

# **SOUTH AFRICA TRADE LIBERALIZATION AND POVERTY IN A DYNAMIC MICROSIMULATION CGE MODEL**

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## **ABSTRACT**

South Africa has undergone significant trade liberalization since the end of apartheid. Average protection has fallen while openness has increased. The macroeconomic performance in this era of liberalizing trade has been unimpressive, with GDP growing by insufficient amounts to make inroads into the high unemployment levels. Poverty levels have also risen. The country's experience presents an interesting challenge for many economists that argue that trade liberalization is pro-poor and pro-growth. This paper uses a dynamic microsimulation CGE approach to examine the impact of further unilateral trade policy reforms on the South African economy with and without trade induced TFP increases. The main findings are that trade liberalization alone has very minimal short run macroeconomic consequences while its long term impacts are positive. The sectoral results indicate that sectors which initially faced high protection levels tend to be the ones to lose out disproportionately more from trade liberalization. Dynamic trade induced TFP increases tend to ameliorate the negative sectoral effects. The welfare outcomes are initially negative in the short run but turn positive if we allow for trade induced TFP increases. The welfare gains are positive in the long term. In terms of poverty, trade liberalization has no appreciable impact on poverty in the short run even if we allow for trade induced TFP increases. However, in the long run poverty is reduced. It falls even more when we allow for induced TFP increases. African and Coloured households gain the most in terms of welfare and numbers being pulled out of absolute poverty by trade liberalization.

# SOUTH AFRICA TRADE LIBERALIZATION AND POVERTY IN A DYNAMIC MICROSIMULATION CGE MODEL

Ramos Mabugu<sup>a</sup> and Margaret Chitiga<sup>b</sup>

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<sup>a</sup>Financial and Fiscal Commission, 2<sup>nd</sup> Floor Montrose Place, Waterfall Park, Bekker Street, Vorna Valley, Midrand, South Africa. Corresponding author. Tel.:+27 11 2072332; fax: +27 11 3889950. Email address: [ramosm@ffc.co.za](mailto:ramosm@ffc.co.za).

<sup>b</sup>Department of Economics, University of Pretoria, Pretoria 0002, South Africa Email address: [Margaret.chitiga@up.ac.za](mailto:Margaret.chitiga@up.ac.za).

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# SOUTH AFRICA TRADE LIBERALIZATION AND POVERTY IN A DYNAMIC MICROSIMULATION CGE MODEL

## 1. INTRODUCTION

South Africa has made significant strides towards trade liberalization since its readmission to the international community after successful free elections in April 1994. This followed years of international isolation imposed on the country due to its racially motivated apartheid policies. Trade as a share of output has risen, with both imports and exports contributing to this increase. Trade liberalization has been accompanied by responsible monetary and fiscal management and this has largely allowed South Africa to continuously experience moderate economic growth since 1994. Inflation has been within target, and the budget deficit has been falling in recent times. However, the economy has failed to grow in sufficient amounts to make inroads into the high unemployment and poverty (Hoogeveen and Özler, 2004)<sup>1</sup>. Indeed, the South African government has recently identified poverty alleviation as an important target of its development programmes.

The experience of South Africa presents an interesting puzzle for those who argue that trade liberalization reduces poverty and increases economic growth. Indeed, critics of trade liberalization seem to have gained an upper hand as the country has recently introduced quotas on Chinese textile imports starting in October 2006. The purpose of this study is to contribute to this debate by exploring systematically the welfare and poverty consequences of further trade liberalization in South Africa. More specifically, the paper seeks to investigate whether removing the remaining tariffs on South African imports would be detrimental for economic growth and poverty reduction. While South Africa has gone a long way in reducing tariffs, further liberalisation is still conceivable because a number of commodities including processed foods, vehicles and components, tobacco products, rubber

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<sup>1</sup> van der Berg et al. (2005) have recently presented evidence showing that that poverty has sharply declined in the last few years largely as a result of increases in social grants, which have significantly alleviated poverty. However, they agree that poverty levels are still very high.

products and the textiles and garments still receive substantial protection. In principle, therefore, there is scope to check whether further trade liberalisation does indeed lead to an acceleration of growth and productivity through greater allocative efficiency and better resource allocation as well as through factor accumulation effects.

In order to assess the impact of unilateral trade liberalization on the economy and on the poor, the study uses a sequential dynamic computable general equilibrium (CGE) model. The endogenous changes obtained from the sequential dynamic CGE model are then fed into a national survey data for predicted household poverty effects. We can draw similarities between our work and that of Annabi et al (2005a,b). There is a growing tradition of trade focused CGE modeling in South Africa, starting with the work of Gelb et al (1992) and followed by Cameron et al (1994)<sup>2</sup>. Recent prominent examples of South African CGE work include that of Coetzee et al (1997), Devarajan and van der Mensbrugghe (2000), Gibson (2000), Gibson and van Seventer (1996a,b; 1997a,b), Arndt and Lewis (2000), Thurlow and van Seventer (2002), McDonald and Kirsten (1999), Van Schoor and Burrows (2003), Chant et al (2001) and McDonald and Punt (2003a, 2003b), Go et al (2004), Thurlow (2004), Kearney and van Heerden (2005), van Heerden et al (2006), Fofana et al (2004, 2006) and Rattsø and Stokke (2005)<sup>3</sup>.

The rest of the paper is organised in the following way: Section 2 presents a description of key trade policy issues for South Africa. Section 3 presents the development of the model while section 4 is devoted to a discussion of the database used to run the model and carry out poverty analysis. Section 5 discusses simulations and results obtained. Section 6 summarizes the results and discusses policy observations emanating from the study.

## **2. SOUTH AFRICAN TRADE REFORM AND PERFORMANCE**

According to Bell (1992,1997), South African trade policy was broadly geared towards import substitution between 1925 and the 1970s. By the 1960s, manufacturing growth had

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<sup>2</sup> For a recent review of trade focused CGE modeling in South Africa, see Mabugu and Chitiga (2006).

<sup>3</sup> There are several other CGE models in use that runs on South African SAMs. Some of these include models at IDC (using a Monash based ORANI model), the World Bank, Global Insight and HSRC.

begun to slow down. As well, there was dissatisfaction with the continued dependence of the economy on gold for foreign exchange reserves. According to Roberts and Thoburn (2002), this failure of import substitution to enhance growth and diversify the economy away from gold is what triggered a change in policy direction away from import substitution beginning in the 1970s. In the 1980s there were renewed attempts to reform the trade regime. Quantitative restrictions continued to be reduced throughout. However, in some sectors such as textiles where structural adjustment was adopted with a view to increasing exports, the outcome was an increase in manufactured imports. According to Belli et al (1993), the 1980s as a whole ended up being highly protective as South Africa ended up with not only the highest tariff rates but also the widest tariff range. Tariff dispersion had become very high. The year 1990 marked renewed attempts to increase exports through the General Export Incentive Scheme (GEIS). In the mid-1990s with political change gripping the country, there was a review of macroeconomic and industrial policy regimes that marked the start of the process of fully-fledged trade liberalization. In 1994, a decision to phase out the GEIS that was considered to be inconsistent with GATT and WTO rules was reached, and eventually they were terminated in 1997<sup>4</sup>.

In 1994 most of the quantitative restrictions had been removed, although quantitative restrictions on agricultural products were still in place. In the same year, the country signed the Marrakech Agreement under the Uruguay Round of the GATT. In that settlement, the country agreed binding 98 percent of all tariff lines. As well, the deal involved reducing the number of tariff lines to six, rationalising the twelve thousand commodity lines and replacement of quantitative restrictions on agriculture by tariff equivalents. South Africa has made a lot of progress towards meeting these commitments, reforming and simplifying its tariff structure. According to the Economist Intelligence Unit, the total number of HS8-digit commodity lines declined to 6,700 in 2004. The HS (Harmonized System) 8-digit lines bearing formula duties declined from 1900 in 1993 to 5 in 2002 (WTO, 1998,2002). The number of lines with specific tariffs has fallen from 500 in 1993 to 195 in 2002. Commodity lines with mixed non-ad valorem duties have fallen from 160 in 2000 to 60 in 2004. Despite these efforts towards simplifying the tariff regime, the number of ad valorem

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<sup>4</sup> As pointed out in Rangasamy and Harmse (2003), GEIS was also phased out as a result of a policy shift that entailed tariff liberalization as a means of reducing the anti-export bias in the economy.

rates still stands at 38 which is higher than the 6 offered in the 1994 GATT/WTO Uruguay round offer. Including the non-ad valorem tariff rates raises the number to over 100 different rates. This suggests that while progress has been made with trade liberalization, the tariff structure still remains dispersed (discriminatory) and complex.

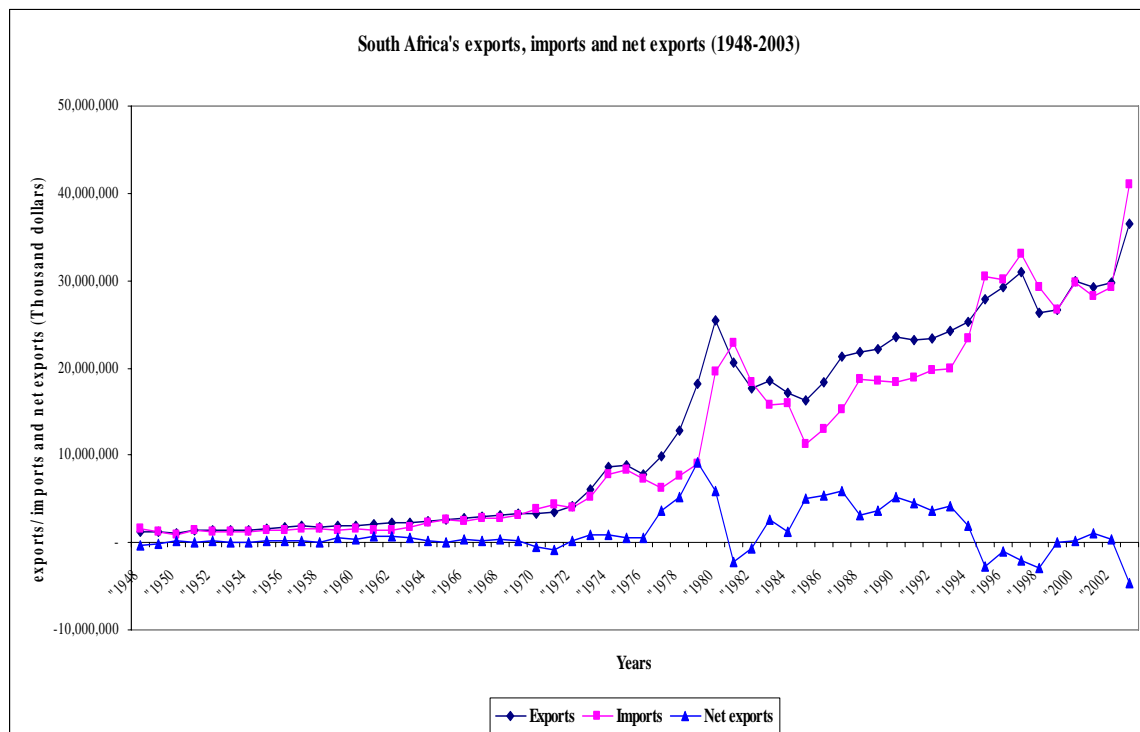
South Africa's trade policy is not only driven by multilateral arrangements but also by bilateral and regional agreements. There are two significant Free Trade Areas (FTAs) that the country has so far concluded. The first is the European Union (EU) – South Africa FTA that was agreed in 1999 and became operational in January 2000. This agreement is asymmetric in nature. While 95 percent of South Africa's exports to the EU will be free of duty at the end of the 12-year lifespan of the agreement, South Africa is obligated to open only 86 percent of its imports from the EU (about 73 percent of its industrial tariff lines) in the same period. There are some exemptions for clothing and textiles, footwear and automotive products where tariffs are scaled down but not completely removed.

The second FTA is with the Southern Africa Development Corporation (SADC) known as the SADC Protocol. It came into effect in August 1996 but was not ratified by all parties at this time. South Africa as the dominant economy in the region is obliged in the agreement to undertake faster liberalisation reforms and a set of "general offers". On the other hand the other countries are allowed a set of "differential offers" implemented over a longer period than South Africa. The agreement is expected to be phased in over eight years. According to this schedule, 98 percent of SADC regional trade should be on duty free basis by 2012.

