coefficient, Leontief, specification) and each commodity potentially being produced by multiple activities (using CES aggregation). **Activities** combine different **factors** into aggregate value added, which in turn is combined with intermediate inputs using a CES specification. Intermediate inputs are bundles of commodities (one per activity). At each stage of the production nest, profit maximisation is assumed along with a zero-profit (i.e. perfect competition) assumption. This ensures that costs are minimised and that the level of each activity is such that the cost of inputs is equal to their respective marginal revenue products.

Intermediate bundles are combined using Leontief technology. In this study, an exception was made by introducing CES substitution between winter cereals (mainly wheat – see section 3.1) and summer cereals (mainly maize) in the grain milling industry. The bundle of these primary inputs is then combined with other intermediates using a Leontief specification as before. This allows a reasonable degree of independence between demand and supply of wheat and maize, which seems more realistic given that they are unlikely to have strong complementarities in the milling industry or in final consumption of grain mill products.

Factors receive payment for their services from activities, which are subsequently paid to their owners, either households or **enterprises**. Enterprises will in turn transfer surpluses towards households. Imported commodities are sourced from the **Rest of the World (ROW)**, which also pays for domestically produced commodities that are exported. Domestic production is divided between domestic supply and exports using a constant elasticity of transformation (CET) specification. In the model, South Africa is generally modelled as a small country, i.e., price taker, on all export markets, but selected export commodities can be deemed to face downward sloping

export demand functions. For this study, it is assumed that the gold, coal and "other mining"[6] commodities face downward sloping export demand curves.

Government levies taxes on commodities (sales tax), imports, activities (production), factors and on household and enterprises (direct income taxes). Government consumes a bundle of government goods, and also makes transfer payments to other agents. Each of households, enterprises, government and rest of the world saves a part of their income, which is accumulated in the **Savings-Investment** account, from which investment commodities are purchased in fixed proportions as determined by the savings-investment closure.

Additional elements of the model specification are embodied in the specification and choice of closures for this study, which are discussed in section 4.2.

3. The Social Accounting Matrix and Other Data

3.1. The Social Accounting Matrix (SAM)

The primary benchmark data is arranged in the form of a social accounting matrix (SAM), which is a system of accounts recording all transactions between agents in the economy. The SAM is a 404 account aggregation of the PROVIDE SAM for South Africa in 2000 (See (PROVIDE 2005) for a full description of the South Africa SAM database). The model SAM has 65 commodities (17 agricultural), 71 activities (24 agricultural), 90 Factors (GOS (capital), land and 88 labour factors) and 162 households. A full listing of accounts is given in Appendix A.

Agricultural commodities are differentiated by type. Wheat does not appear in the SAM as a separate commodity; it is part of "winter cereals". While wheat forms the majority of this commodity (accounting for 94.3% of income from winter cereals (Agricultural Census of 2002)), it also includes barley (4.3%) and other unspecified winter cereals (1.4%). Given the high share of wheat in the winter cereals commodity, it is reasonable to treat the commodity as a proxy for wheat.

Agricultural activities are distinguished according to regions. This is consistent with the fact that farms are typically multiproduct firms. Each Agricultural activities / production region is also modelled as a multi-product firm. This implies that a given activity represents all farming activities within that region. Agricultural activities are distinguished by province, e.g. Eastern Cape agriculture represents all agricultural activity in the Eastern Cape province. The provinces where the majority of wheat is produced are further disaggregated into a number of regions to distinguish the main wheat producing regions within a province. The provinces that are disaggregated are the Free State,

[6] The Other Mining commodity includes important export commodities such as diamonds, natural gas and many other minerals and chemical substances. It does not include crude oil.

Northern Cape, North West and Western Cape (see Appendix B for details on the regions used within the model).

There is provincial disaggregation for both factors and households. Besides the geographical distinction factors are further disaggregated based on race and skill level of occupation. Households are further disaggregated according to criteria such as gender of the head of household, education level and whether the household resides in one of the former homelands.

3.2. Structural Analysis

The SAM database embodies certain structural economic relationships, which partly determines how the model will respond to a particular shock. A brief structural analysis, focused on the role of winter cereals, is therefore useful to help explain particular model results and to ensure a common point of departure at interpretation[7]. Figure 1 and Figure 2 shows a decomposition of (final) demand and supply for winter cereals in 2000 value terms. The Western Cape and Free State are the sources of most (53%) of wheat used in South Africa, while imports account for a further 11%. Appendix B provides more detailed information on the regions within the provinces (which form the agricultural activities as modelled) and their contribution to wheat production in South Africa.

In terms of demand the majority of winter cereals (82%) is used by the grain milling industry, while a significant portion (6%) is also used by the animal feeds industry. There is no direct final demand for winter cereals by households, though a small portion (3%) is exported.

[7] Note that the structural information is based on a variety of sources, and have been adjusted to satisfy accounting constraints using cross entropy methods (See (PROVIDE 2005)). The pertinent information therefore forms part of a consistent set of accounts, but it may differ from alternative sources.

Figure 1: Structure of Supply of Winter Cereals in the PROVIDE SAM

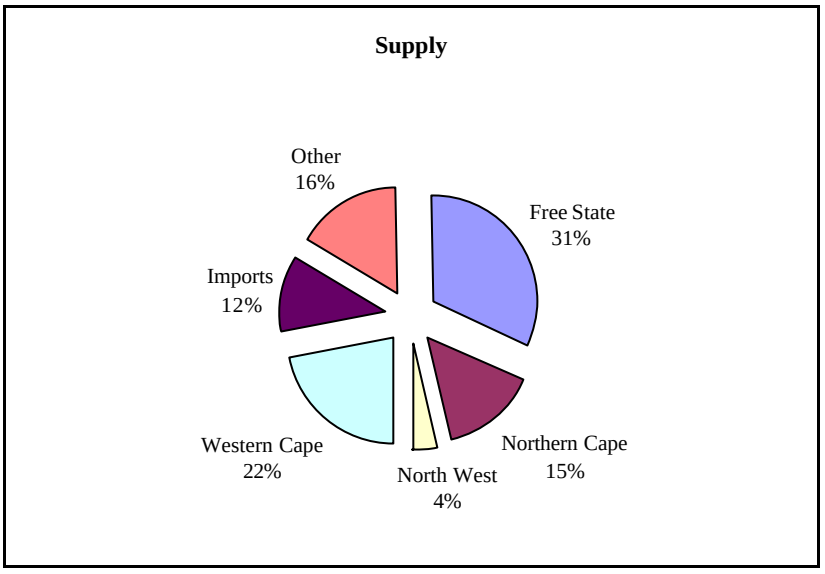
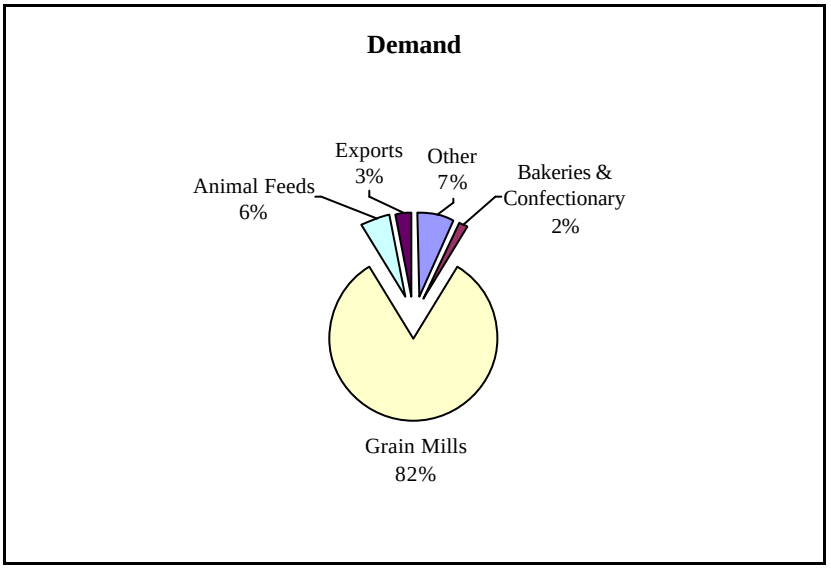


Figure 2: Structure of Demand for Winter Cereals in the PROVIDE SAM



Further information can be gleaned from tax accounts in the SAM, notably the import tax account. In 2000 as reflected in the SAM, import tax revenue paid from the winter cereals commodity amounts to R145.13 million, implying an import tariff rate of 34.5% of the value of landed winter cereals. This rate is the base rate in the model, which is the main policy instrument under consideration in this paper. To place this in perspective with regard to results that are generated it must be mentioned that in CGE model simulations the results are mainly driven by the relative changes from the base and not so much by the starting point.

3.3. Elasticities

High Armington elasticities for winter cereals (value=5) are selected in order to achieve close correlation between import and domestic prices. This follows the observation that historical import parity prices and SAFEX wheat index prices are very closely matched. A relatively high elasticity is also sensible in light of the observation that wheat is a relatively homogenous product[8] and easily traded[9]. Other elasticities are standard values as have been used in other studies, selected on the basis of reasonableness.

4. Experiments and Model Closures

4.1. Experiments Set-up

Import tariff rates on winter cereals are increased in increments of 5 percentage points, up to 25 percentage points higher than the base case. The maximum tariff rate simulated is therefore 34.5% (the base tariff rate) + 25% = 59.5%. The different simulations are as follows:

Simulation	Winter Cereals Import Tariff Rate
Base	34.5%
Sim1	39.5%
Sim2	44.5%
Sim3	49.5%
Sim4	54.5%
Sim5	59.5%

Note that the implied tariff levied per ton of imported wheat will differ depending on prices. Throughout this study, percentage point changes in tariff rates are good approximations for percentage point changes in tariff per ton imported because import prices vary only with exchange rate fluctuations, which are small[10].

[8] While it is accepted that there are different types and grades of wheat, and that there are different types of grains in the winter cereals commodity, the category is still fairly homogenous in the context of a SAM, where there is typically a high degree of aggregation over non-similar commodities.

[9] We continue using winter cereals as a proxy for wheat. The fact that there are other products in the winter cereals commodity is an argument for an Armington elasticity that is not excessively high, as is the fact that there is a degree of complementarity between different grades of wheat in the South African milling industry. The particular choice of elasticity is the result of informal econometric analysis and model calibration: the elasticity was adjusted until the achieved ratio between price changes in final demand and imports of winter cereals roughly equalled the relevant coefficient (0.63) on a regression of SAFEX prices on import parity prices. Hence we achieve a similar effect in the model, namely that a shock to import prices of X is reflected in a price change in the final demand price of 59% of X. See also section 5.1, which reports model results.

[10] However, if other experiments were to be conducted using the same model, such as international prices changes, varying tariffs per ton would result (specifically, high tariffs per ton when international prices are high).

4.2. Model Closures

The model contains certain conditions that must be satisfied – government account balance, external balance, factor market balance and savings-investment equality. These closure rules represent important assumptions on the way institutions operate in the economy and can substantively influence model results.

In most cases, closure rules are chosen due to their appropriateness in the South African context given the experiments that will be conducted. The closures are generally "realistic", that is, they are chosen to approximate our beliefs of what might actually happen assuming other aspects of policy are maintained. They are not necessarily welfare-neutral.

Results are generally reported for a single set of closure rules, except where government finances are discussed, in which case results are compared to an alternative specification.