South Africa still has certain general preference schemes with Zimbabwe and Malawi. South Africa held the first meeting on the Joint Commission of Co-operation with Angola in February 2003. South Africa also benefits from United States of America (USA)'s African Growth and Opportunity Act (AGOA) scheme. It is estimated that approximately 6500 South African products qualify for export under this preference scheme for 8 years starting in 2000. The USA International Trade Commission estimates that AGOA accounted for US\$1.7 billion worth of exports from South Africa in 2004 (30 percent of South Africa exports to the USA), up from US\$1.3 billion in 2002. There are other planned FTAs with India, Brazil and the United States of America. In addition South Africa and Tanzania have

signed a memorandum of understanding on trade and industry programmes and a general agreement on economic, scientific, technical and cultural co-operation.

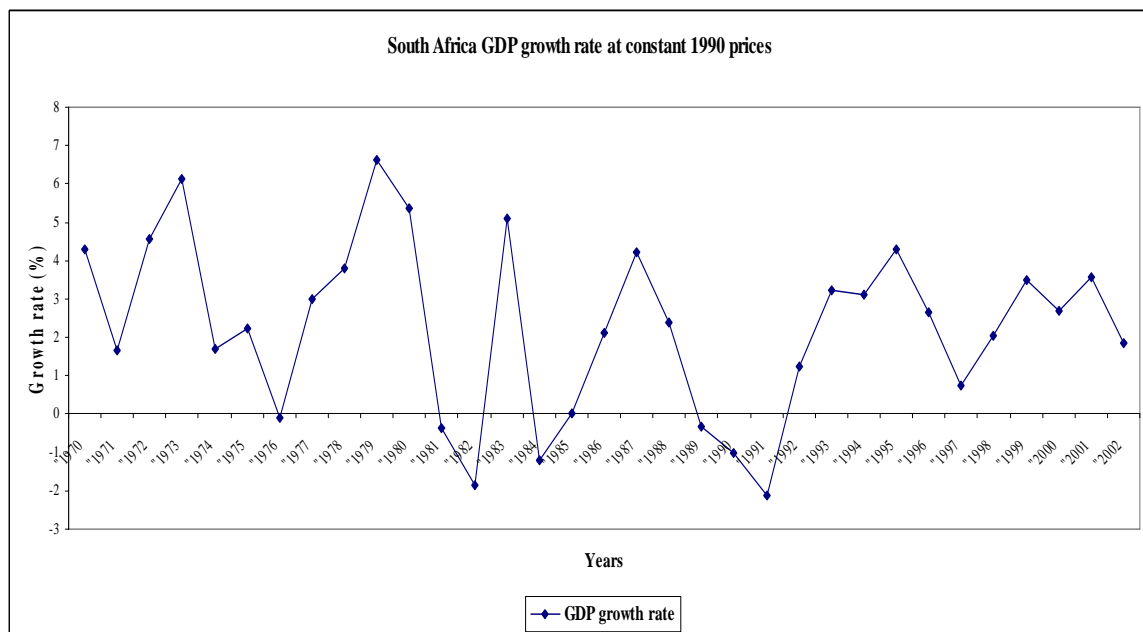
Trends in exports, imports and net exports from 1948 to 2003 are illustrated in Figure 1 below. As shown in the figure, there was a gradual increase in exports and imports from 1948 to around 1970. Figure 1 shows the dominant influence of high gold prices in the 1980s as well as the negative impact of international sanctions on the country's trade performance. The aggregate response of trade to the opening up in 1994 has been quite dramatic. Closer inspection shows that the trade ratio started to grow in 1992, perhaps reflecting the post apartheid reintegration. The slowdown in 1997-99 was probably related to the Asian crisis, but may also reflect the ending of the impetus provided by the ending of apartheid as observed by Davies and van Seventer (2004). The acceleration after 1999 reflects both world recovery and domestic liberalisation policies starting to make an impact (Davies and van Seventer (2004)).



**Figure 1: Trends in exports, imports and net exports from 1948-2003**

Source: The Department of Trade and Industry website, South African Trade Statistics.

Figure 2 shows the macroeconomic performance of the South African economy as measured by changes in the gross domestic product (GDP) from 1970-2003. The growth in GDP has been quite volatile over the years. There was a gradual increase from 1970 to 1980 though the growth was not even. Slow growths were observed from 1970 -1972 and 1974-1976. However, the economy generally performed well for this time period. The growth in between 1980 and 1983 was almost constant though there was a decline in 1982. GDP then declined sharply between 1983 and 1985. The period from 1986 to 1995 witnessed gradual increases. This was, however, followed by a gradual decline from 1996 to 2002 and an increase in 2003 (not shown in the figure).



**Figure 2: South Africa GDP growth from 1970-2002**

Source: United Nations Statistics Division website

There are a growing number of studies suggesting growing poverty levels in South Africa<sup>5</sup>. According to the World Bank (1999), extreme poverty is concentrated mainly in rural areas where over 75 per cent of the households cannot meet the minimum food requirements. Using a poverty line of 1 US\$ per capita per day, the study argues that urban poverty is much less acute, with only about 10 per cent of the households below the poverty line. The UNDP (2000) gives the rate of poverty as 45%. This is despite the fact that South Africa is classified

<sup>5</sup> See for example Gelb (2003).



as an upper middle- income country. Poverty differs greatly by region and by race, with the majority of the poor being African Africans and those unemployed (Klassen and Woolard (1998)).

Inequality in South Africa was largely defined in the past along racial lines. Table 1 shows the changes in inequality in South Africa as a whole as well as the changes by population group and type of area using three inequality measures: the Gini Index, mean log deviation, and the Theil Index. As shown in the table, the Gini coefficient for South Africa slightly increased from 0.56 to 0.58, indicating increasing income differentials. Mean log deviation went up from 0.56 to 0.61. The distribution between and among racial groups significantly worsened over the five-year period. There was a significant increase in inequality among the African population. Inequality also slightly increased among Coloreds and slightly decreased among Asians and Whites. In addition inequality slightly increased between the urban and rural areas.

<Table 1>: Changes in inequality between 1995 and 2000

		1995	2000
South Africa	Gini Index	0.565 (0.005)	0.577 (0.005)
	Mean Log Deviation	0.563 (0.011)	0.607 (0.012)
	Theil Index	0.608 (0.014)	0.617 (0.012)
Africans	Gini Index	0.467 (0.007)	0.501 (0.005)
	Mean Log Deviation	0.370 (0.011)	0.436 (0.010)
	Theil Index	0.414 (0.015)	0.460 (0.012)
Coloreds	Gini Index	0.439 (0.009)	0.453 (0.008)
	Mean Log Deviation	0.326 (0.014)	0.359 (0.012)
	Theil Index	0.345 (0.016)	0.348 (0.013)
Indians/Asians	Gini Index	0.398 (0.019)	0.374 (0.014)
	Mean Log Deviation	0.265 (0.025)	0.243 (0.021)
	Theil Index	0.287 (0.034)	0.233 (0.018)
Whites	Gini Index	0.344 (0.007)	0.319 (0.009)
	Mean Log Deviation	0.203 (0.008)	0.179 (0.011)
	Theil Index	0.201 (0.007)	0.172 (0.011)
Urban	Gini Index	0.527 (0.006)	0.533 (0.006)
	Mean Log Deviation	0.502 (0.013)	0.517 (0.013)
	Theil Index	0.494 (0.013)	0.502 (0.013)
Rural	Gini Index	0.493 (0.009)	0.502 (0.008)
	Mean Log Deviation	0.410 (0.016)	0.428 (0.014)
	Theil Index	0.513 (0.022)	0.516 (0.022)

Source: Hoogeveen and Özler (2004).

### 3. THE SEQUENTIAL DYNAMIC CGE FOR POVERTY ANALYSIS AND DATA

#### 3A. The Model

This section presents the structure of the poverty focused sequential dynamic CGE model applied to South African data. This model is based on Annabi *et al.* (2005a, 2005b). The static part of the model is fairly standard and follows from the EXTER+ model (Fofana *et al.* (2004, 2006)). Sequential dynamics is built into the EXTER+ model for a small open economy so that the dynamics do not influence world prices and interest rates. Early recursive dynamic CGE models include the work of Bchir *et al.* (2002), Bourguignon *et al.* (1989) as well as Jung and Thorbecke (2000). Taking into account South African CGE literature, the model's dynamic structure is similar to that proposed by Thurlow (2004).

Arndt and Lewis (2001) develop a similar model structure to analyse the consequences of AIDS on the economy. Rattsø and Stokke (2005) analyse trade liberalization in a dynamic Ramsey model and that growth specification is of direct relevance to our model.

The static part of the model broadly has a production and demand side interacting simultaneously. Overall output is modelled using a Leontief production structure. Value added in turn is a constant elasticity of substitution (CES) combination of labour and capital. Total capital demand is derived from cost minimization subject to the CES function. Labour is a CES aggregation of skilled and unskilled labour. All labour categories are assumed mobile across sectors and wages are crucial for income distribution. Capital, on the other hand, is sector-specific in the short run, implying rising supply curves on the real side but is allowed greater mobility in the long run when dynamics set in. As a result of this asymmetry, we would expect greater volatility in the rental capital return in the short run and broad convergence in the long run. The choice between domestic and imported inputs is specified as a CES function. On the demand side, households maximise Stone Geary type utility functions subject to their budget constraints, yielding linear expenditure system demands. The Armington assumption is used to model the choice between domestic and imported goods by households for final consumption. General equilibrium requires that the goods and factor markets are in equilibrium and the fundamental macroeconomic identity is satisfied. The goods market clears when demand and supply are equated via the material balance condition in each period. The fundamental macroeconomic identity requires the equality between investment and savings. The model has two options for revenue compensation in response to a trade liberalization that may reduce tariff revenue. The adjustments could be on the indirect tax rate or on the direct tax rate. Finally, the nominal exchange rate is chosen to be the numéraire for each period.

The static model is made sequential dynamic by a set of cumulation and updating rules from one year to the next. Growth in the total supply of labour is endogenous and is driven by an exogenous population growth rate. Since we lack data about the evolution of the labour participation rate in the future, we use the growth rate of population instead of the labour force and this implies that the labour participation rate is constant over time. It is also assumed that minimal consumption in the linear expenditure system.

Current period's investment augments the capital stock in the next period. Capital stock for each sector is updated by an accumulation function that equates next-period capital stock ( $K_{i,t+1}$ ), to the depreciated capital stock of the current period and the current period's quantity of investment ( $INV_{i,t}$ ) as follows:

$$K_{i,t+1} = (1 - \delta)K_{i,t} + INV_{i,t}$$

A key question to resolve is how to allocate new investments between the different competing sectors. The literature suggests two approaches: using a capital distribution function (see Abbink *et al.* (1995)) or using an investment demand equation. We opt for the investment demand approach that fits in well with the data that we have available on investment by destination. There are now a number of alternative specifications of the investment by destination functions in the literature (see for example Bchir *et al.* 2002). The most well known in dynamic CGE circles and one that we use in this work follows from the work of Bourguignon *et al.* (1989) and later elaborated on in Jung and Thorbecke (2000) and Annabi (2003). It takes the following form:

$$\frac{INV_t^i}{K_t^i} = \kappa_{1i} \left( \frac{R_t^i}{U_t} \right)^2 + \kappa_{2i} \left( \frac{R_t^i}{U_t} \right)$$

where  $\kappa_{1i}$  and  $\kappa_{2i}$  are positive parameters calibrated on the basis of the investment elasticity and the investment equilibrium equation. The investment rate is increasing with respect to the ratio of the rate of physical return to capital ( $R_t^i$ ) and its user cost ( $U_t$ ). The user cost is the resulting dual price of investment multiplied by the sum of the depreciation rate and exogenous real interest rate. Investment by destination is used to satisfy the equality condition by being set equal to the investment by origin observations found in the benchmark data. It is also used to calibrate the sectoral capital stocks in base run.

All other variables that are nominally indexed such as transfers are also subject to dynamic updating. The model is solved over a twenty-year time horizon and is checked to confirm that it is homogeneous of degree zero in prices and satisfies Walras Law.

The model addresses both comparative static and dynamic impacts of trade liberalization. The dynamic effects captured so far are due to more efficient allocation of capital and labour to sectors over time, as factor supplies grow, and caused by trade liberalization. In other words, it is the comparative static story of trade liberalization repeated year by year as factor supplies grow. This channel usually leads to very small impacts. New trade theory has now moved beyond only looking at neoclassical market structures to consider things such as increasing returns to scale, imperfect competition, technology transfers and dynamic links such as those between trade liberalization and total factor productivity (TFP). The model is extended so as to capture trade induced TFP increases. There is some literature in South Africa that points to the importance of openness and domestic factors in inducing TFP growth that is used to inform this study. Johnsson and Subramanian (2001), based on econometric evidence conclude that a one percentage point fall in nominal tariffs raises total factor productivity growth rate by 0.74 percentage points. They also find a role for machinery and equipment investment for TFP growth. In follow up work, Harding and Rattsø (2005) and Rattsø and Stokke (2005) emphasise adoption and innovation factors in explaining endogenous TFP in South Africa and offer econometric evidence supporting this claim. Ferdekke and Vase (2001)'s work emphasises domestic factors in explaining TFP growth, highlighting a key role played by the ratio of skilled to unskilled labour for TFP growth. We explore, albeit in an ad hoc fashion, the likely influence of these trade induced TFP changes on growth and poverty in South Africa.

To carry out poverty analysis, we follow the top down approach. This procedure involves first obtaining results summarizing the effects of trade liberalization from the sequential dynamic CGE model. In a second step, these results are fed into a micro simulation household model to obtain the predicted household effects. Data from the 2000 Household Income and Expenditure Survey of South Africa and Labour Force Survey were used

(Statistics South Africa, 2001, 2002)<sup>6</sup>. The survey is nationally representative and has detailed information on household consumption patterns, income and household characteristics such as area, gender, number of persons and socio-economic characteristics. Non – parametric approaches are used based on the observed distribution of these households in the survey, their sample weights, number of individuals in the household and their independent characteristics of ethnicity, skill type and region. We have used the publicly available and efficient software called Distribution Analysis Software (DAD) for poverty analysis (Duclos *et al.* 2002). DAD allows us to compute many poverty descriptive indicators. The one that we are interested in for this particular study are the well known Foster Greer and Thorbecke (FGT) measures which can be summarised thus (see Foster *et al.* 1984):

$$P_{\alpha} = \frac{1}{Nz^{\alpha}} \sum_{j=1}^J (z - y_j)^{\alpha}$$

where  $j$  is a subgroup of individuals with consumption below the poverty line ( $z$ ),  $N$  is the total sample size,  $y$  is expenditure of a particular individual  $j$  and  $\alpha$  is a parameter for distinguishing between the alternative FGT indices<sup>7</sup>.

### 3B. The Data

To capture the base year structure of the South African economy, we have relied on a 2000 South African SAM that was developed by Thurlow and van Seventer (2002) under the auspices of the International Food Policy Research Institute (IFPRI). The original SAM includes 43 sectors, 14 household types, a government sector, enterprise and the rest of the world. The SAM has 4 factors of production, namely capital, unskilled, semi-skilled and

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<sup>6</sup> It should be noted that there is an active literature discussing the merits and demerits of this household survey (see for example Simkins, 2003; Hoogeveen and Özler, 2004). The main criticism center on the perceived inadequacies of the sampling weights used, the lack of information required to impute comparable values on home produced goods and the lack of relevant quantities data to compute ‘unit values’ and price data to compute food prices at the community level. The latter two criticisms are largely irrelevant for this work since the CGE model is used to generate price and quantities information while Simkins (2003) has demonstrated that the 2000 sampling weights are not as unreliable as first feared.

<sup>7</sup> When  $\alpha = 0$  the expression simplifies to  $\frac{J}{N}$ , or the headcount ratio. This is a measure of the incidence of poverty. When  $\alpha = 1$  the expression gives us poverty depth measured by the poverty gap. When  $\alpha = 2$  the expression gives us the severity of poverty measured by the squared poverty gap.

skilled labour. In this study, an aggregated version of this SAM that includes 10 sectors, 3 factors of production (capital, skilled and unskilled labor) and 16 household types distinguished by region, skill and ethnicity is used.

The following are the 10 sectors used including their constituent parts:

1. Agriculture – comprising agriculture, fishing and forestry, referred to as AGRI
2. Mining – comprising gold, coal and other mining, referred to as MINI
3. Food – comprising food, beverages and tobacco, referred to as FOOD
4. Textiles – comprising textiles, apparel, leather and footwear, referred to as TEXT
5. Manufacturing – comprising paper products, printing, rubber, plastic, glass, non metal mineral products, iron, non ferrous metals, machinery, electric machinery, communication equipment, scientific equipment, other industries, wood, metal products and furniture, referred to as MANF
6. Petroleum, referred to as PETRO
7. Chemicals – comprising basic chemicals and other chemicals, referred to as CHEM
8. Vehicles – comprising vehicles and transport equipment, referred to as VEHI
9. Capital Goods – comprising electricity, water and construction, referred to as CONS
10. Services – comprising wholesale, trade, hotels and accommodation, transport services, communication, finance and insurance, business services, medical and other services, other producers and government services, referred to as SERV

According to Table 2, services is the largest sector in terms of value added, making up over 66 percent of value added, followed by manufacturing, mining and capital goods which together account for about 20 percent of value added. Unlike other sub-Saharan African countries, the share of the agriculture and food sectors in value added is very small, each contributing roughly 3 percent of value added. While the economywide tariff is relatively low at about 3.2 percent, this masks significant sectoral variation which highly distorts the trade regime. The highly protected sectors are textiles (11.9 percent), food (6.2 percent), vehicles (4.3 percent) and chemicals (3.6 percent). Agriculture is mildly protected, facing an average protection of 1 percent. The remaining sectors, notably mining, capital goods, petroleum and services are receiving little to no protection.

Mining is the most dominant sector on the trade scene, contributing about 34 percent of total exports. This is followed by manufacturing (26 percent) and then services (15 percent). An almost similar pattern is repeated by looking at export intensity. This measure shows that mining, manufacturing, petroleum and chemicals are very important intensive exporters of

their output. Notice that these sectors are the most capital intensive in the economy. The relatively labour intensive sectors of textiles and services have small export intensities. With the exception of capital goods and services, the rest of the sectors face significant competition from foreigners for the domestic market.

<Table 2>: Initial sectoral shares

	Tariff rate	Sectoral share in			Import Penetration	Export Intensity	Share in Value Added		Sectoral Wage Share	Sectoral Capital Share
		Value Added	Imports	Exports			Wages	Capital		
Agriculture	0.70	3.16	1.60	2.71	6.39	11.37	1.07	2.09	2.10	4.27
Mining	0.01	6.49	10.20	33.44	49.48	78.08	3.09	3.40	6.05	6.95
Food	6.15	3.11	4.60	5.28	7.97	9.92	1.38	1.73	2.70	3.54
Textiles	11.87	1.05	3.51	2.16	17.00	12.25	0.81	0.24	1.59	0.49
Manufacturing	5.42	8.77	35.58	26.07	26.82	22.95	5.05	3.72	9.89	7.61
Petroleum	0.07	1.39	1.21	3.53	31.56	30.12	0.20	1.19	0.39	2.43
Chemicals	3.58	2.05	9.74	5.67	25.43	18.05	1.10	0.95	2.15	1.95
Vehicles	4.28	1.50	15.37	6.14	35.63	19.69	0.89	0.61	1.73	1.25
Capital Goods	0.00	5.53	0.47	0.53	0.90	1.13	2.63	2.90	5.14	5.93
Services	0.00	66.95	17.73	14.48	4.57	4.16	34.88	32.07	68.25	65.59
TOTAL	3.21	100.00	100.00	100.00	12.56	13.74	51.10	48.90	100.00	100.00

Source: Own computations based on constructed SAM 2000

The IFPRI SAM identifies 14 representative households according to their levels of income. Unlike the IFPRI SAM where households are identified according to income level, in this paper households are defined taking into account exogenous characteristic of the representative groups such as rural-urban, ethnicity and skill level of the head of household. We have used the Income and Expenditure Survey (IES) of 2000 and the Labour Force Survey (LFS) of September 2000 to form the following 16 households:

UASK	Urban African Skilled Households
UCSK	Urban Coloured Skilled Households
UI SK	Urban Indian Skilled Households
UWSK	Urban White Skilled Households
UAUSK	Urban African Unskilled Households
UCUSK	Urban Coloured Unskilled Households
UIUSK	Urban Indian Unskilled Households
UWUSK	Urban White Unskilled Households
RASK	Rural African Skilled Households



RCSK	Rural Coloured Skilled Households
RISK	Rural Indian Skilled Households
UWSK	Rural White Skilled Households
RAUSK	Rural African Unskilled Households
RCUSK	Rural Coloured Unskilled Households
RIUSK	Rural Indian Unskilled Households
RWUSK	Rural White Unskilled Households

Urban households spend disproportionately more of their income on services than rural households. It's important to recall that services have no nominal protection. On the other hand, rural households spend disproportionately more on primary agriculture commodities and foodstuffs than their urban counterparts. Both these commodities receive some amount of protection. When it comes to manufactured goods, we notice that urban households consume marginally more than rural households. Ethnicity also plays a role. Whites are the most important consumers of services, followed by Indians. Whites also consume disproportionately more of primary agriculture than other racial groups. Africans and Coloureds are by far the most important consumers of foodstuffs. Indians consume disproportionately more of the mining good than any other group while Whites consume significantly fewer textiles than other groups. Coloureds consume less manufactured goods than all other groups. These consumption patterns imply that changes in the consumer prices of these goods resulting from trade policy intervention have quite differential impacts on each household category depending on which goods experience price rises or falls.

A major hurdle that needed to be cleared involved what poverty line to use for the analysis. The choice was made difficult by the fact that there is no official poverty line for South Africa and different analysts use different poverty lines. Some researchers use the 'cost of basic needs' approach to draw normative poverty lines. Using this approach, Hoogeveen and Özler (2004) argue that a reasonable poverty line for South Africa lies between R322 (lower bound poverty line) and R593 (upper bound poverty line) per capita per month in 2000 prices. There is also the internationally known US\$2 per day poverty line that translates to R174 per capita per month. As pointed out in Hoogeveen and Özler (2004), this is very similar to the poverty line of R105 per capita per month in 1993 prices used by Deaton (1997). The 'dollar a day' poverty line is also another poverty line typically used. It translates

to R87 per capita per month in 2000 prices. Table 3 reports computed poverty measures using these different poverty lines.

<Table 3>: FGT measures for different poverty lines in South Africa

	P0				P1				P2			
	1 US\$p.d	2US\$p.d	R322/m	R593/m	1US\$p.d	2US\$p.d	R322/m	R593/m	1US\$p.d	2US\$p.d	R322/m	R593/m
SA	9.2	29.6	52.6	70.4	2.8	11.2	25.6	42.6	1.3	5.7	15.4	29.8

Source: Own computations based on Income and Expenditure Survey 2000

*Notes: P0, P1 and P2 are respectively poverty headcount, poverty gap and squared poverty gap. The first two poverty lines are on a per capita per day basis while the latter two are on a per capita per month basis.*

In this study we make use of the 3864 South African rands per year as suggested by Hoogeveen and Özler (2004) and Fofana et al (2006). According to Table 4, 53 percent of South Africans were poor in 2000 according to the lower bound ‘cost of basic needs approach’ poverty line. The poverty gap was 25 percent while the poverty gap squared (severity) was 15 percent. Poverty headcount, its incidence and severity are more widespread in rural areas than in urban areas (see Table 4). According to Table 4, it is clear that poverty affects mainly unskilled African and Coloured households where 61 and 36.2 percent respectively are classified as poor. Poverty is very low among Asian households and is even lower amongst White households at 0.1 percent. As to be expected, all skilled households are not poor.