4.2.1. Government Closure

Changes to import taxes involve fiscal implications (directly, and indirectly, via economic expansion or contraction), and the government's response to these can be expected to play an important role.

Constant tax rates are assumed throughout, which means shocks will affect government income. Two alternate closures were explored:

- GC1: Under this closure, government maintains its expenditure levels in volume terms despite revenue shocks. Adjustment falls to the government deficit, so that an economic contraction (at constant tax rates) will put pressure on the savings-investment balance.

- GC2: In this "balanced" scenario, government makes "reasonable" adjustments to its expenditure levels. Specifically, the *share* of government consumption expenditure of total final demand in the economy is fixed. This is convenient since it allows economic expansion or contraction without substantially altering the role government plays. On the other hand, it implies that changes in government expenditure can take place, which has implications when we assess welfare effects.

Under either closure, all tax rates are fixed and government savings (the fiscal deficit) adjusts in order to achieve fiscal balance. Note that the burden of financing government expenditure will fall on households via savings, since tax rates and investment are fixed (see section 4.2.3). While all experiments were conducted using both closures, it was found that the results are not sensitive to these two different government closures; hence only results for closure GC2 are reported (except in section 5.6, where both are reported).

4.2.2. External Balance

We assume that South Africa has a flexible exchange rate. Net foreign savings is held fixed at the base level. Changes in tariffs have an effect on the exchange rate, but since wheat trade is relatively small relative to total trade for the economy, this effect is relatively minor.

4.2.3. Savings-Investment Closures

We use a balanced investment-driven savings configuration whereby the share of investment in absorption is fixed, and savings rates adjust equally in order to balance the identity,

Investment = Government savings + Net foreign savings
+ Savings (household & enterprise)

The external balance (net foreign savings) is fixed because of the selected external balance, but the government balance will vary because of the effects mentioned above. This effectively means changes in government finances will impact on firms and households by affecting their savings rates.

As with the government closure, this closure is chosen for realism rather than for being neutral with regard to welfare: changes in investment can occur, which will affect the future earnings potential of the economy and therefore future welfare.

4.2.4. Factor Market Closures

Factor market closures are chosen to best reflect the realities of the South African economy; hence unskilled labour is specified as not being fully employed. Skilled labour and capital, which are scarce factors, are assumed to be fully employed and are mobile between industries. This means that, following a negative shock to a particular sector, we can expect these factors to partially relocate to more profitable industries. The implications of this closure are particularly important when the effects of shocks on the wheat industry are considered.

Land, on the other hand, is held fixed in each sector. Since our agricultural activities are disaggregated by region, it would not make sense to allow land to relocate.

4.2.5. Numeraire

We use the consumer price index (CPI) as the numeraire; all prices are therefore relative to the CPI, which is held fixed.

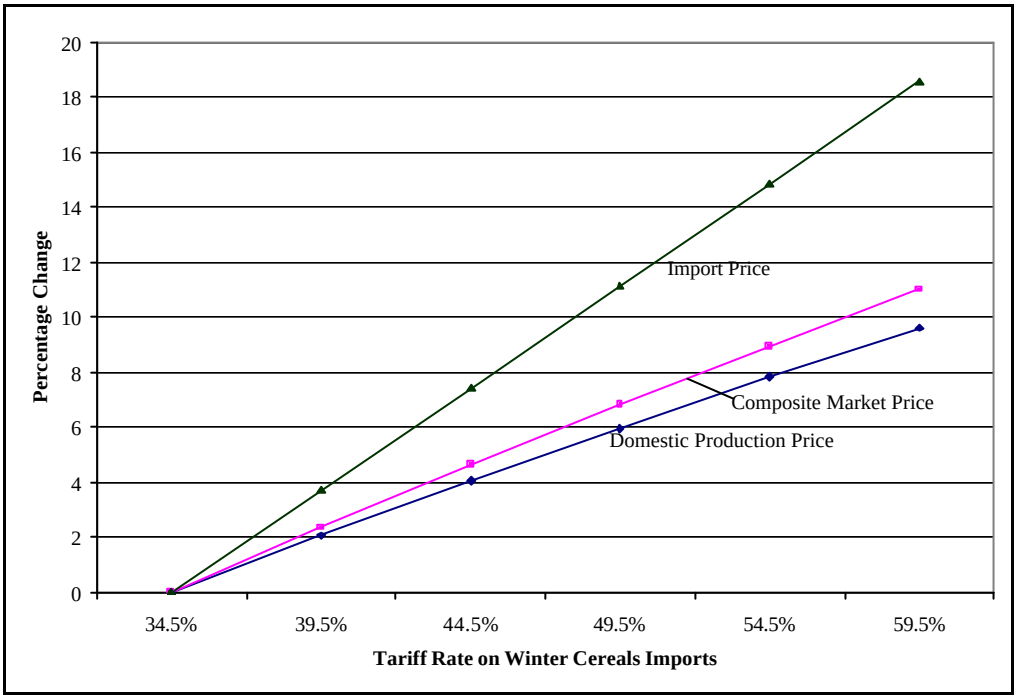
5. Model Results: Import Tariff Simulations

5.1. Winter Cereals Market Effects

The most direct effects of the tariff rate change, namely on the domestic market for winter cereals, are reported first. Prices of imports are affected directly, while final prices are affected indirectly, via the Armington specification of imperfect substitutability between domestic and imported commodities. Finally, the prices received by domestic producers will also be affected.

Figure 3 shows price effects on winter cereals for the various tariff rate changes. To the right of the base case, prices increase as the tariff rate increases[11].

Figure 3: Winter Cereal Price Effects



All of the prices change near-linearly with changes in the tariff rate. The import price increases by 18.6% for simulation 5, the composite commodity price changes by a factor[12] of 0.6 of the change in the import price and the domestic output price, received by domestic producers, increases by a factor of 0.5 of the import price.

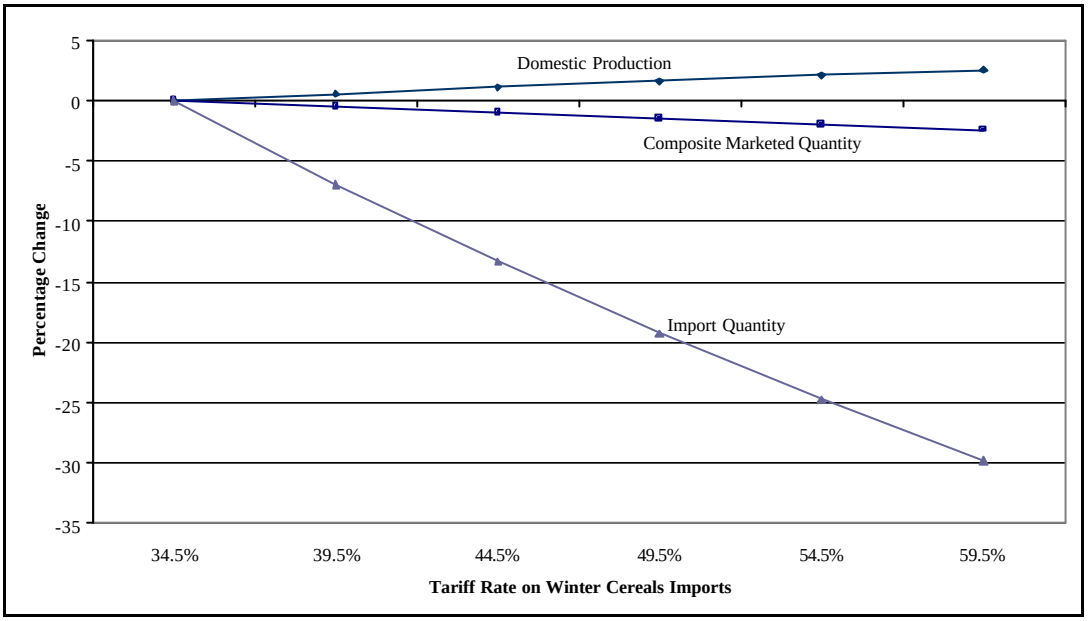
[11] Exchange rate fluctuations are also embodied in the price changes shown, but these are very small: a 0.3% appreciation for simulation 5 (a 25 percentage point increase in the tariff rate).

[12] This relationship reflects a) the share of imports versus domestic production in the SAM, b) the Armington elasticity selected for this model and also c) the effective elasticity of (total) demand for winter cereals in the model. See also section 3.3 on the choice of Armington elasticity.

The increase in import prices of winter cereals following a tariff increase leads to a strong decline (down by 29.8% at the highest tariff rate) in the quantity of winter cereals imported (see Figure 4). Some of this shortfall is made up by increased (2.5%) domestic production but quantity demanded by the domestic market is still lower (2.5%) than in the base case, which confirms our expectations given that its marketed price is higher.

The quantity of domestically produced winter cereals therefore increases (2.5%), and also the price (9.3%), therefore the value of domestic winter cereal production increases by 12.1%, or R 384.4 million.

Figure 4: Winter Cereals Quantity Effects



5.2. Other Commodity Market Effects

Other commodity markets are also affected by these changes. Nearly all of the results follow a linear pattern, the effects increasing proportionally with the tariff rate. Hence, only the results for the 25 percentage points increase in the tariff rate are reported.

Figure 5 shows final composite (imported and domestically produced) commodity price changes for selected commodities and aggregates[13] in the model. Products dependent on winter cereals show price increases: grain mills (2.3%), animal feeds (0.7%) and bakeries and confectionary (0.4%). Other prices are generally affected because their input costs increase (see Figure 8) or because they are also produced in the same regions that produce winter cereals.

[13] Detailed results for individual commodities show price changes ranging between –2 percent and +2 percent.

The food aggregate (using base-quantity-weighted averaging) shows a price increase of 0.3%, implying that food prices as a whole rises relative to other prices (specifically, the consumer price index or CPI). This suggests possible adverse effects to low-income households who spend proportionally more on food.