<Table 4>: Poverty and inequality indexes (in percent)

	Initial Values in 2000		
	P0	P1	P2
<b>South Africa</b>	53	25.3	15
<b>Residential Area</b>			
Urban	42.4	18.4	10.2
Rural	68.3	35.4	22.1
<b>Ethnic group</b>			
African household	61	29.5	17.6
Coloured household	36.2	14.7	7.8
Indian household	6.4	2.3	0.8
White household	0.1	0	0
<b>Region, Ethnic and skill group</b>			
Urban African Skilled	0	0	0
Urban Coloured Skilled	0	0	0
Urban Indian Skilled	0	0	0
Urban White Skilled	0	0	0
Urban African Unskilled	17.9	10.08	5.5
Urban Coloured Unskilled	8.3	5.02	2.1
Urban Indian Unskilled	1.8	0.78	0.25
Urban White Unskilled	0.02	0	0
Rural African Skilled	0	0	0
Rural Coloured Skilled	0	0	0
Rural Indian Skilled	0	0	0
Rural White Skilled	0	0	0
Rural African Unskilled	43.6	15.4	11.2
Rural Coloured Unskilled	29.7	11.6	3.4
Rural Indian Unskilled	3.9	1.5	0.4
Rural White Unskilled	0.06	0	0

Legend: P0=Poverty headcount; P1= Poverty gap; and P2= Poverty severity

#### 4. SIMULATION RESULTS

This section examines the impact of two trade liberalization scenarios that are assumed to commence in 2008. The two scenarios are as follows:

- *Unilateral trade liberalization.* The core simulation for this paper is a unilateral trade liberalization involving a complete removal of all import tariffs. No dynamic trade induced TFP increase is assumed.

- *Unilateral trade liberalization coupled with dynamic trade induced TFP increases:* This simulation is similar to the first one but includes TFP effects induced by trade liberalization.

In both simulations, the assumption made is that government budget equilibrium is arranged by an endogenous uniform increase in indirect taxes through the Euler price equations. Alternative compensatory tax mechanisms – direct income tax, sales tax and value-added tax – could also be used. An adjustment variable is introduced in the investment demand functions to handle savings-investment equilibrium. As pointed out in Annabi et al (2005), it is important to note that in dynamic analysis the economy is growing even without a shock. As a result, the relevant counterfactual to compare the results to is this ‘business as usual’ (BAU) growth path unlike in static CGE analysis where the relevant counterfactual is the base year SAM.

### **3A. Unilateral trade liberalization**

#### *Macroeconomic effects*

Table 5 below summarizes the macroeconomic effects of a full trade liberalization scenario without including dynamic trade induced productivity gains. Immediately we can see that trade liberalization has a very small effect on the macroeconomy, an observation that is consistent with the observation that South Africa already has very low import tariffs so that their removal will not have major impacts on the economy. Taking 2009 as the short run, Table 5 shows that trade liberalization increases GDP by only 0.02 percent in the short run and leads to small but positive increases in GDP over the rest of the policy period (2010-2020) due mainly to accumulation effects. The minor short run contraction in 2008 is explained by the contraction in previously highly protected sectors induced by increased import competition when the period is too short for capital to have relocated to the expanding export intensive sectors<sup>8</sup>.

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<sup>8</sup> Annabi et al (2005) find a similar effect in a study on Bangladesh.

<Table 5>: Macroeconomic effects of unilateral trade liberalization (% change from BAU path)

	GDP PATH	CONSUMPTION	INVESTMENT	EXPORTS	IMPORTS	SKILLED WAGE	UNSKILLED WAGE	CONSUMER PRICE INDEX	CAPITAL GOOD PRICE	USER CAPITAL COST
2007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	-0.01	-1.75	0.67	2.74	2.87	-1.87	-1.80	-1.53	-2.61	-1.90
2009	0.02	-1.63	0.67	2.96	2.98	-1.76	-1.65	-1.46	-2.34	-1.84
2010	0.05	-1.53	0.69	3.14	3.08	-1.67	-1.53	-1.41	-2.06	-1.79
2011	0.07	-1.44	0.71	3.30	3.17	-1.58	-1.43	-1.36	-1.86	-1.76
2012	0.10	-1.37	0.73	3.44	3.25	-1.51	-1.33	-1.32	-1.72	-1.73
2013	0.12	-1.30	0.74	3.56	3.32	-1.45	-1.25	-1.28	-1.63	-1.70
2014	0.14	-1.24	0.74	3.66	3.37	-1.39	-1.17	-1.25	-1.57	-1.68
2015	0.17	-1.19	0.75	3.74	3.42	-1.33	-1.11	-1.23	-1.53	-1.66
2016	0.18	-1.14	0.75	3.82	3.46	-1.29	-1.05	-1.21	-1.52	-1.65
2017	0.20	-1.10	0.76	3.88	3.50	-1.25	-1.00	-1.20	-1.51	-1.64
2018	0.22	-1.07	0.76	3.93	3.53	-1.21	-0.96	-1.19	-1.51	-1.63
2019	0.23	-1.04	0.76	3.98	3.56	-1.18	-0.93	-1.18	-1.51	-1.62
2020	0.24	-1.02	0.75	4.01	3.58	-1.15	-0.90	-1.18	-1.51	-1.62

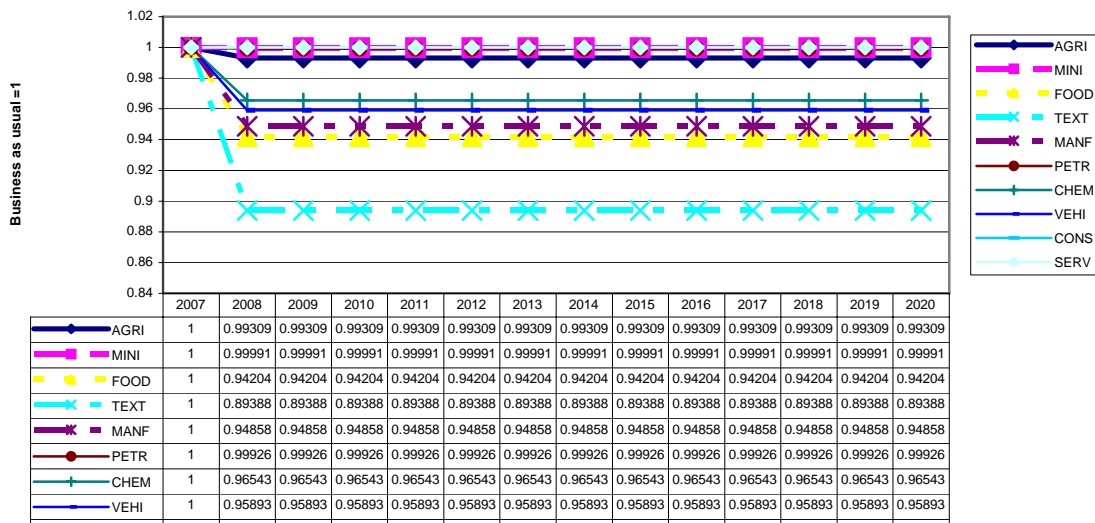
Both the rental and the user cost of capital decline in both the short and long run, but the rental return to user cost ratio increases in the long run. As a result, we notice that full trade liberalization leads to growth in investment by destination, with the long run response being stronger than the short run response. Similarly, the trade liberalization induced decline in domestic import prices leads to an increase in imports in the short and long run. The consumer price index also falls in the short and long run in response to reduced production costs made possible by lowering of tariffs. This, coupled with the ensuing decrease in domestic costs of production and the real exchange rate depreciation induces exports to increase in the short and long run. Exports grow more than imports in the long run. Because of the volume movement in exports and imports, sales on the domestic market fall. Both skilled and unskilled wages decline throughout the period following reduced demand for labour from the contracting labour intensive sectors. The short run contraction is more severe than the long run contraction since in the long run capital will have reallocated to the more efficient sectors compared to the short run. As well, unskilled wage rates contract much less than skilled wages. In line with GDP developments, welfare as measured by the

dynamic equivalent variation also falls initially in the short run but increases thereafter. These welfare changes are consistent with the fall in consumer price index being less than the fall in consumption in the short run while the fall in consumption in the long run is less than the fall in consumer price index. Based on the headcount ratio it can be concluded that poverty headcount is largely unaffected in the short run but declines in the long run. The amounts involved are very small.

### *Sectoral effects*

The initial impact of the unilateral tariff removal is felt in import prices that fall for those sectors initially with positive levels of protection as shown in Chart 1. The fall in import prices is related directly to initial tariff protection, hence import prices fall the most in the textiles sector which has the highest initial protection, followed by food, manufacturing, vehicles, chemicals and agriculture. The import prices for the remaining sectors is virtually unchanged since their import duty is zero or very small.

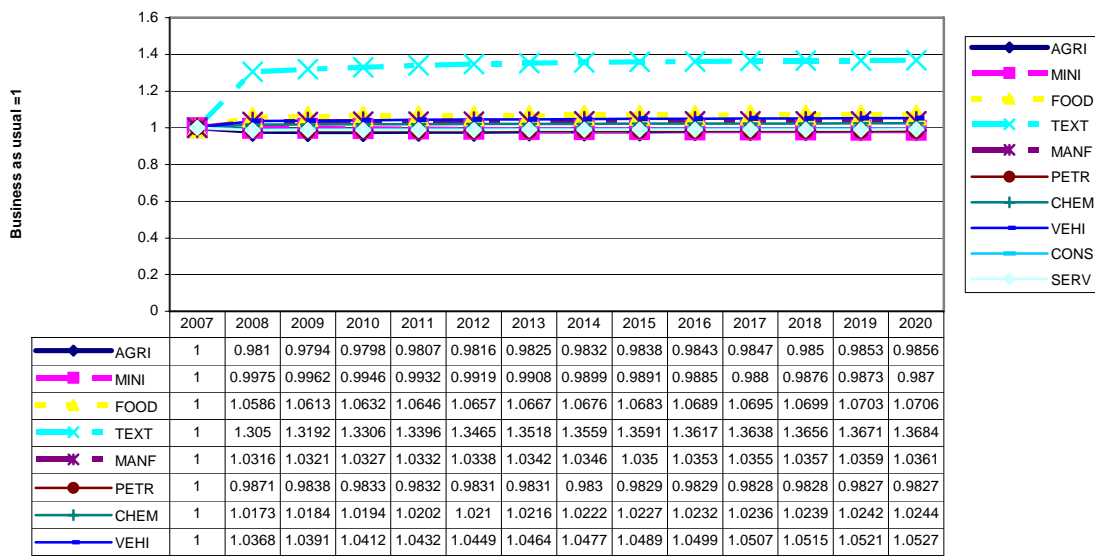
**Chart 1: Evolution of import price (domestic) following a trade liberalization**



The reduction in domestic import prices and initial import penetration ratios for each sector are what explain the resulting sectoral import demands following unilateral trade liberalization (see Chart 2). Imports rise the most for textiles, followed by food, manufacturing, vehicles and chemical products. The increase is higher in the long run

compared to the short run. These sectors have relatively higher initial tariff protection and import penetration. Imports remain virtually unchanged or fall slightly both in the short run and in the long run for the other sectors, most notably for agriculture, petroleum, services, capital goods and mining. The sectors in which imports fall are also the ones with the lowest initial tariff protection as consumers substitute towards other goods which have experienced relative cheapening following trade liberalization.

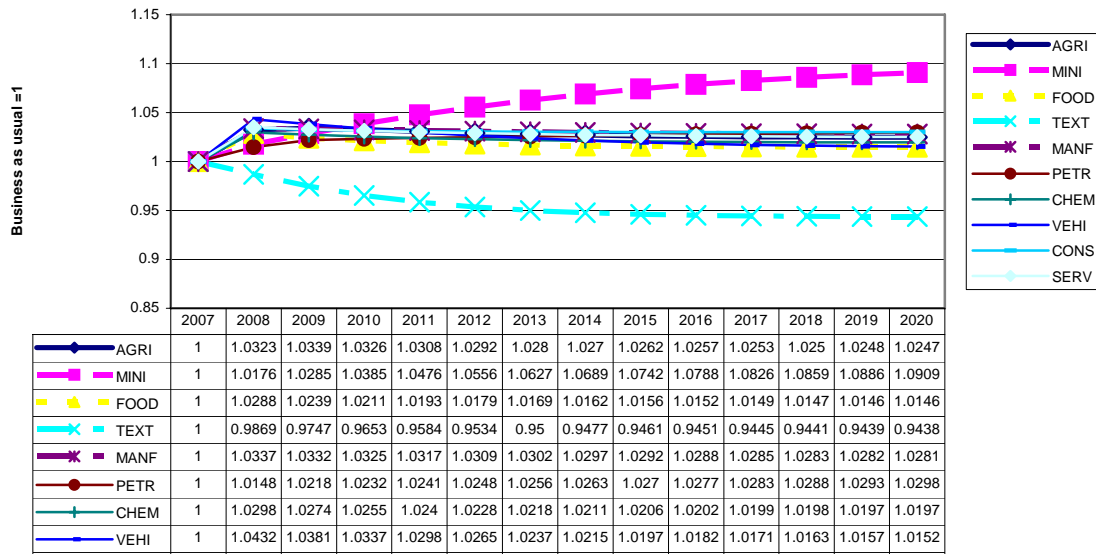
**Chart 2: Evolution of imports following a trade liberalization**



The increase in imports results in a depreciating exchange rate. With world export prices given by the small country assumption, the exchange rate depreciation leads to increases in domestic export prices which induce export volumes to increase. As can be observed in Chart 3, exports go up both in the short run and in the long run for all sectors except textiles. They go up most dramatically in the mining sector given its initial higher export intensity (78 percent) compared to other sectors. With the exception of mining and petroleum, the long run growth of exports is lower than that in the short run. But interestingly, exports fall even more in the long run for the textiles sector, despite the fact that this is the sector with initially the highest protection levels. This result is due to a combination of falling production induced by dwindling domestic demand as well as the

negative effect of domestic indirect tax adjustment which falls disproportionately more on this sector. Thus, the increased competition has reduced output and export for textiles.

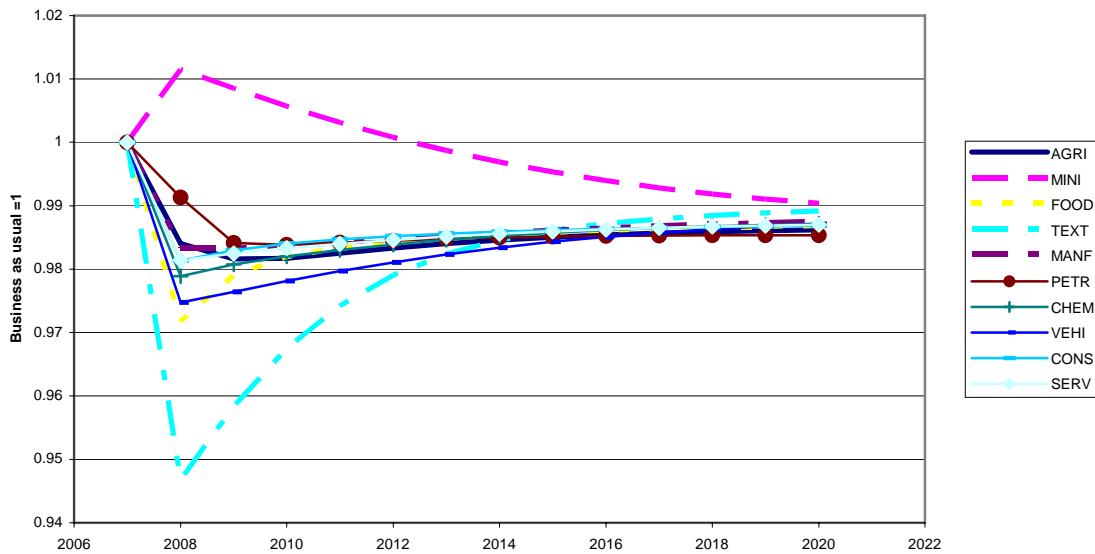
**Chart 3: Evolution of exports following a trade liberalization**



The developments in value added prices, factor remunerations and input costs to a large extent influence the reallocation (static efficiency) and accumulation (dynamic) effects of trade liberalization. Chart 4 shows the evolution of value added prices. Value added prices increase in the short run for mining, which receives the greatest positive stimulus from the trade induced real exchange rate depreciation. All other sectors experience declining value added prices in the short run. All sectors experience declining prices in the long run, but with mining being the least affected.

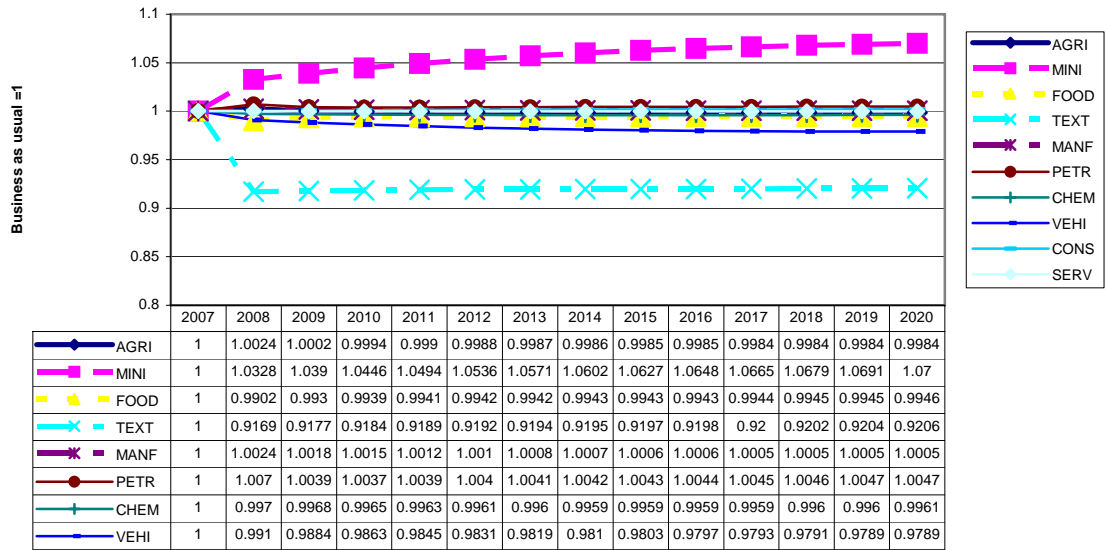


**Chart 4: Evolution of the price of value added in response to trade liberalization**

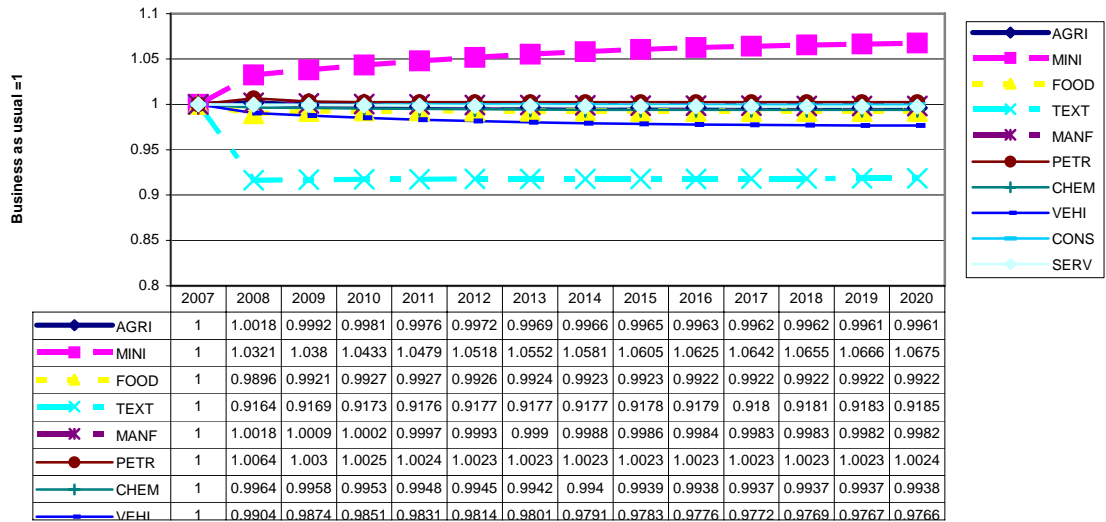


The variations in the value added price influence the movement of the wage rates and the capital rental rate and these in turn trigger factor reallocations. Wages fall for both skilled and unskilled labour in both the short and long run. The fall in wages can be traced directly to a fall in labour demand as a result of the contraction in labour demand of the labour intensive sectors of services, textiles and chemicals. The expanding mining sector is relatively capital intensive, which explains why its capital rate of return increases. As can be gleaned from Chart 5 and Chart 6 below, both skilled and unskilled labour relocates towards the expanding mining sector and to a limited extent towards agriculture, manufacturing and petroleum. Capital goods also attract skilled labour both in the short and long run. The declining sectors, especially textiles, chemical goods, vehicles and to a minor extent services are generally shedding labour.

**Chart 5: Evolution of skilled labour following a trade liberalization**



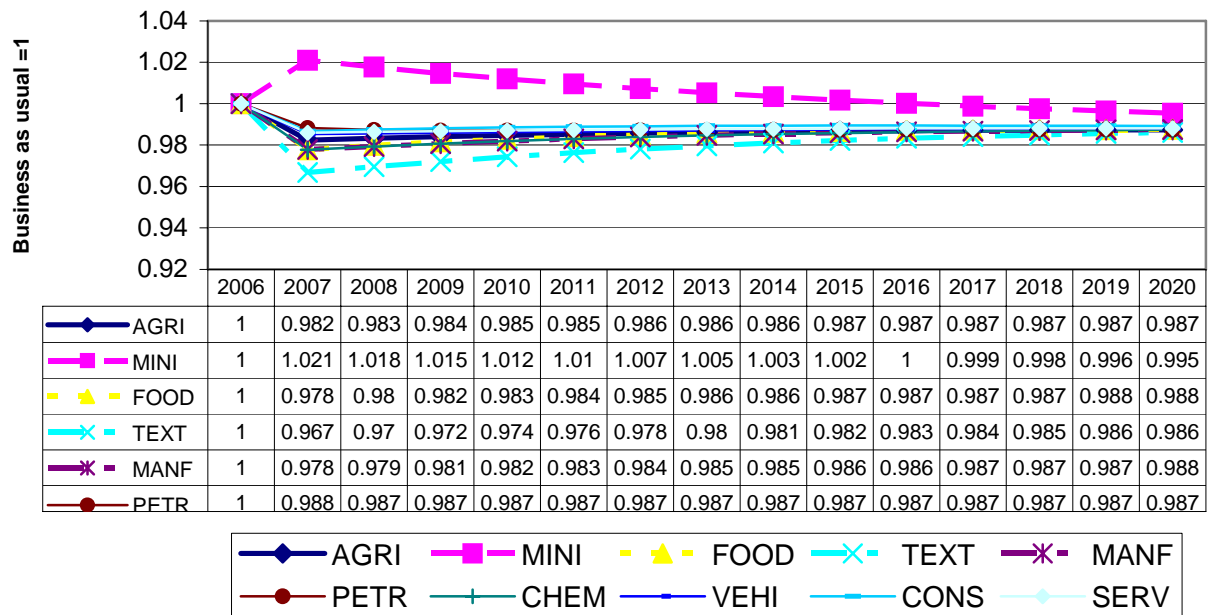
**Chart 6: Evolution of unskilled labour demand following a unilateral trade liberalization**



Capital stock movements reinforce the effects on output from labour reallocation and accumulation. As shown in Chart 7, the rate of return on capital initially increases in the short run and subsequently declines in the long run for the capital intensive mining, in line with value added price developments discussed earlier. There is a pronounced initial decline

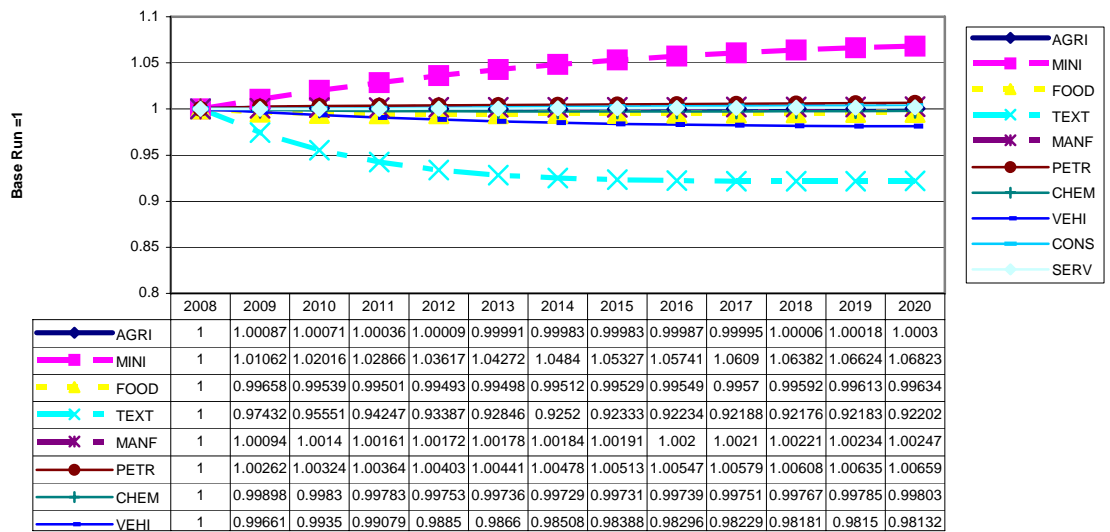
in capital return for textiles as well as the other initially highly protected sectors (food, manufacturing and chemicals). The short run volatility in capital returns are to be explained by the observation that capital is given and sector specific. However, in the long run the rates tend to converge as capital has had sufficient time to reallocate to the most profitable sectors (this is why the short run positive return in mining falls in the long run). Relatively speaking, we notice that mining has become relatively more profitable than other sectors especially in the short run following trade liberalization.