Figure 5: Purchaser price of composite commodity (PQD)

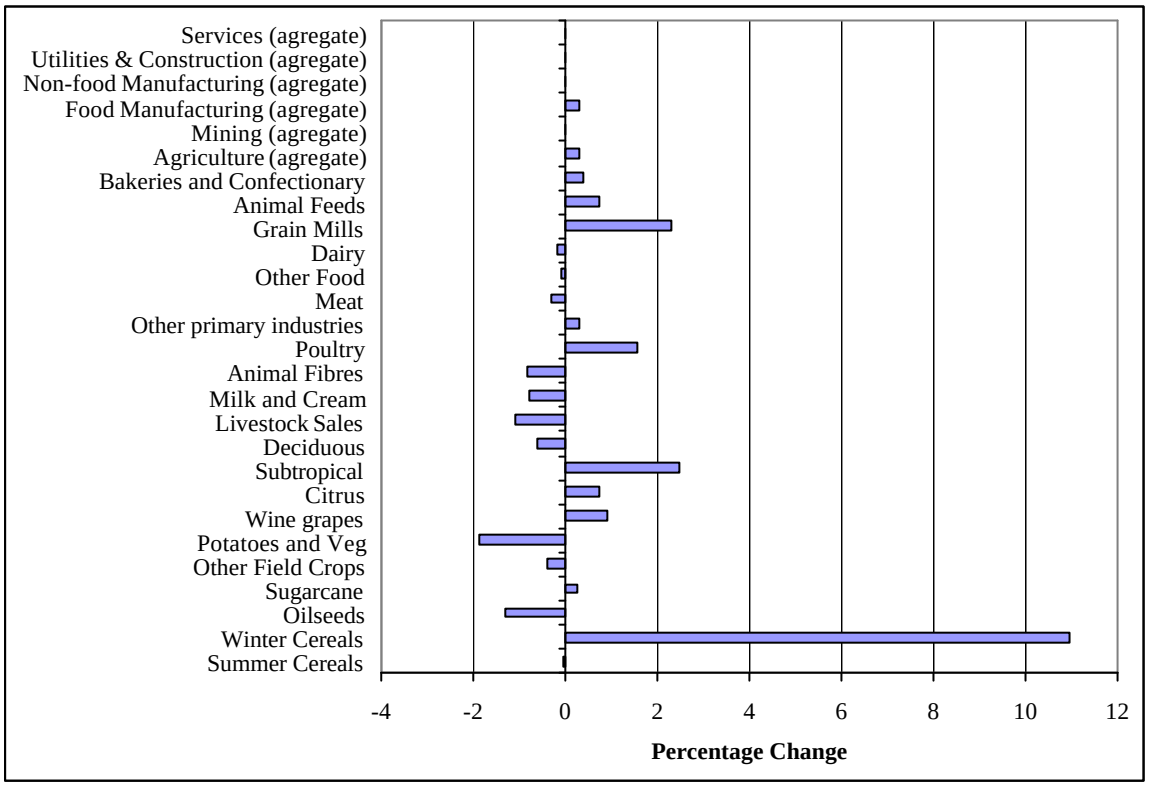


Figure 6: Quantity of Commodity Imports (QM)

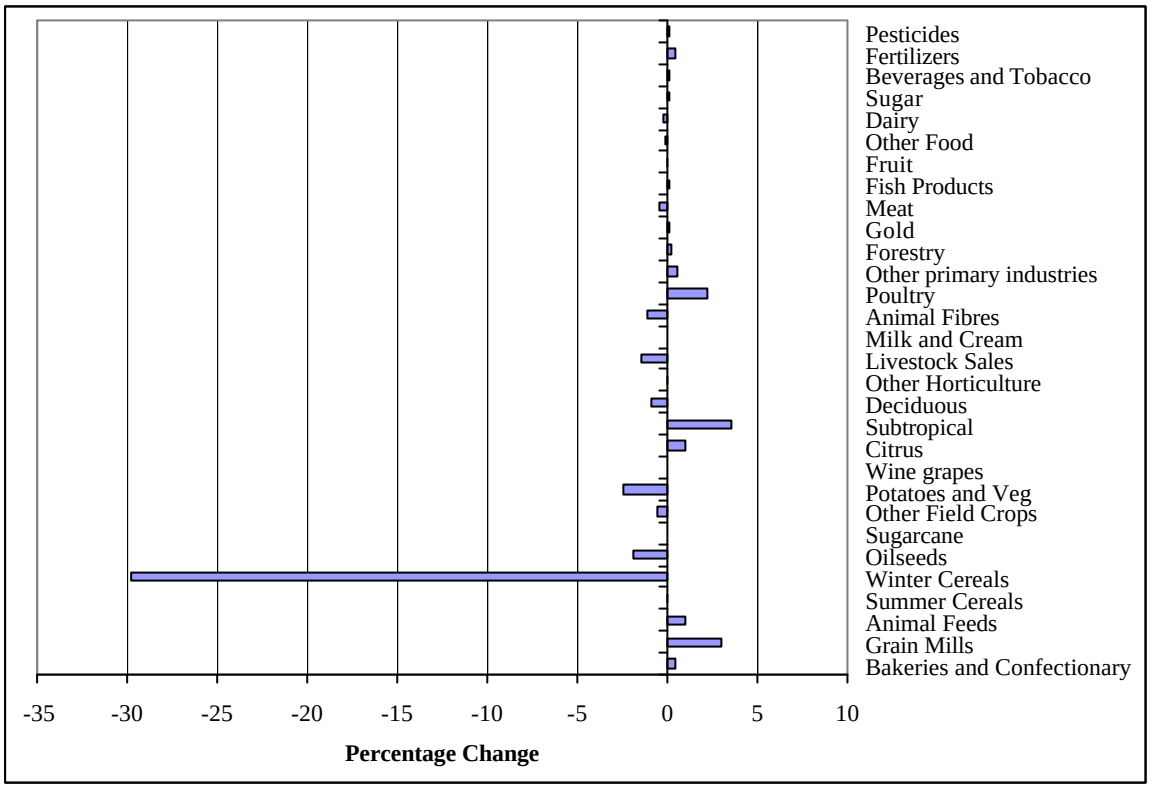


Figure 7. Demand for Intermediate Demand (QINTD)

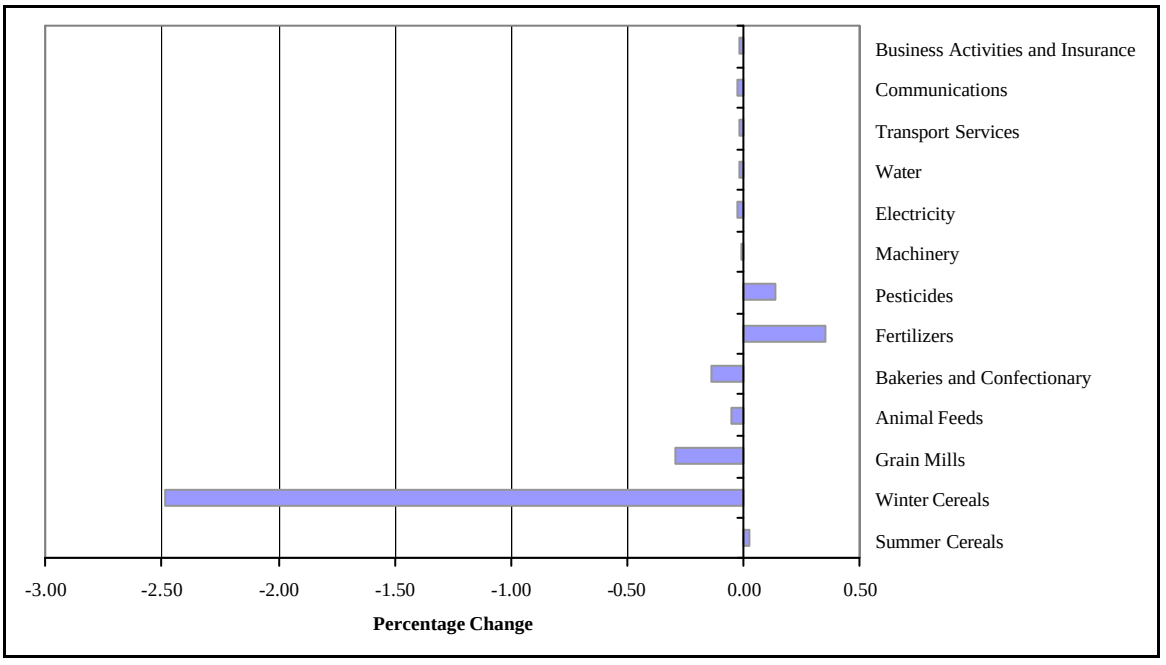


Figure 6 shows another important trade-related effect that imposing tariffs on wheat would entail: imports of downstream products, namely grain mill products, animal feeds and bakeries and confectionary will increase. This happens mainly because these products have become more

expensive to produce locally, given that the price of winter cereals has increased. In the case of increased protection for wheat, these industries could present the argument that their own products should also be subject to increased tariff protection because this is necessary just in order to maintain their base level of effective protection.

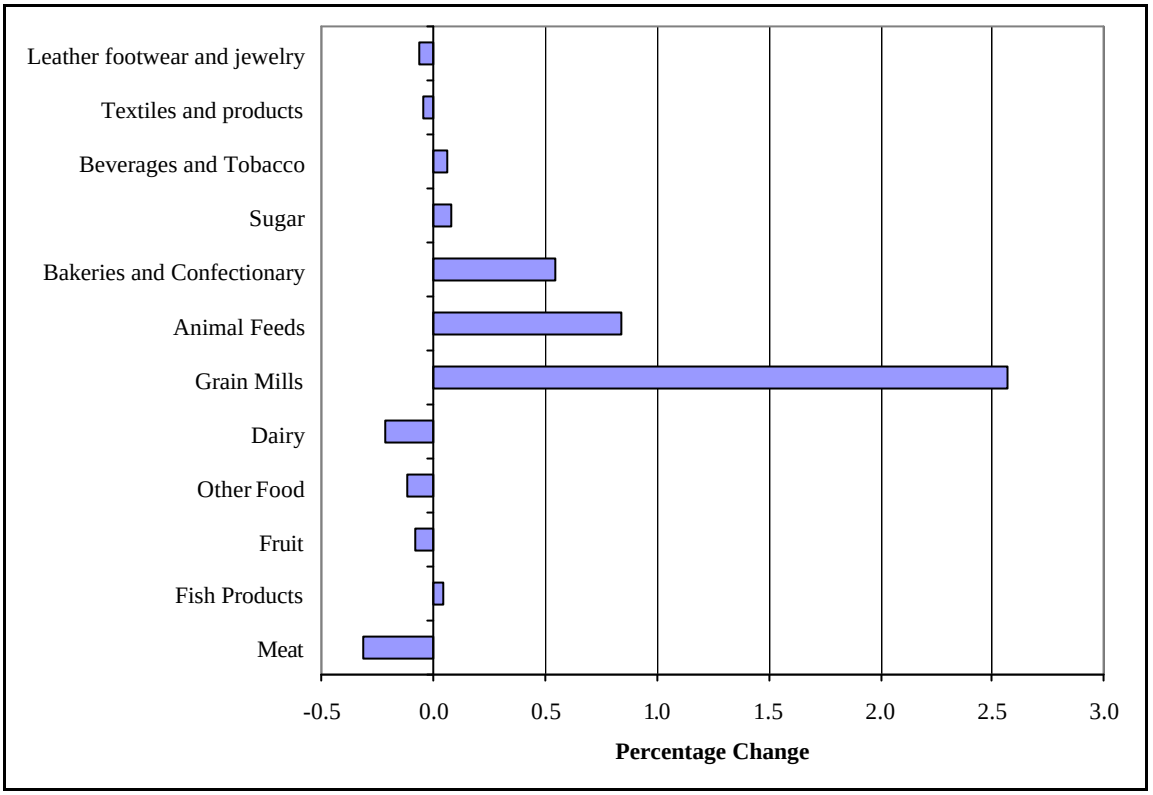
In Figure 7, we show the quantity of commodities demanded as intermediate goods. Winter cereals shows a marked decline (-2.5%) due to its price increase, whereas summer cereals do not show a decrease because of the substitution allowed between them in the grain milling industry. Grain mill products, bakeries and confectionary and animal feeds show small decreases as a result of their cost increases, pesticides and fertilizers show increases due to the expansion of agricultural activity in winter cereals producing areas. Other commodities typically used as intermediates suffer slight declines, likely due to a general economic contraction.