**Chart 7: Capital return path following a full trade liberalisation**



As shown in Chart 8, the consequences of these capital price developments are that capital reallocates towards mining and its accumulation is also the highest in this sector. Accumulation remains negative both in the short and long run for the now relatively unprofitable sectors of food, textiles, chemical and vehicles. The sharpest declines are in textiles, especially in the long run following from the massive relative fall in the capital rate of return.

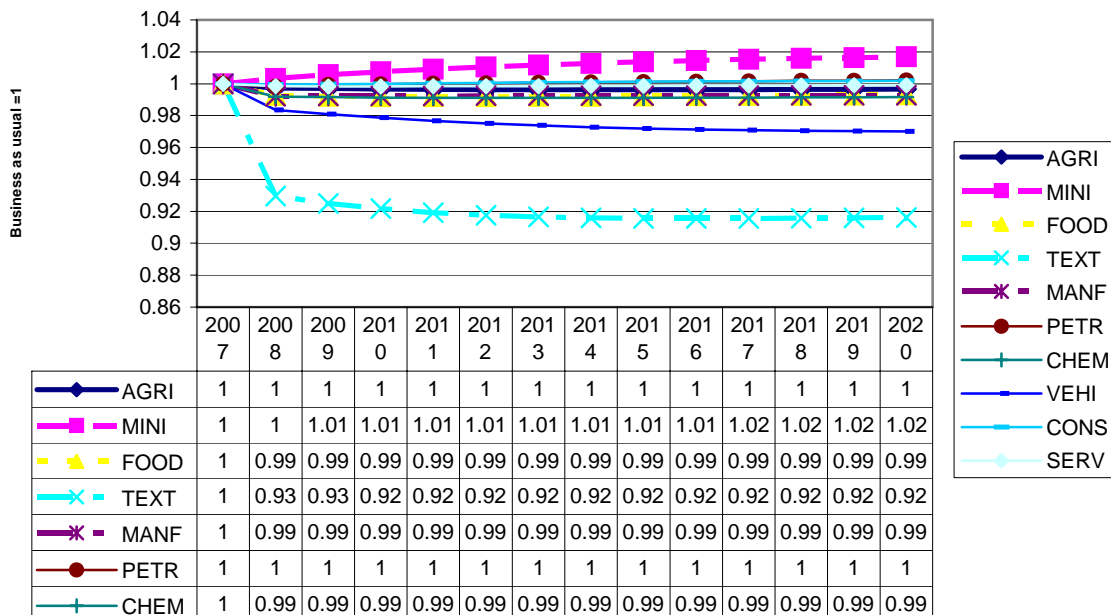
**Chart 8: Evolution of investment demand by origin following a unilateral trade liberalization**



The resulting impacts on output of these value added price dynamics and factor reallocations are that resources will move away from other sectors, especially textiles, towards the mining sector. As expected, trade liberalization leads to reductions in domestic sales. Looking at sectoral domestic sales development gives us an idea of which sectors are driven out of the market by the increased import competition. As Chart 9 shows, it turns out that the only winner in terms of domestic market capture in the short run is mining. All other sectors experience losses in their shares of the domestic market. The worst affected is textiles followed by vehicles, chemicals, manufacturing, food and agriculture. The intuition behind this result is that the tariff reduction following an across the board tariff removal induces a drop of government revenue (these products represent little more than 8 percent of indirect tax revenue). Government loss of revenue is compensated by an increase of domestic indirect taxes. Food, textiles, vehicles and chemicals show the highest domestic tax rates so that the tax increase affects mostly these sectors and particularly textiles. There is a drop of these sectors domestic demand, over and above the drop induced by increased import pressure. Inter industry flows are then responsible for transmitting these negative flows to other sectors with the exception of mining which remains insulated as it does not have strong linkages with the rest of the economy. Mining gains even more of the domestic market share in the long run, but this time a number of other sectors regains their domestic

market shares. These are petroleum and capital goods, all of them relatively capital intensive sectors. The rest of the sectors suffer losses. The changes in domestic market shares are relatively small compared to the changes in exports and imports because of the relatively small initial import intensities as well as the imperfect substitution between local and imported sales which both have the tendency to limit further import substitution of domestic production.

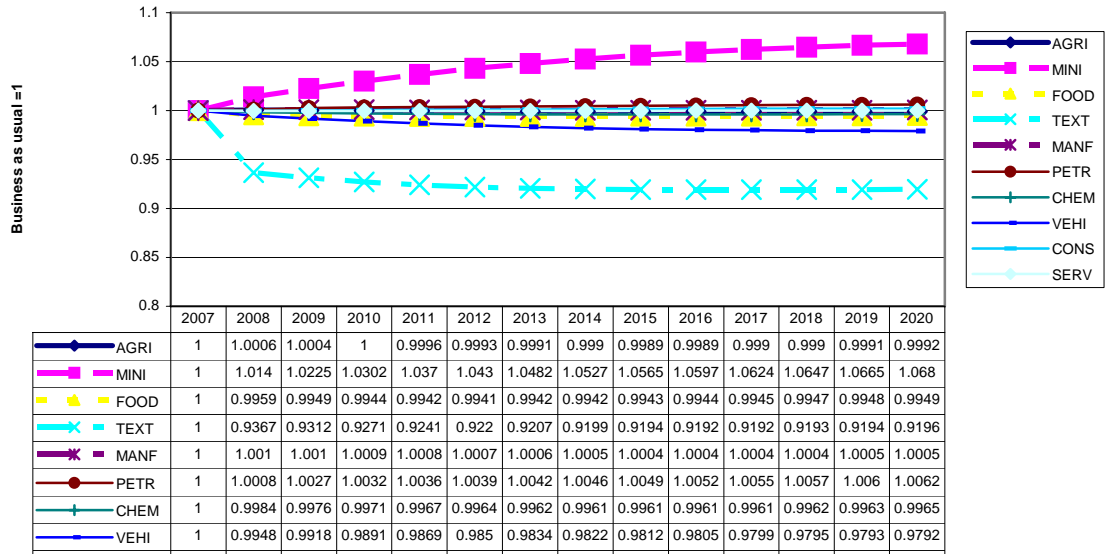
**Chart 9: Evolution of domestic sales following a trade liberalization**



The changes in domestic sales have an impact on domestic prices and consequently gross supply. Chart 10 shows that output goes up dramatically in mining both in the short and long run, driven by the surge in exports from the real exchange rate depreciation which is further reinforced by the positive domestic sales effect. There are also very minor gains for agriculture, manufacturing and petroleum in the short run as a result of cheaper inputs as well as positive export incentives. In the long run, mining receives the highest expansion in gross supply while petroleum, manufacturing, capital goods and services also continue to

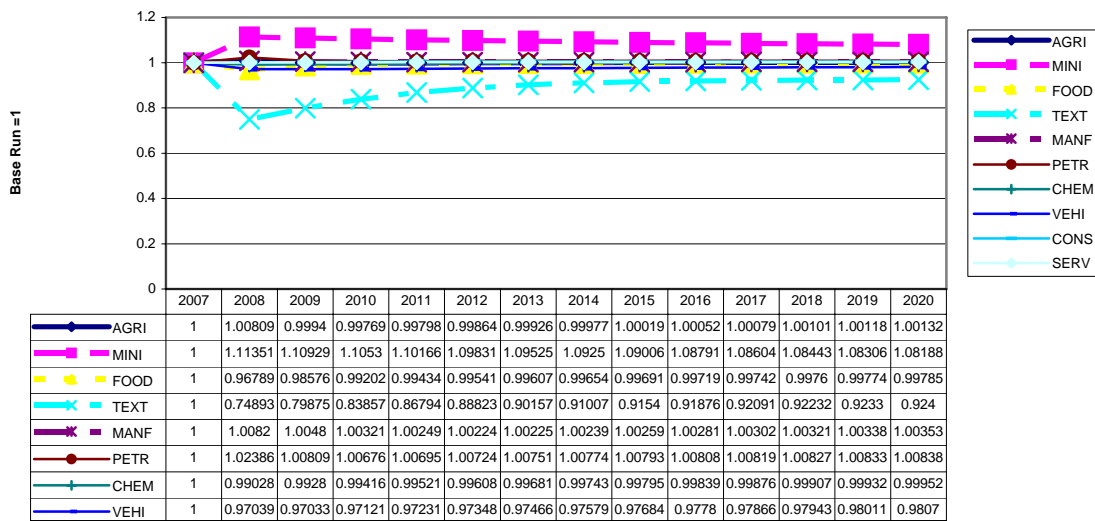
experience positive supply responses. The remaining sectors experience declining fortunes, with the most severely affected being textiles, followed by vehicles, food and chemicals.

Chart 10: Evolution of gross supply following a trade liberalization



As would be expected from the movements in capital rates of return and capital accumulation discussed above as well as the observation that falling import prices also reduce the cost of imported investment, Chart 11 shows that investment by destination goes up both in the short run and the long run for mining, agriculture, manufacturing, petroleum and capital goods. The biggest increases are in the mining sector. Services experiences increases in investment only in the long run. The main reason for this is that relatively speaking, the average return to capital relative to the user cost of capital goes up in these sectors. There is a pronounced fall in the short run for textiles, followed by gradual declines in food, chemicals, food and vehicles as the average return to capital relative to the user cost of capital falls in the short run relative to other sectors. However, investment by destination falls by less in these sectors due to a relative cheapening over time in these goods.

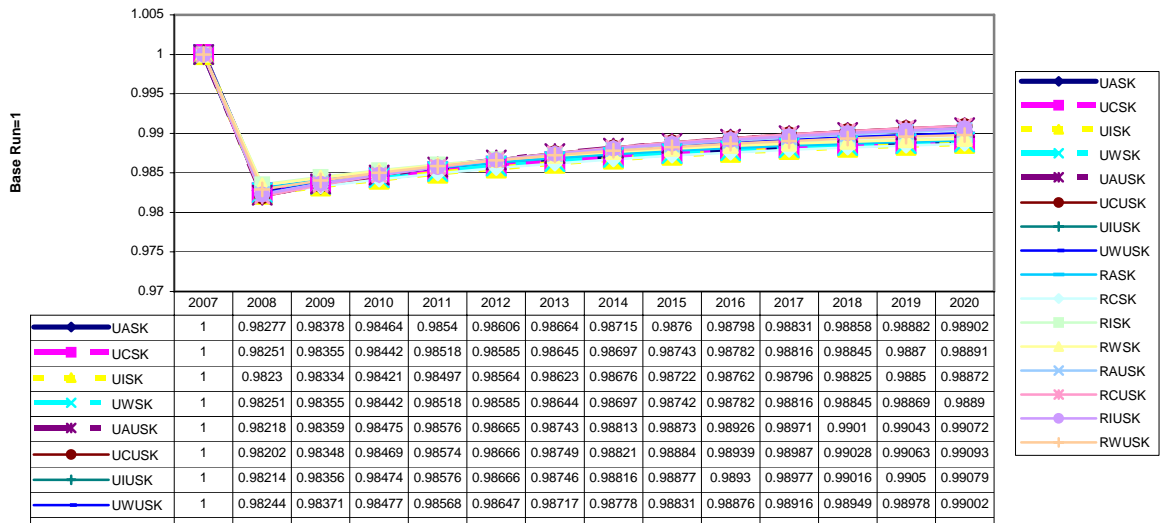
**Chart 11: Evolution of investment by destination following a unilateral trade liberalization**



*Welfare effects*

Because factor prices are the main drivers of household income, we would generally expect household incomes to fall, with the fall determined by initial factor shares. As confirmed in Chart 12, household income falls both in the short and long run following full trade liberalization for all households. However, rural skilled households tend to experience smaller declines in income than other groups. This is because they depend disproportionately less on employment in the declining textiles sector. Total real household consumption follows the same trend as household incomes, declining for all households both in the short and long run.

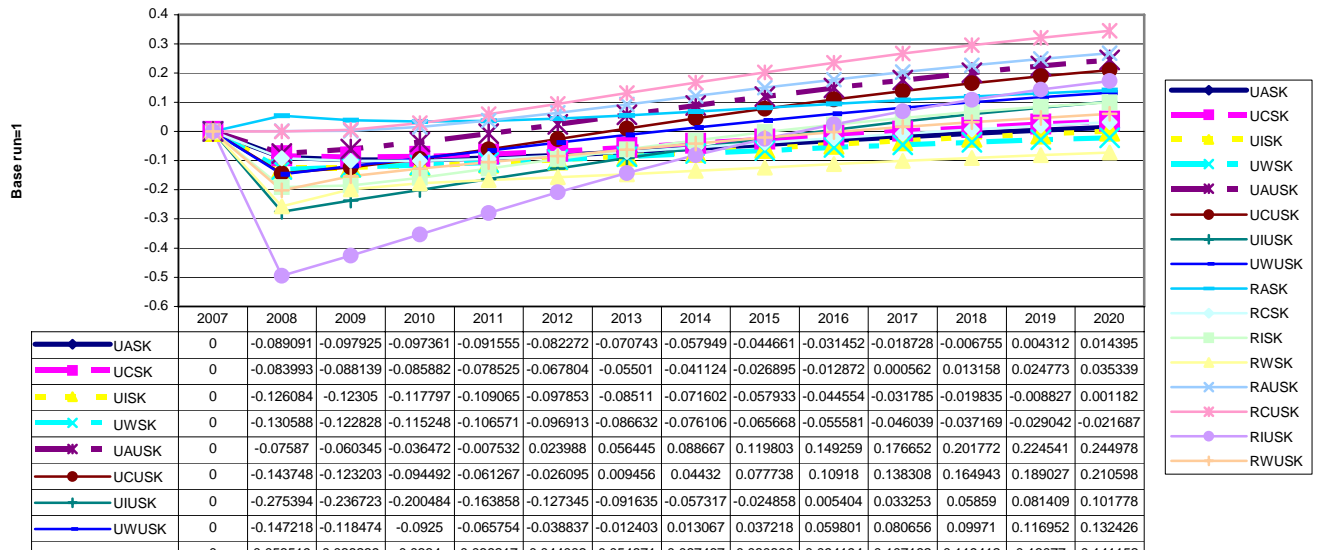
Chart 12: Evolution of household income following trade liberalization



As shown in Chart 13, welfare as measured by the dynamic equivalent variation falls for most households in the short run because income declines more than the consumer price index for most households. Rural African households and Urban Coloured Unskilled households experience positive welfare effects in the short run as their income fall by less than the fall in the consumer price index. In the long run, with the exception of skilled White households, changes in income and consumer price index move in such a way that households experience welfare increases. Coloured and African unskilled households are the main beneficiaries, irrespective of their regional location.



Chart 13: Evolution of equivalent variation following a trade liberalization



Poverty effects

The impact of trade liberalization on poverty is captured by changes in the poverty indices reported in the last column of Table 6. The changes in poverty are largely in line with the changes in welfare. This is because the changes are largely driven by changes in the consumer price index and changes in household income or consumption. The impacts on poverty are very small. Using the percent change in average headcount index of poverty measure, the results in Table 6 suggest that a unilateral removal of tariffs has a very small but negative impact on poverty headcount. The burden of these negative impacts is shared almost evenly between urban and rural households. Indian unskilled households, in particular rural Indian households, shoulder a disproportionate amount of the poverty burden. This is largely because of their higher dependence on employment in textiles, the sector that faced the highest protection before the trade policy intervention. The average poverty gap and the squared poverty gap also follow a similar pattern.

<Table 6>: Impact of trade liberalization on poverty (in percent of BAU)

	Short Run =2009			Long Run =2020		
	<i>P0</i>	<i>P1</i>	<i>P2</i>	<i>P0</i>	<i>P1</i>	<i>P2</i>
<b>South Africa</b>	0	0.55	0.83	-0.19	-2.15	-2.65
<b>Residential Area</b>						
Urban	0.0014	0.17	0.29	-0.01	-1.58	-1.98
Rural	0.0013	0.2	0.38	-0.52	-4.41	-4.65
<b>Ethnic group</b>						
African household	0.009	0.12	0.19	-1.1	-1.3	-1.66
Coloured household	0.001	0.25	0.26	-5.2	-5.54	-6.1
Indian household	0.026	0.19	0.43	-0.6	-1.82	-1.97
White household	0.01	0.15	0.33	0	0	0
<b>Region, Ethnic and skill group</b>						
Urban African Skilled	0	0	0			
Urban Coloured Skilled	0	0	0			
Urban Indian Skilled	0	0	0			
Urban White Skilled	0	0	0			
Urban African Unskilled	0.007	0.22	0.45	-1.43	-1.44	-1.78
Urban Coloured Unskilled	0.001	0.54	0.84	-1.27	-2.35	-2.98
Urban Indian Unskilled	0.03	0.55	0.65	-0.2	-0.67	-0.85
Urban White Unskilled	0	0	0			
Rural African Skilled	0	0	0			
Rural Coloured Skilled	0	0	0			
Rural Indian Skilled	0	0	0			
Rural White Skilled	0	0	0			
Rural African Unskilled	0	0	0	-1.34	-3.59	-3.92
Rural Coloured Unskilled	0	0	0	-1.4	-6.22	-7.05
Rural Indian Unskilled	0.0031	0.72	0.78	0	0	0
Rural White Unskilled	0.006	0	0	0	0	0

The picture reverses in the long run, with the incidence of poverty declining for the whole country by about 0.19 percent, which is still quite small. The reduction in poverty is as a result of the static and dynamic efficiency gains from trade liberalization as well as accumulation effects. The main beneficiaries of reduced poverty are Coloured households, followed by African households. Both supply a higher proportion of their labour endowment to the mining sector and other tradeable sectors. They also consume disproportionately more foodstuffs whose cost has been reduced by trade liberalization. Indian households also experience reductions in poverty, but by a relatively smaller margin. Rural households benefit more than urban households, given their higher dependence on the booming mining sector.

### **3B. Unilateral trade liberalization with TFP increases**

As argued above, the impacts of trade liberalization on the economy have tended to be very small, even after allowing for dynamic effects emanating from factor accumulations through time. One rationalization used for this result was that the country has already reaped the gains from trade given that the country has undergone substantial trade liberalization since 1994. In line with modern trade literature, we wish to explore in this section whether dynamic trade induced TFP changes may lead to “bigger numbers” from trade liberalization.

#### *Macroeconomic effects*

According to Table 7, removing all tariffs under the assumption of trade induced TFP increases has very pronounced and beneficial effects compared to trade liberalization without productivity gains. We see that factoring TFP gains will raise GDP from about 1 percent in 2009 to over 6 percent in 2020. This in turn will positively impact on incomes, which in turn raises savings and consequently investment. Private consumption rises sharply compared to the no TFP change scenario. The increase in GDP feeds into increased consumption both in the short and long run. The capital good price rises in the short run before falling in the long run. However, because of TFP increases, the user cost of capital falls from 2009 until 2020. Because of the rising rental to user cost of capital ratio couple with the higher induced savings, there is a boom in investment by destination, with the long run response being stronger than the short run response. Imports increase dramatically not only due to the cost reducing effects of tariff cuts but also because TFP induced growing economy requires a higher level of imports to meet higher production levels and increased household demands. Indeed imports rise much faster than exports in the short run, in part due to an induced real exchange rate appreciation. In the long run, exports grow more than imports. The consumer price index increases initially in the short run before declining in the long run. Skilled and unskilled wages increase in both periods following increased demand for labour to meet higher growth needs. Welfare rises dramatically in line with the observed consumer price index and consumption developments. Finally, trade induced TFP increases and accumulation effects lead to reductions in poverty, both in the short and long run.

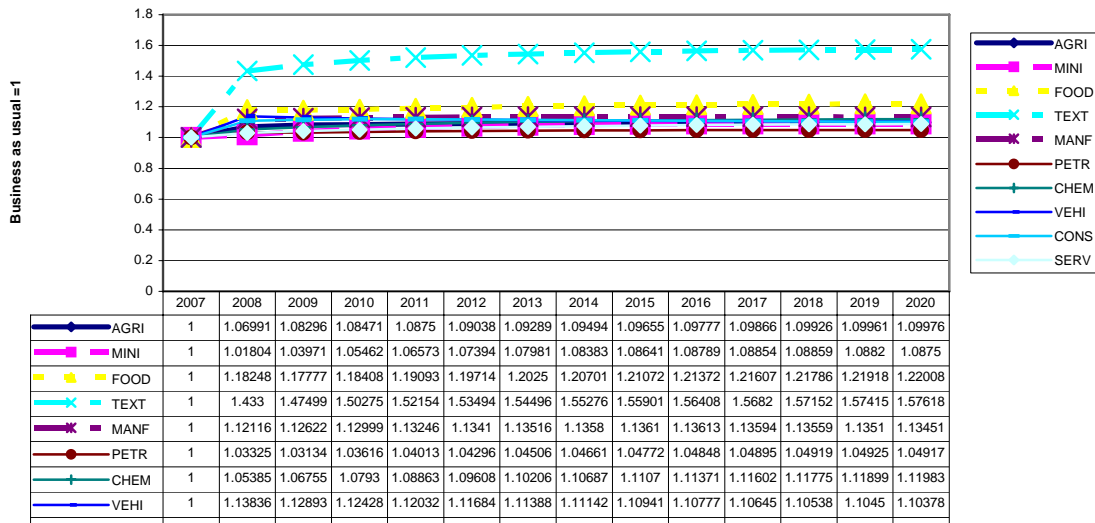
<Table 7>: Macroeconomic effects of a unilateral trade liberalization and TFP improvements (% change from BAU path)

	GDP PATH	CONSUMPTION	INVESTMENT	EXPORTS	IMPORTS	SKILLED WAGE	UNSKILLED WAGE	CONSUMER PRICE INDEX	CAPITAL GOOD PRICE	CAPITAL USER COST
2008	-0.06	8.52	17.50	3.36	10.32	7.87	8.65	0.35	12.94	1.27
2009	0.91	9.34	18.86	4.63	11.03	9.41	9.98	0.15	7.93	-0.93
2010	1.88	10.29	18.96	6.14	11.62	10.94	11.48	-0.17	5.60	-1.87
2011	2.76	11.17	18.57	7.63	12.07	12.31	12.85	-0.50	3.93	-2.43
2012	3.53	11.93	17.99	9.00	12.40	13.49	14.06	-0.79	2.55	-2.79
2013	4.18	12.58	17.36	10.22	12.66	14.49	15.09	-1.02	1.37	-3.03
2014	4.72	13.12	16.74	11.26	12.85	15.32	15.94	-1.20	0.38	-3.18
2015	5.16	13.55	16.16	12.14	12.98	16.00	16.64	-1.34	-0.44	-3.28
2016	5.51	13.90	15.63	12.87	13.08	16.53	17.19	-1.44	-1.11	-3.33
2017	5.78	14.17	15.15	13.46	13.15	16.94	17.61	-1.51	-1.66	-3.36
2018	5.99	14.37	14.72	13.93	13.18	17.24	17.93	-1.56	-2.09	-3.37
2019	6.15	14.51	14.34	14.30	13.20	17.46	18.16	-1.59	-2.43	-3.36
2020	6.26	14.60	14.00	14.58	13.19	17.61	18.31	-1.60	-2.70	-3.34