5.3. Impact on Activities

5.3.1. Intermediate Input Costs

Figure 8 shows the prices of aggregated bundles of intermediate inputs to selected activities (the effects are very small for activities not shown). Winter cereals are mostly used by the grain mills activity (which accounts for 82% of demand for winter cereals), which explains the increase in costs in that industry. A smaller part is also used by the animal feeds activity (6% of demand). Bakeries and confectionary use winter cereals (2% of demand), but mainly grain mill products (including wheat flour) (29% of demand), therefore the indirect effect of price increases in grain mill products is more important in explaining the price increase in this sector.

Figure 8: Price of Aggregate Intermediate Inputs to Activities (PINT)



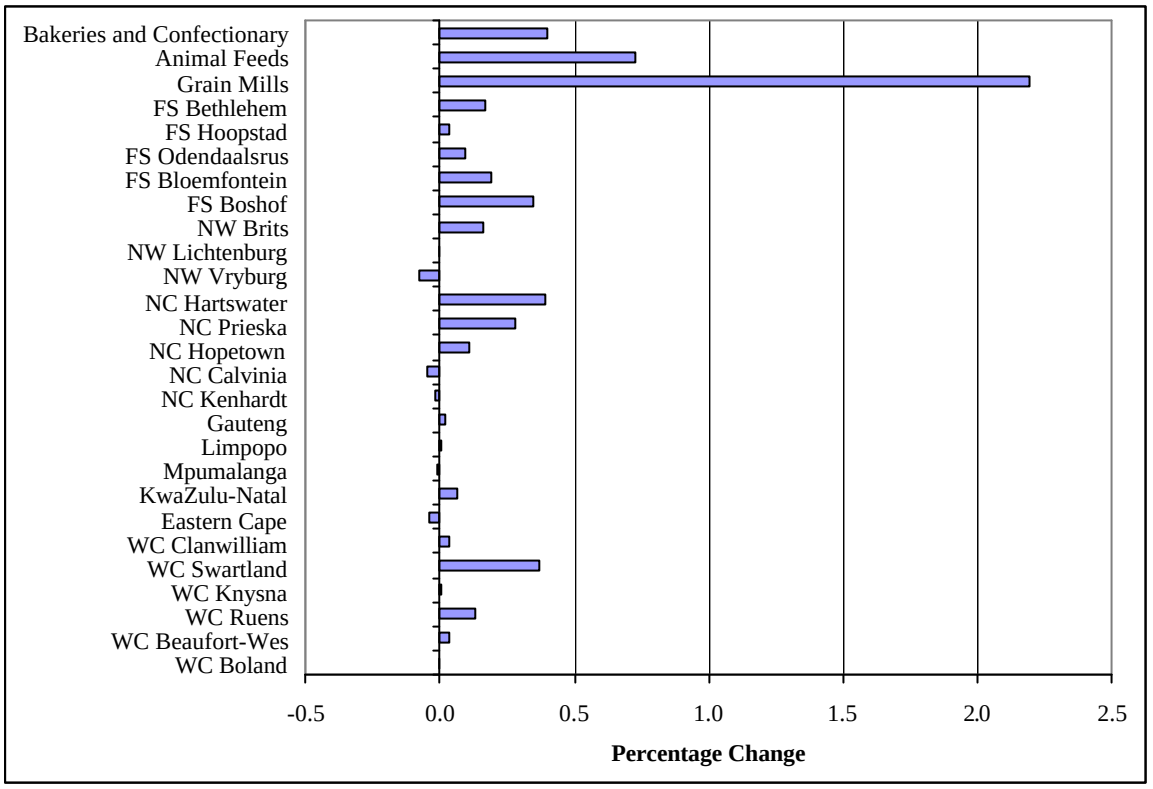
5.3.2. Activity Price and Quantity Effects

Figure 9 shows how the price effects are reflected in the prices activities receive for their aggregate production[14]. Activities that use winter cereals increase their output prices as a response to the increase in their input costs[15]. Winter cereal producers raise their prices as a result of increased effective demand. For the latter, the most important factor determining the magnitude of the price effect is the share of winter cereals in the particular region's production.

[14] See Appendix B for detail on agricultural regions.

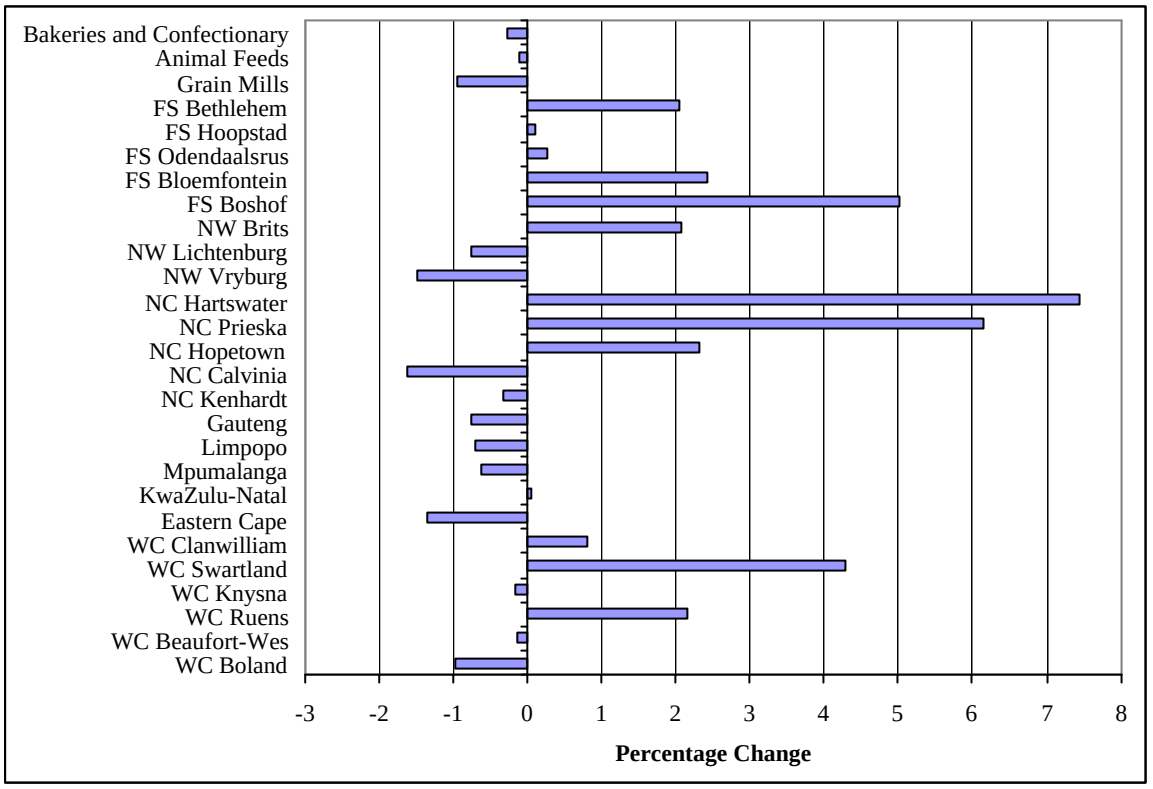
[15] This does *not* imply that activities have any degree of control over prices – all agents in the model are price takers and for all activities average input cost and marginal cost equal output price.

Figure 9: Producer Prices by Activity (PX)



While the output prices of both winter cereal producers and users increase, they do so for different reasons, and we can therefore expect different quantity responses (see Figure 10). Winter cereal producers increase production in response to higher demand for their output, but wheat users decrease production in response to increased input costs.

Figure 10: Quantity of Domestic Production by Activity (QX)



Expansion or contraction of industries is primarily affected via changes in returns to factors and subsequent reallocation. The change in the price of value added (PVA) reported in Table 1 indicates changes in the return to factors in different activities, and it can be seen that changes in quantity of production (Figure 10) follows these price incentive effects closely.

Recall that total winter cereal production increases by 2.5% and the price at which it is produced increases by 9.3% (see section 5.1); this is also reflected in Figure 9 and Figure 10.

Table 1: Value added effects (Rand values for 2000)

Sector[16]	Base Value Added (R millions)	Price (PVA) Change	Quantity (QVA) Change	Value Change	Value Change (R millions)
Agriculture	36815.28	0.00%	0.22%	0.22%	81.1
Western Cape	7926.22	0.04%	0.70%	0.74%	58.8
WC Boland	3587.65	-0.09%	-0.90%	-0.99%	-35.6
WC Beaufort West	439.98	-0.03%	-0.10%	-0.13%	-0.6
WC Ruens*	1707.23	0.15%	2.13%	2.28%	39.0
WC Knysna	564.15	-0.03%	-0.15%	-0.18%	-1.0
WC Swartland*	1133.55	0.37%	4.28%	4.67%	52.9

[16] The town names are an indication of the region. See Appendix B for details on all towns and surrounding areas including agricultural regions.

Sector[16]	Base Value Added (R millions)	Price (PVA) Change	Quantity (QVA) Change	Value Change	Value Change (R millions)
WC Clanwilliam	493.66	0.05%	0.80%	0.84%	4.2
Free State	4981.89	0.14%	1.56%	1.70%	84.6
FS Boshof*	482.25	0.46%	4.92%	5.40%	26.1
FS Bloemfontein	757.67	0.24%	2.39%	2.64%	20.0
FS Odendaalsrus	223.43	0.01%	0.32%	0.33%	0.7
FS Hoopstad	1928.11	-0.01%	0.14%	0.13%	2.5
FS Bethlehem*	1590.43	0.19%	2.03%	2.22%	35.3
Northern Cape	3023.70	0.11%	1.56%	1.67%	50.5
NC Kenhardt	1406.19	-0.04%	-0.31%	-0.35%	-4.9
NC Calvinia	530.75	-0.15%	-1.55%	-1.70%	-9.0
NC Hopetown*	345.92	0.16%	2.29%	2.45%	8.5
NC Prieska*	179.26	0.42%	6.02%	6.47%	11.6
NC Hartswater*	561.58	0.58%	7.27%	7.89%	44.3
North West	3189.60	-0.05%	-0.18%	-0.23%	-7.2
NW Vryburg	637.81	-0.16%	-1.44%	-1.60%	-10.2
NW Lichtenburg	1789.92	-0.09%	-0.69%	-0.78%	-14.0
NW Brits	761.86	0.14%	2.08%	2.23%	17.0
Eastern Cape	2560.27	-0.13%	-1.28%	-1.40%	-35.9
KwaZulu Natal	4497.73	-0.01%	0.11%	0.10%	4.5
Mpumalanga	4847.15	-0.08%	-0.58%	-0.66%	-31.9
Limpopo	3187.98	-0.07%	-0.65%	-0.71%	-22.8
Gauteng	2600.75	-0.09%	-0.67%	-0.76%	-19.6
Non-agricultural Sectors	739797.89	-0.03%	-0.02%	-0.05%	-335.5
Grain Mills	2306.16	-0.03%	0.80%	0.77%	17.9
Animal Feeds	682.78	-0.03%	0.48%	0.45%	3.1
Bakeries & Confectionary	2611.76	-0.02%	0.04%	0.03%	0.7
Other	734197.19	-0.03%	-0.02%	-0.05%	-357.1
TOTAL	776613.17	-0.02%	-0.01%	-0.03%	-254.4

* Winter Cereal's Share in Region's Production > 10%

5.3.3. Effects on Income Earned in Activities

To show how these various effects translate into changes to income in the economy, Table 1 also indicates the effects on "value of value added" for various activities in the final two columns. Because of increased import tariffs, some additional value is created in the winter cereal producing regions, such as in the Swartland (R 52.9 million), Hartswater area (R 44.3 m), Ruens/Southern Cape (R 39.0 m), Boshof area (R 26.1 m) and areas surrounding Bloemfontein (R 20.0 m). However, this positive impact must be seen in the light of other effects on the economy. All agricultural regions with limited winter cereal production (i.e. those denoted by the province names) show lower value-added (except KwaZulu-Natal). Agriculture as a whole still has a positive outcome (R81.1 m), but the negative effect seen in the rest of the economy, while representing only a slight decrease, outweighs

the (mixed) benefit to agriculture. Overall, there is a loss of R 254 million value added in the economy.

The wheat-using industries show slight increases in the value of value added. This is due to substitution of value-added (primary factor use) for intermediate inputs – recall that total production quantities in these sectors decline – and suggests a movement of production towards higher-value output components within their respective categories. Where technically feasible, this is a sensible response to the incentive effects identified.

5.4. Factor Impacts

5.4.1. Employment

In the light of the modelling assumption that unskilled labour categories are not fully employed, it is possible to determine changes in employment from the model results for these categories. Figure 11 shows changes in employment for the Free State, Northern Cape and Western Cape at a 25 percentage point increase in the import tariff rate. Introducing higher tariff rates on winter cereals therefore has the predictable effect of increasing employment amongst some of the factors directly involved in the production of winter cereals in the Northern Cape, Free State and Western Cape. However, employment decreases in all other sectors, which strongly suggests that the result would be an increase in unemployment overall. For the majority of categories (31 to be precise), the effect is quite small (Figure 12), with a decrease in employment of less than 0.1%. Of the 48 labour factors affected, the picture is negative for 41, and positive for the remaining 7. Note that these labour categories represent labour in all economic sectors, not only in agriculture.

Figure 11: Employment (FS) – Free State, Northern Cape and Western Cape

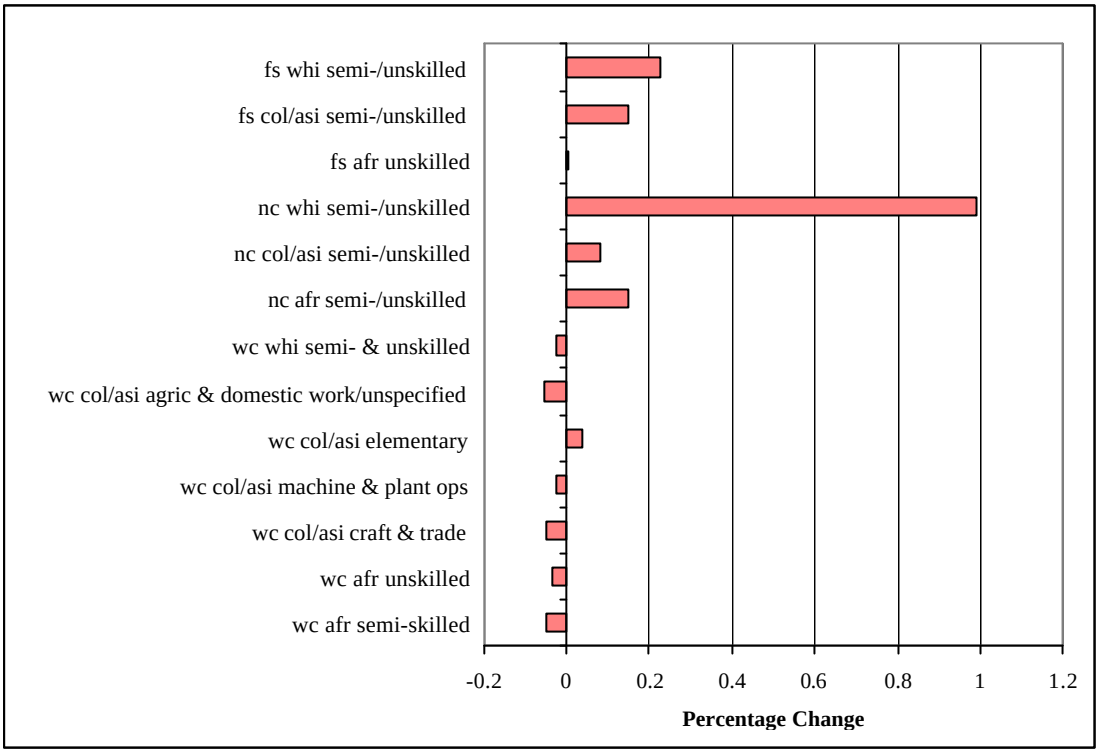
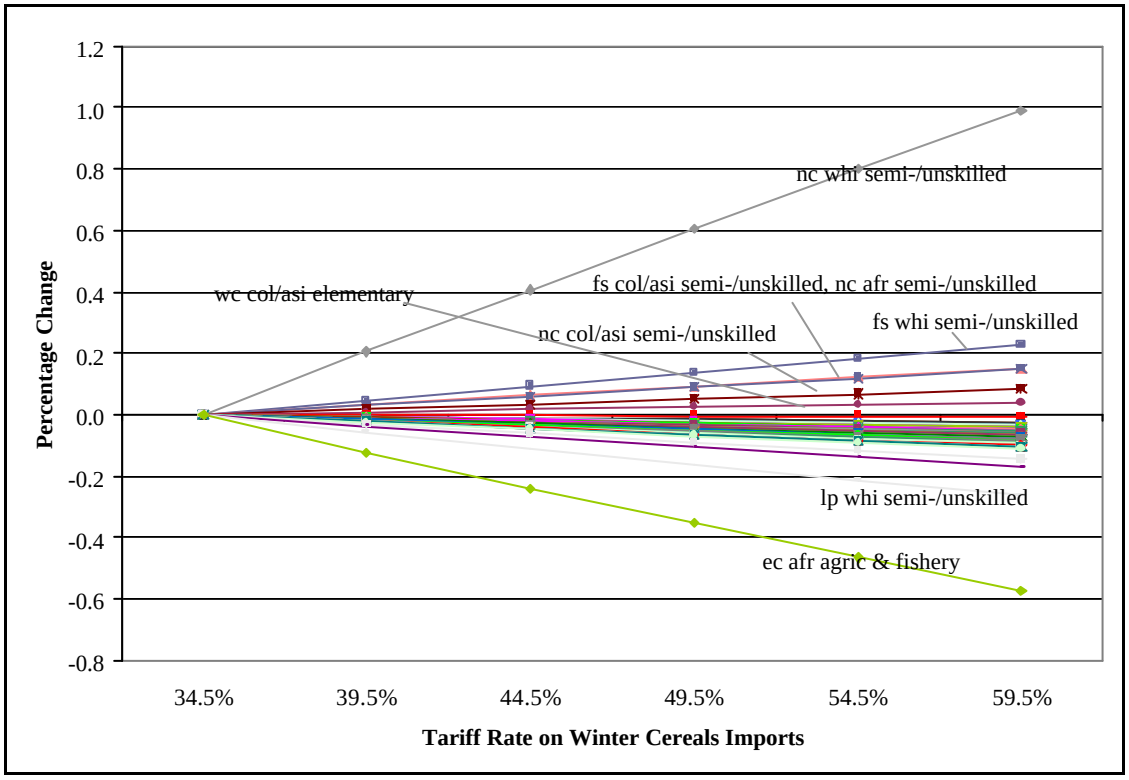


Figure 12: Employment (FS)



5.4.2. Factor income

In the case of the 48 unemployed factors mentioned above, income changes are due to changes in employment levels (and therefore follow similar patterns as in Figure 12) because the wage rate remains constant. Factor which are assumed to be fully employed, i.e. skilled labour, land and GOS, experience a change in wage rate that drives the changes in factor incomes for these factors. Factor income for all skilled labour decreases on average by 0.04%.

The returns to capital (factor income of gross operating surplus (GOS)) decrease slightly, by 0.03%. GOS and skilled labour are mobile across sectors, so that they experience decreases in their incomes even after their reallocation (at the margin) to sectors that might offer higher returns because of the increased tariff rates (notably agricultural regions with significant winter cereal production).

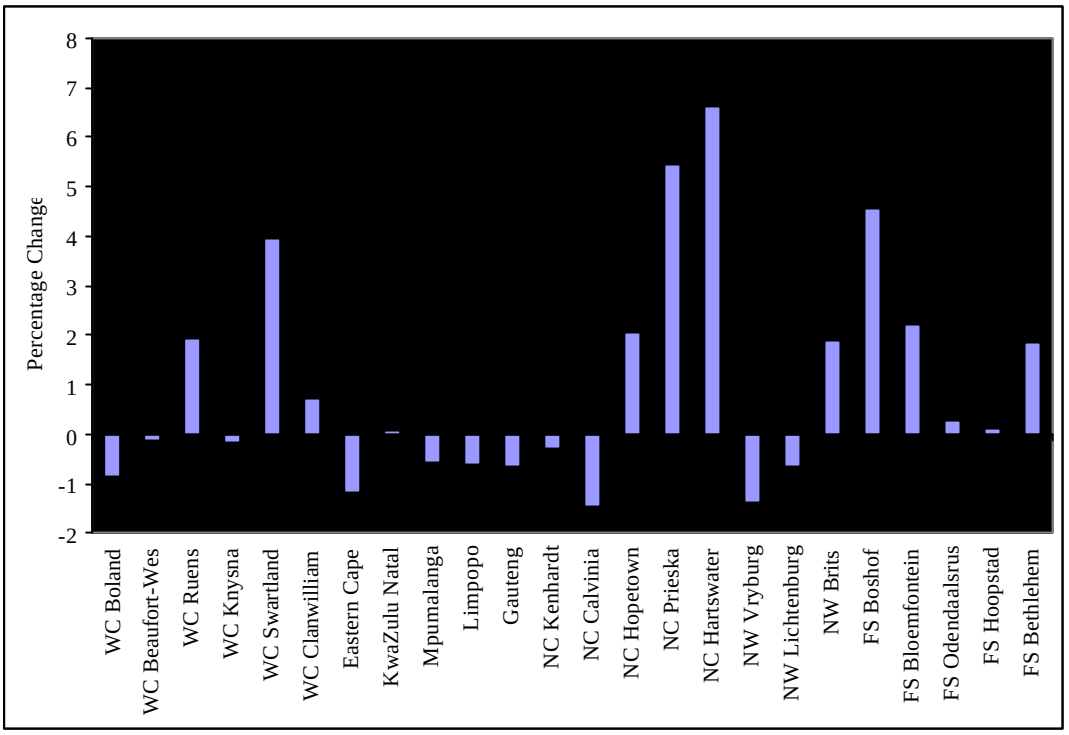
5.4.3. Return to Land

The rate of return on land as a primary production factor increases by 0.2%. Underlying this are diverging trends in different regions – Figure 13 provides the details[17]. There are large increases in returns to land in the winter cereal producing regions, but these are almost completely offset by declines in all other regions.

Why do rates of return to land in non-winter cereal producing regions suffer? There is of course the general economic decline that affects all sectors negatively and the slight exchange rate appreciation, which tends to harm trade-focussed sectors such as agriculture. However, there is a more fundamental reason, namely that land is fixed while other scarce factors are free to relocate. When capital and skilled labour relocate from sectors, amongst others the non-winter cereal producing regions, there is more land relative to capital (and other factors) in these sectors, hence the return to land is lower. By the same reasoning, the ratio in the main winter cereal producing regions decreases, hence the particularly large increases in returns to land here. This underscores the importance of allocative efficiency in the economy, demonstrating one of the costs of "artificially" raising returns in some sectors relative to others.

[17] See Appendix B for detail on agricultural regions.

Figure 13: Returns to Land (WFDIST)



5.5. Household Impact[18]

Changes to household expenditure are shown in Figure 14 for the Free State and in Figure 15 for the Western Cape and Northern Cape. These are mainly driven by changes in income accruing to the factors of which the households are the owners. Out of 162 household groups, only 7 show increases following the increase in tariffs on winter cereals. Five of these are in the Northern Cape and two in the Free State. No household groups in the Western Cape increase their expenditure. This is indicative of the fact that the net welfare impact in the Western Cape is negative, bearing in mind that these household groups are representative of all households in a province and not only rural or agricultural related households. This suggests that the beneficiaries are those directly involved in winter cereal production – farmers and in some instances farm workers – but nobody else. It also seems that even many of the household groups that do have an interest in winter cereal production do not benefit overall.

[18] For detail on the formation of household categories, consult PROVIDE (2005).

Figure 14: Household Expenditure (HEXP) – Free State

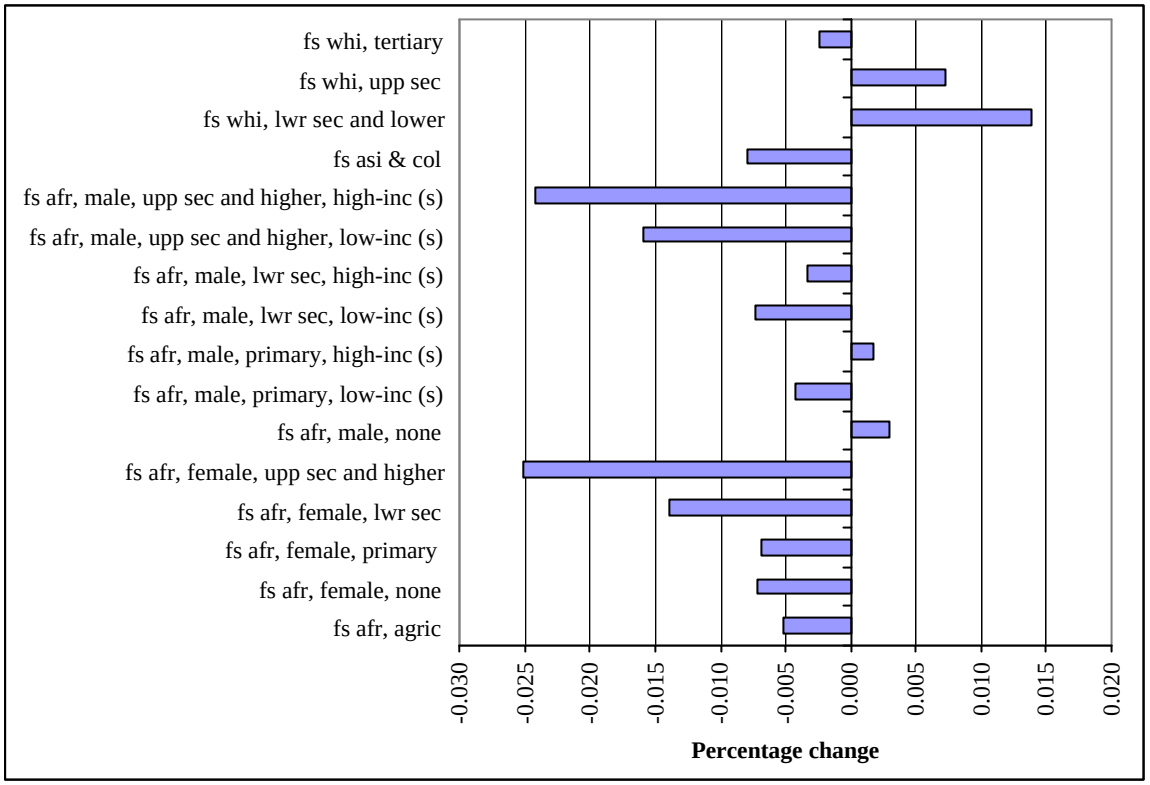


Figure 15: Household Expenditure (HEXP) – Western Cape and Northern Cape

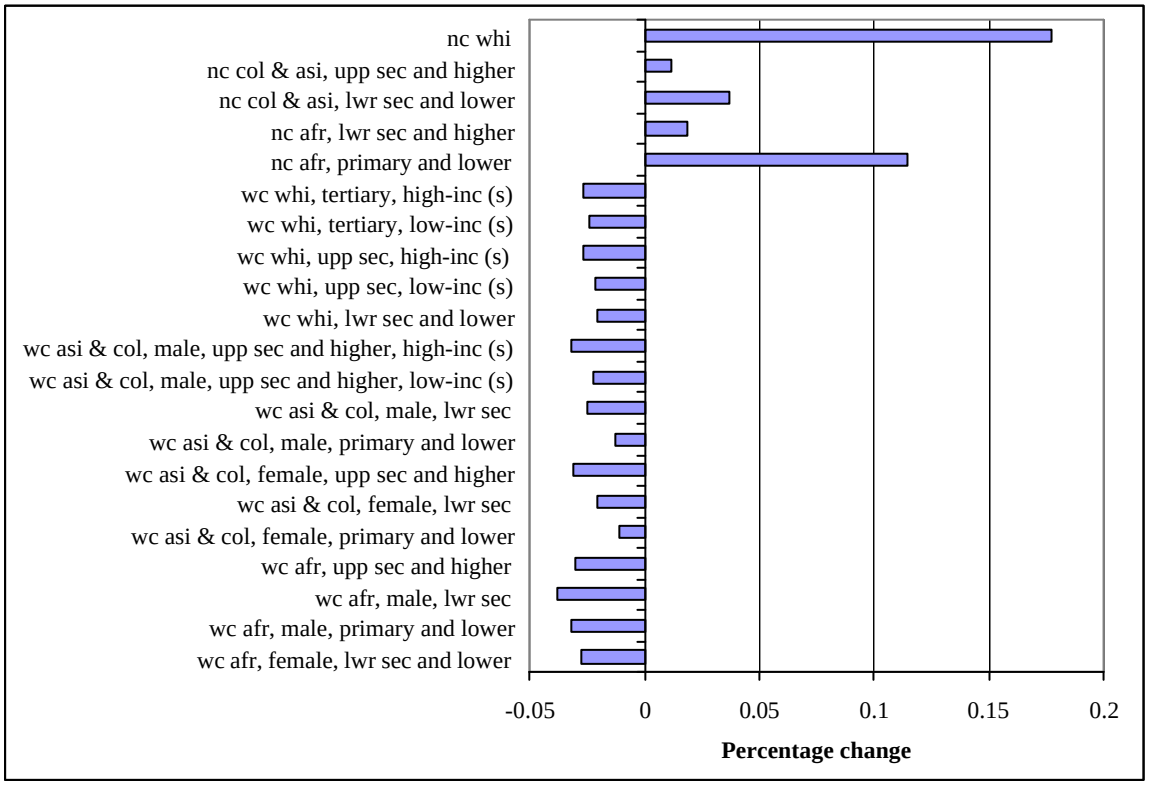


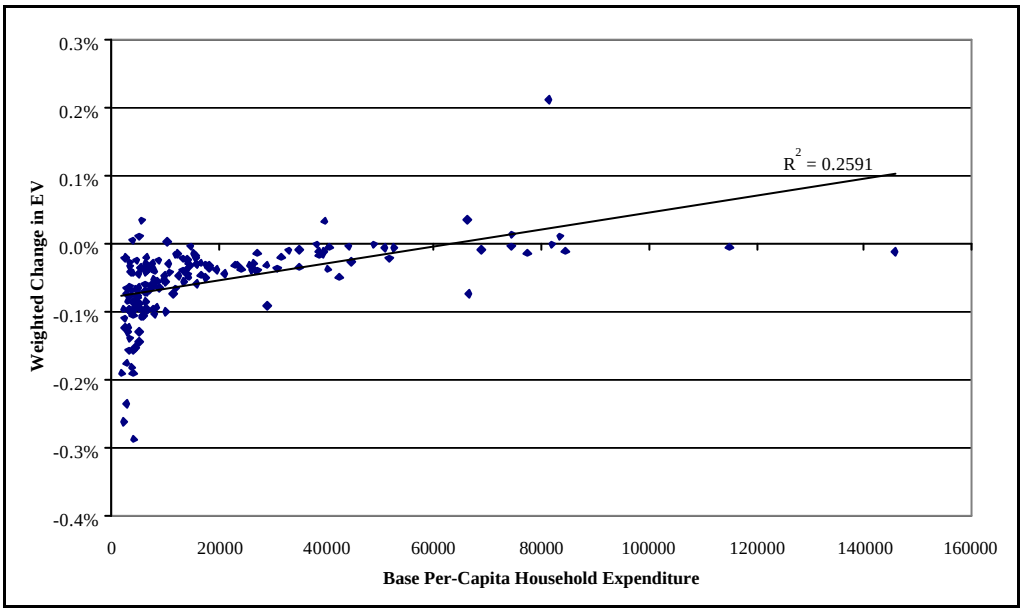
Figure 16 plots weighted (by inverse of base expenditure) changes in an equivalent variation (EV) welfare measure against base per capita income for the households. The pattern is not entirely clear, but there is considerable variation in the effects of the experiment on low-income households. The overall result suggests that tariff protection on winter cereals is regressive. This is likely to be in part due to the relative increase in food prices (see section 5.2).

If household expenditure is used as a proxy for welfare, it is important to keep in mind that there are other factors that may affect household welfare, particularly government expenditure, which affects the availability of social services, and investment, which affects the future potential of the economy. "Realistic" closures were used, implying that changes to these items can occur in the model[19]. To put the household expenditure effects in a welfare perspective, the various changes to the variables (for a tariff increase of 25 percentage points) are reported (in 2000 values):

- Total household expenditure decreases by R 170 million.
- Government expenditure decreases by R 52 million.
- Total investment decreases by R 44 million.

We can therefore conclude that the total (current and future) negative welfare effect is substantially greater than shown by a household expenditure welfare measure.

Figure 16: Change in Equivalent Variation (EV) Welfare Measure vs Per Capita Income



[19] The foreign account closure uses a fixed balance, implying that the foreign account is in fact welfare-neutral.

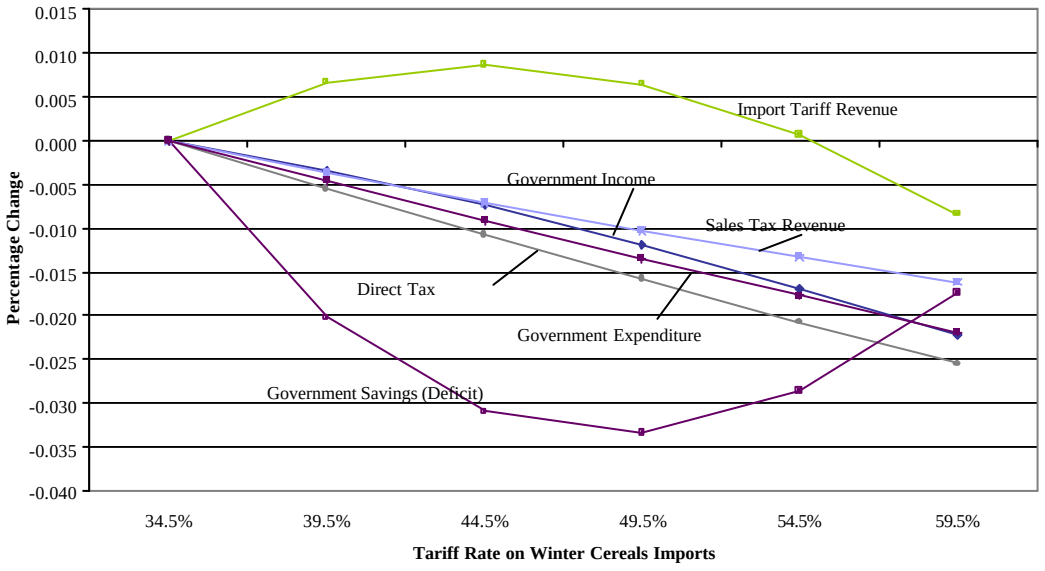
5.6. Government Effects

Figure 17 shows the percentage changes in government related variables. All of the changes are very small (less than 0.04 percent). Revenue from direct income tax on households and enterprises decreases as a result of the decrease in enterprise income and aggregate household income. The tax rates on enterprises and households remain constant. The decrease in revenue from sales tax is the result of a decrease in the value of final demand for commodities. The import tax revenue show an increase for increases in the tax rate up to a 10 percentage point increase over the base value. The increase in the import tariff rate however leads to a decrease in the value of imports. Therefore for additional import tariff rate increases the decrease in revenue as a result of the decline in the value of imports outweighs the increase in the tax revenue as a result of the increase in the tax rate. There is a net payment to industries so that the increase reflected in the graph for indirect tax revenue (net of subsidies) indicates an increase in the payment to industries.

Government (dis-)savings decreases over the entire range considered, but the decrease is the greatest at a tariff rate of 15 percentage point increase over the base value. Government savings is the difference between government income and expenditure, and a decrease in this case signifies a decrease in the government deficit. The rate of decrease in government income is lower than that of government expenditure.

The initial (small) improvement in the deficit dissipates as the tariff rate is further increased, which suggests that increasing import tariffs is not necessarily a robust means to improve the fiscal balance. In any case, the fiscal balance improves while the value of government expenditure declines – a situation not necessarily to the advantage of social welfare.

Figure 17: Government Finance



For this experiment, we have also looked at the results produced when using a different government closure rule, GC1, where government consumption volumes are held fixed. The results are virtually identical to those reported for this closure, because there is a slight decrease in the price of government goods, which allows constant volume expenditure to practically coincide with constant government expenditure to value of total demand ratio.

6. Conclusion

The impact of a 25 percentage point increase in the tariff rate on wheat on the economy translates into a small decrease in gross domestic product (GDP) of 0.03 percent in net terms (i.e. after accounting for the benefits to winter cereals farmers and farm workers) when compared to the base case. This represents a cost of R257.4m (2000 values) to the economy. There is also a slight currency appreciation (0.03%) and accompanying decline in levels of trade.

The direct effects of imposing higher import tariff rates on winter cereals are to raise prices of winter cereals, and to cause a substantial substitution in favour of domestic winter cereal production. Higher prices for winter cereals also affect downstream industries (grain mills, animal feeds and bakeries & confectionary), increasing their input costs, lowering production and increasing final prices for their output goods. There is also a slight currency appreciation (0.03%) and accompanying decline in levels of trade.

The general contraction of the economy as indicated by changes in GDP is the result of different changes taking place at industry level. Most industries are affected negatively, except the winter cereal producers themselves. The main winter cereal producing agricultural regions tend to expand and this expansion is sufficient to cause a net increase in value added (comparable to GDP) in agriculture as a whole, but the net effect on the whole economy is outweighed by negative effects in non-agricultural sectors. Furthermore, there is a reallocation of scarce factors from other sectors towards winter cereal production. This is an important consideration in terms of allocative efficiency in the economy because the returns from winter cereal production are raised "artificially" when tariff rates are increased.

The reallocation of resources towards winter cereal production is also reflected in the results for factors and households, where only those closely involved in winter cereal production benefit. This is especially the case in the Free State and Northern Cape. However in the Western Cape, despite the fact that there are two main winter cereal producing areas in the Western Cape, it was found that the anticipated benefits as a result of the increased tariff on wheat imports is not sufficient to outweigh the negative impacts on employment and factor income as a result of the general contraction in the economy. The effects are also mildly regressive, that is they tend to harm low-income households more than higher-income households. This can be partly explained by the increase in some food prices.

That the imposition of a higher tariff on an imported product lowers overall welfare is not at all surprising given the static neoclassical nature of the model. The results shown in this study can be seen as the identification and quantification of the static economic costs, should policymakers wish to apply tariffs for strategic, humanitarian or any other purpose.

7. References

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8. Appendix A: SAM Accounts

This section contains a complete listing of SAM accounts used in the model for this study, organised by type.

Commodities: Agriculture

1. Summer Cereals
2. Winter Cereals
3. Oilseeds
4. Sugarcane
5. Other Field Crops
6. Potatoes and Veg
7. Wine grapes
8. Citrus
9. Subtropical
10. Deciduous
11. Other Horticulture
12. Livestock Sales
13. Milk and Cream
14. Animal Fibres
15. Poultry
16. Other primary industries
17. Forestry

Commodities: Other

18. Coal
19. Gold
20. Crude Oil
21. Other Mining
22. Meat
23. Fish Products
24. Fruit
25. Other Food
26. Dairy
27. Grain Mills
28. Animal Feeds
29. Bakeries and Confectionary
30. Sugar
31. Beverages and Tobacco
32. Textiles and products
33. Leather footwear and jewelry
34. Wood and Furniture
35. Paper and products
36. Publishing and broadcasting
37. Petroleum
38. Basic Chemicals
39. Fertilizers
40. Primary Plastics
41. Pesticides
42. Other Chemicals and chem products
43. Tyres
44. Other manufacturing
45. Glass and plastic products
46. Ceramics
47. Cement
48. Other Non-metallic
49. Iron and Steel
50. Non ferrous metals
51. Other Metals
52. Oth Transp Engines and Vehicle parts
53. Electric equipment and machinery
54. Machinery
55. Motor Vehicles
56. Electricity
57. Water
58. Construction
59. Trade
60. Other Services
61. Transport Services
62. Communications
63. FSIM
64. Business Activities and Insurance
65. General Govt health and social work

Activities: Agricultural

(Western Cape)
66. AWC1_2_6
67. AWC5_9
68. AWC3
69. AWC4
70. AWC7
71. AWC8
72. Eastern Cape
73. KwaZulu Natal
74. Mpumalanga
75. Limpopo
76. Gauteng

(Northern Cape)
77. ANC1_8
78. ANC2_3_5
79. ANC4
80. ANC6
81. ANC7

(North West)
82. ANW1_3_5
83. ANW2
84. ANW4

(Free State)
85. AFS1
86. AFS2_3_7

87. AFS4_8
88. AFS5
89. AFS6

Activities: Other

90. Coal
91. Gold
92. Other Mining
93. Meat
94. Fish Products
95. Fruit
96. Other Food
97. Dairy
98. Grain Mills
99. Animal Feeds
100. Bakeries and Confectionary
101. Sugar
102. Beverages and Tobacco
103. Textiles and products
104. Leather footwear and jewelry
105. Wood and Furniture
106. Paper and products
107. Publishing and broadcasting
108. Petroleum
109. Basic Chemicals
110. Fertilizers
111. Primary Plastics
112. Pesticides
113. Other Chemicals and chem products
114. Tyres
115. Other manufacturing
116. Glass and plastic products
117. Ceramics
118. Cement
119. Other Non-metallic
120. Iron and Steel
121. Non ferrous metals
122. Other Metals
123. Other transport Engines and Vehicle parts
124. Electric equipment and machinery
125. Machinery
126. Motor Vehicles
127. Electricity
128. Water
129. Construction
130. Trade
131. Other Services
132. Transport Services
133. Communications
134. Business Activities and Insurance
135. Government heatlh and soc serv
136. Domestic Services

Households

137. wc afr, female, lwr sec and lower
138. wc afr, male, primary and lower
139. wc afr, male, lwr sec
140. wc afr, upp sec and higher
141. wc asi & col, female, primary and lower
142. wc asi & col, female, lwr sec
143. wc asi & col, female, upp sec and higher
144. wc asi & col, male, primary and lower
145. wc asi & col, male, lwr sec
146. wc asi & col, male, upp sec and higher, low-inc
147. wc asi & col, male, upp sec and higher, high-inc
148. wc whi, lwr sec and lower
149. wc whi, upp sec, low-inc
150. wc whi, upp sec, high-inc
151. wc whi, tertiary, low-inc
152. wc whi, tertiary, high-inc
153. ec afr, agric
154. ec afr, homeland, female, none
155. ec afr, homeland, female, primary
156. ec afr, homeland, female, lwr sec
157. ec afr, homeland, female, upp sec and higher, low-inc
158. ec afr, homeland, female, upp sec and higher, high-inc
159. ec afr, homeland, male, none
160. ec afr, homeland, male, primary
161. ec afr, homeland, male, lwr sec
162. ec afr, homeland, male, upp sec and higher, low-inc
163. ec afr, homeland, male, upp sec and higher, high-inc
164. ec afr, non-homeland, female, none
165. ec afr, non-homeland, female, primary
166. ec afr, non-homeland, female, lwr sec
167. ec afr, non-homeland, female, upp sec and higher
168. ec afr, non-homeland, male, none
169. ec afr, non-homeland, male, primary
170. ec afr, non-homeland, male, lwr sec
171. ec afr, non-homeland, male, upp sec and higher
172. ec asi & col, primary and lower
173. ec asi & col, lwr sec
174. ec asi & col, upp sec and higher
175. ec whi, lwr sec and lower
176. ec whi, upp sec
177. ec whi, tertiary
178. nc afr, primary and lower
179. nc afr, lwr sec and higher
180. nc col & asi, lwr sec and lower
181. nc col & asi, upp sec and higher
182. nc whi
183. fs afr, agric
184. fs afr, female, none
185. fs afr, female, primary
186. fs afr, female, lwr sec
187. fs afr, female, upp sec and higher
188. fs afr, male, none
189. fs afr, male, primary, low-inc
190. fs afr, male, primary, high-inc
191. fs afr, male, lwr sec, low-inc
192. fs afr, male, lwr sec, high-inc

193. fs afr, male, upp sec and higher, low-inc
194. fs afr, male, upp sec and higher, high-inc
195. fs asi & col
196. fs whi, lwr sec and lower
197. fs whi, upp sec
198. fs whi, tertiary
199. kz afr, agric, homeland
200. kz afr, agric, non-homeland, low-inc
201. kz afr, agric, non-homeland, high-inc
202. kz afr, homeland, female, none
203. kz afr, homeland, female, primary
204. kz afr, homeland, female, lwr sec
205. kz afr, homeland, female, upp sec and higher
206. kz afr, homeland, male, none
207. kz afr, homeland, male, primary
208. kz afr, homeland, male, lwr sec
209. kz afr, homeland, male, upp sec and higher
210. kz afr, non-homeland, female, none
211. kz afr, non-homeland, female, primary
212. kz afr, non-homeland, female, lwr sec
213. kz afr, non-homeland, female, upp sec and higher, low-inc
214. kz afr, non-homeland, female, upp sec and higher, high-inc
215. kz afr, non-homeland, male, none
216. kz afr, non-homeland, male, primary
217. kz afr, non-homeland, male, lwr sec, low-inc
218. kz afr, non-homeland, male, lwr sec, high-inc
219. kz afr, non-homeland, male, upp sec and higher, low-inc
220. kz afr, non-homeland, male, upp sec and higher, high-inc
221. kz asi, female, lwr sec and lower
222. kz asi, male, lwr sec and lower, low-inc
223. kz asi, male, lwr sec and lower, high-inc
224. kz asi, male, upp sec and higher, low-inc
225. kz asi, male, upp sec and higher, high-inc
226. kz col
227. kz whi, lwr sec and lower
228. kz whi, upp sec, low-inc
229. kz whi, upp sec, high-inc
230. kz whi, tertiary
231. nw afr, agric
232. nw afr, female, none
233. nw afr, female, primary
234. nw afr, female, lwr sec
235. nw afr, female, upp sec and higher
236. nw afr, male, none, low-inc
237. nw afr, male, none, high-inc
238. nw afr, male, primary, low-inc
239. nw afr, male, primary, high-inc
240. nw afr, male, lwr sec, low-inc
241. nw afr, male, lwr sec, high-inc
242. nw afr, male, upp sec and higher, low-inc
243. nw afr, male, upp sec and higher, high-inc
244. nw asi & col
245. nw whi, lwr sec and lower
246. nw whi, upp sec and higher
247. gt afr, agric
248. gt afr, non-homeland, female, none
249. gt afr, non-homeland, female, primary
250. gt afr, female, lwr sec
251. gt afr, non-homeland, female, upp sec, low-inc
252. gt afr, non-homeland, female, upp sec, high-inc
253. gt afr, non-homeland, female, tertiary
254. gt afr, non-homeland, male, none
255. gt afr, non-homeland, male, primary
256. gt afr, non-homeland, male, lwr sec
257. gt afr, non-homeland, male, upp sec
258. gt afr, non-homeland, male, unknown
259. gt afr, non-homeland, male, tertiary, low-inc
260. gt afr, non-homeland, male, tertiary, high-inc
261. gt col, lwr sec and lower
262. gt col, upp sec and higher
263. gt asi, lwr sec and lower
264. gt asi, upp sec and higher
265. gt whi, lwr sec and lower, low-inc
266. gt whi, lwr sec and lower, high-inc
267. gt whi, upp sec, low-inc
268. gt whi, upp sec, high-inc
269. gt whi, tertiary, low-inc
270. gt whi, tertiary, high-inc
271. mp afr, agric
272. mp afr, female, none
273. mp afr, female, primary
274. mp afr, female, lwr sec
275. mp afr, female, upp sec and higher
276. mp afr, male, none
277. mp afr, male, primary, low-inc
278. mp afr, male, primary, high-inc
279. mp afr, male, lwr sec, low-inc
280. mp afr, male, lwr sec, high-inc
281. mp afr, male, upp sec and higher, low-inc
282. mp afr, male, upp sec and higher, high-inc
283. mp asi & col
284. mp whi
285. lp afr, agric
286. lp afr, female, non & pre-primary
287. lp afr, female, primary
288. lp afr, female, lwr sec
289. lp afr, female, upp sec and higher, low-inc
290. lp afr, female, upp sec and higher, high-inc
291. lp afr, male, none
292. lp afr, male, primary, low-inc
293. lp afr, male, primary, high-inc
294. lp afr, male, lwr sec
295. lp afr, male, upp sec and higher, low-inc
296. lp afr, male, upp sec and higher, high-inc
297. lp asi & col
298. lp whi

Factors: Labour

299. wc afr skilled/high-skilled
300. wc afr semi-skilled
301. wc afr unskilled

302. wc col/asi high-skilled
303. wc col/asi clerks
304. wc col/asi service & shops
305. wc col/asi craft & trade
306. wc col/asi machine & plant ops
307. wc col/asi elementary
308. wc col/asi agric & domestic work/unspecified
309. wc whi high-skilled
310. wc whi skilled
311. wc whi semi- & unskilled
312. ec afr high-skilled
313. ec afr skilled
314. ec afr agric & fishery
315. ec afr craft & trade
316. ec afr machine & plan ops
317. ec afr elementary
318. ec afr domestic & unspecified
319. ec col/asi high-skilled/skilled
320. ec col/asi semi-/unskilled
321. ec whi high-skilled
322. ec whi skilled
323. ec whi semi-/unskilled
324. nc afr high-/skilled
325. nc afr semi-/unskilled
326. nc col/asi high-/skilled
327. nc col/asi semi-/unskilled
328. nc whi high-skilled/skilled
329. nc whi semi-/unskilled
330. fs afr high-/skilled
331. fs afr semi-skilled
332. fs afr unskilled
333. fs col/asi high-/skilled
334. fs col/asi semi-/unskilled
335. fs whi high-/skilled
336. fs whi semi-/unskilled
337. kz afr high-skilled
338. kz afr skilled
339. kz afr agriculture & fisheries
340. kz afr craft & trade
341. kz afr machine & plant ops
342. kz afr elementary
343. kz afr domestic & unspecified
344. kz col high-/skilled
345. kz col semi-/unskilled
346. kz asi high-skilled/skilled
347. kz asi semi-/unskilled
348. kz whi high-skilled/skilled
349. kz whi semi-/unskilled
350. nw afr high-/skilled
351. nw afr semi-skilled
352. nw afr unskilled
353. nw col/asi high-/skilled
354. nw col/asi semi-/unskilled
355. nw whi high-/skilled
356. nw whi semi-/unskilled
357. gt afr high-skilled
358. gt afr clerks
359. gt afr service & shops
360. gt afr craft & trade
361. gt afr machine & plant ops
362. gt afr elementary
363. gt afr domestic/agric/unspecified
364. gt col high-/skilled
365. gt col semi-/unskilled
366. gt asi high-/skilled
367. gt asi semi-/unskilled
368. gt whi high-skilled
369. gt whi skilled
370. gt whi semi-/unskilled
371. mp afr high-skilled
372. mp afr skilled
373. mp afr semi-skilled
374. mp afr unskilled
375. mp col/asi high-/skilled
376. mp col/asi semi-/unskilled
377. mp whi high-/skilled
378. mp whi semi-/unskilled
379. lp afr high-skilled
380. lp afr skilled
381. lp afr semi-skilled
382. lp afr unskilled
383. lp col/asi high-/skilled
384. lp col/asi semi-/unskilled
385. lp whi high-/skilled
386. lp whi semi-/unskilled

Factors: Other

387. Gross operating surplus mixed income (capital)
388. Land

Trade and Transport Margins

389. Transport margin
390. Trade Margin

Tax Accounts

391. Import duties (IMPTAX)
392. Production rebates (INDREF)
393. Production taxes (INDTAX)
394. Production subsidies (INDSUB)
395. Value added taxes in imports (VATM)
396. Value added taxes on domestic goods (VATD)
397. Sales subsidies (SALSUB)
398. Excise duty (ECTAX)

Other Accounts

399. Enterprises
400. Government
401. Savings
402. Stock Changes
403. Rest of World
404. Account Totals

9. Appendix B: Agricultural Regions in SAM

Region Name	Magisterial Regions	Value of Winter Cereal Production (R million)	Share of Region's Production in Total Winter Cereal Production	Winter Cereal's Share in Region's Production
FS Bethlehem	Bethlehem, Harrismith, Vrede, Frankfort, Reitz, Lindley, Senekal, Fouriesburg, Ficksburg	450.5	15.9%	15.4%
WC Swartland	Malmesbury, Hopefield, Piketberg, Vredenburg, Moorresburg	427.5	15.1%	20.1%
WC Ruens	Caledon, Hermanus, Bredasdorp, Swellendam, Heidelberg (Cape)	283.6	10.0%	10.7%
NC Hartswater	Herbert, Barkly West, Warrenton, Hartswater	274.6	9.7%	27.7%
FS Hoopstad	Kroonstad, Ventersburg, Hennenman, Parys, Vredefort, Koppies, Heilbron, Viljoenskroon, Bothaville, Wesselsbron, Hoopstad, Bultfontein, Theunissen	240.8	8.5%	7.2%
FS Bloemfontein	Bloemfontein, Botshabelo, Bethulie, Rouxville, Smithfield, Zastron, Brandfort, Winburg, Marquard, Clocolan, Excelsior, Ladybrand, Wepener, Dewetsdorp, Reddersburg, Edenburg, Trompsburg, Jagersfontein, Philippolis	202.6	7.2%	14.7%
FS Boshof	Boshof, Fauresmith, Jacobsdal, Koffiefontein, Petrusburg	182.7	6.5%	23.4%
NC Hopetown	Hopetown, Britstown, De Aar, Philipstown, Richmond, Hanover, Colesberg, Noupoort	75.3	2.7%	13.7%
Limpopo	Entire Limpopo Province	72.3	2.6%	1.4%
NC Kenhardt	Namakwaland, Kenhardt, Gordonia, Kimberley	67.6	2.4%	3.4%
NW Brits	Rustenburg, Brits	66.5	2.3%	5.2%
NC Prieska	Prieska, Carnarvon	61.9	2.2%	23.3%
WC Boland	Cape, Wynberg, Simon's Town, Goodwood, Bellville, Mitchells Plain, Stellenbosch, Kuils River, Somerset West, Strand, Paarl, Wellington, Worcester, Ceres, Tulbagh, Robertson, Montagu	60.4	2.1%	1.0%
Eastern Cape	Entire Eastern Cape	54.1	1.9%	1.3%
Mpumalanga	Entire Mpumalanga	52.0	1.8%	0.6%
NW Lichtenburg	Potchefstroom, Ventersdorp,	51.4	1.8%	1.6%

Region Name	**Magisterial Regions**	**Value of Winter Cereal Production (R million)**	**Share of Region's Production in Total Winter Cereal Production**	**Winter Cereal's Share in Region's Production**
	Coligny, Koster, Lichtenburg, Delareyville, Wolmaransstad, Schweizer-Reneke, Bloemhof, Christiana			
Gauteng	Entire Gauteng	37.9	1.3%	0.8%
NC Calvinia	Calvinia, Sutherland, Williston, Fraserburg, Victoria West, Kuruman, Postmasburg, Hay	37.8	1.3%	4.2%
FS Odendaalsrus	Odendaalsrus, Welkom, Virginia, Sasolburg	34.3	1.2%	8.6%
WC Knysna	Knysna, George, Mossel Bay, Riversdale	34.3	1.2%	4.0%
KwaZulu-Natal	Entire KwaZulu-Natal	25.5	0.9%	0.3%
WC Clanwilliam	Clanwilliam, Vredendal, Vanrhynsdorp	20.7	0.7%	2.7%
NW Vryburg	Vryburg, Klerksdorp, Marico, Swartruggens	13.0	0.5%	1.2%
WC Beaufort West	Oudtshoorn, Calitzdorp, Ladismith, Uniondale, Beaufort West, Laingsburg, Murraysburg, Prince Albert	3.3	0.1%	0.5%
		2 830	100%	

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