*Sectoral effects*

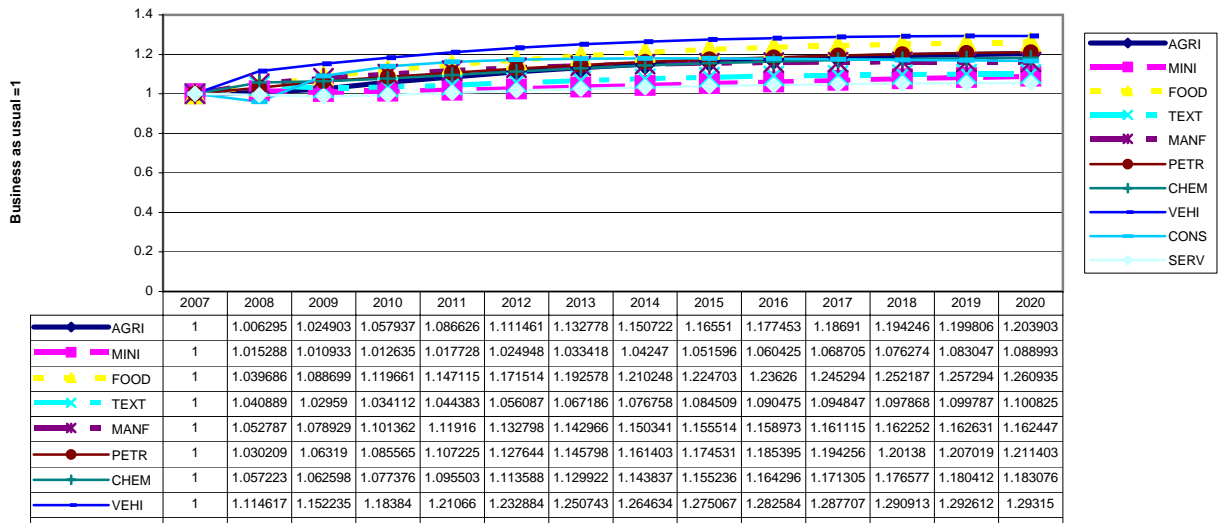
Obviously the fall in import prices as a result of tariff removal with TFP increases will not differ from that induced by tariff removal in the absence of induced TFP increases. However, the overall impact on import levels will differ because of the increase in import demand induced by TFP growth. Thus, from Chart 14 we notice that imports are higher in the trade induced TFP increase tariff reduction scenario than the same scenario without productivity gains. The sectoral distribution of these TFP induced higher imports is similar to the case without TFP increases and driven by changes in import prices as before.

Chart 14: Evolution of imports following trade liberalization and TFP improvements



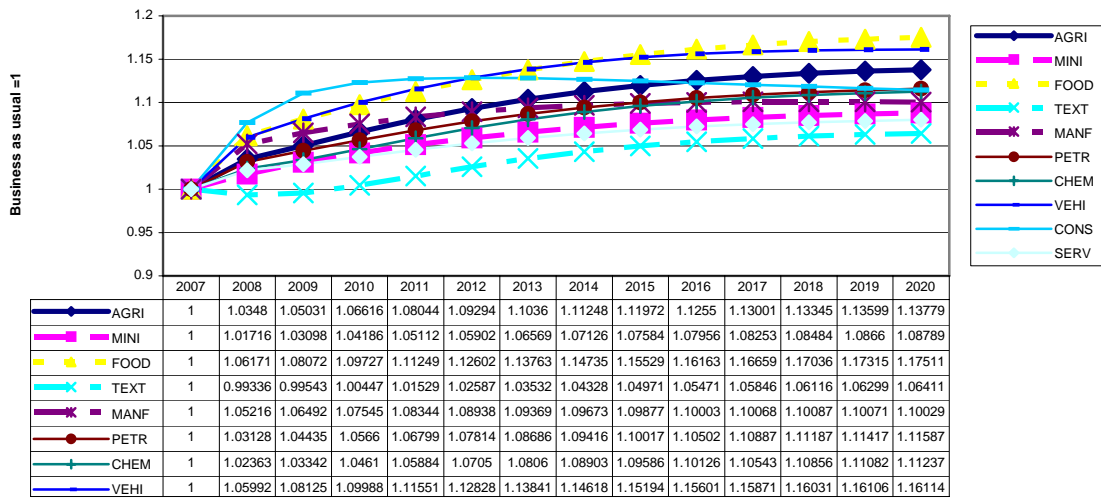
The trade induced TFP increase results in an increase in exports in all sectors both in the short and long run (see Chart 15) which is higher than when there was no trade induced TFP increases. While mining was responsible for most of the export growth in the previous scenarios, export growth is now driven by Vehicles, Manufacturing and Food. This is because they have larger linkages with the domestic economy which is growing than the Mining sector has, hence they benefit more from a growing economy.

Chart 15: Evolution of exports following trade liberalization and TFP improvements



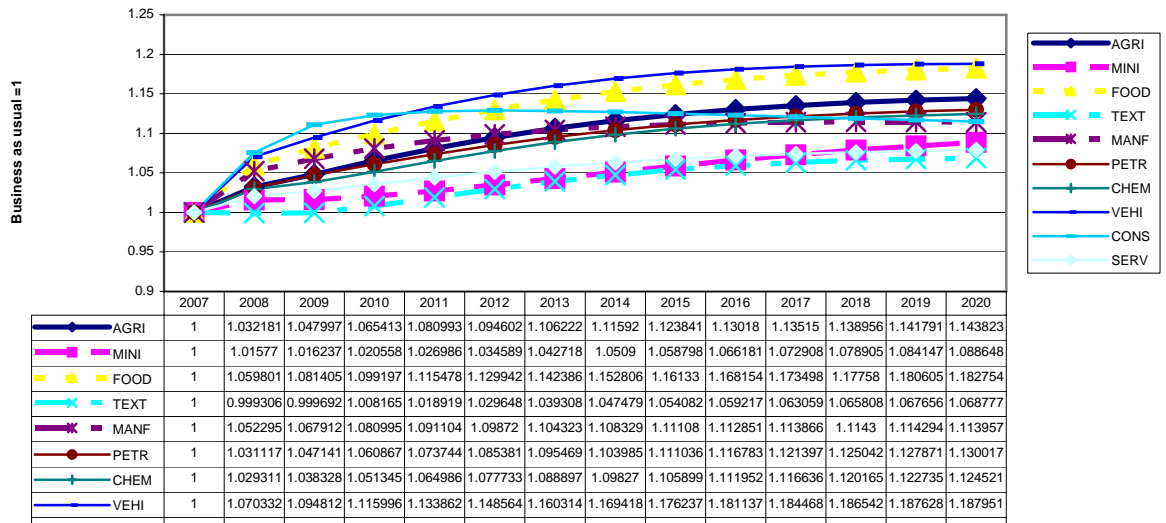
While the only sector that gained in terms of domestic sales in the tariff reduction scenario without TFP increases was Mining, we notice from Chart 16 that all sectors now experience increased domestic demand in the trade liberalization induced TFP gain scenario induced by higher growth in the long run. Viewed from the context of the earlier scenario, the sector that gains the most is textiles. This is because textiles has the highest initial factor scale parameter associated with it.

**Chart 16: Evolution of domestic sales following trade liberalization and TFP improvements**



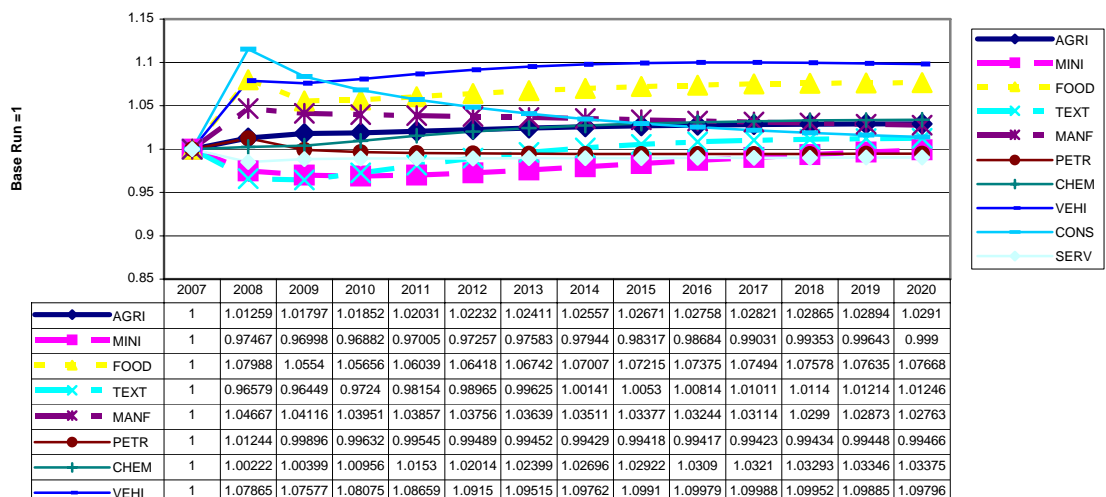
The effect on gross supply follows a similar trend as the outcome in domestic demand that has just been discussed (see Chart 17). All sectors benefit from trade induced TFP increases. Sectors such as Food, Vehicles, Construction and Agriculture with higher scale parameters gain the most. Services benefits from the high growth scenario because its output is an important input for most of the sectors which are experiencing gains. Mining, the sector that benefited the most in the case without trade induced TFP growth does not benefit as much, although it still experiences positive impacts. This is because of a lower factor scale parameter associated with its production functions as well as lower linkages with the rest of the economy.

**Chart 17: Evolution of gross supply following trade liberalization and TFP improvements**



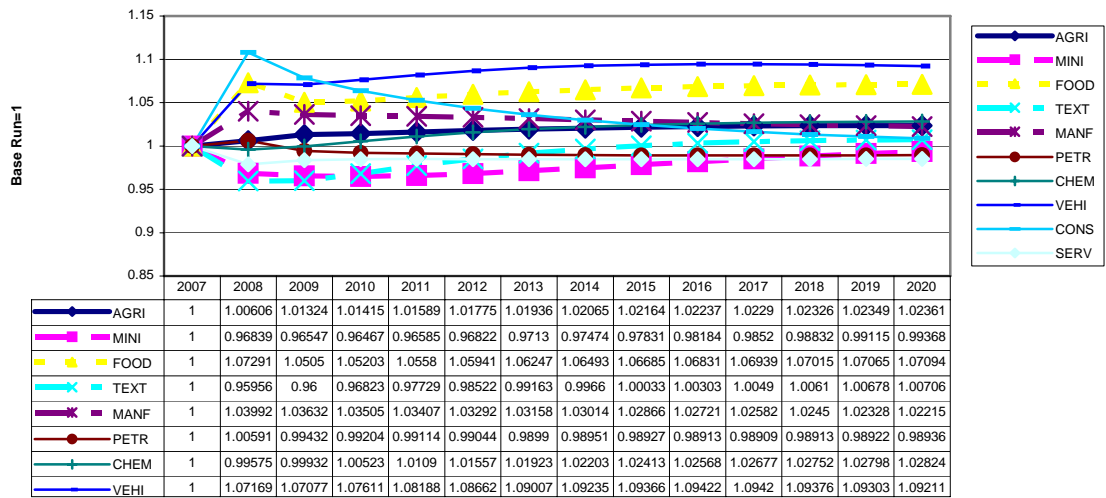
On the factor markets, wages increase for both skilled and unskilled workers in the short and long run in response to increased labour demand as a result of the expanding economy (Chart 18 and 19). Unskilled wage rates rise slightly more than skilled wage rates. Labour is now being drawn from mining sectors towards the other sectors, a complete reversal of what was observed in the scenario with no trade induced TFP increases. Overall, employment increases for all skill categories although skilled labour experiences marginally higher growth.

**Chart 18: Evolution of skilled labour demand following trade liberalization and TFP improvements**



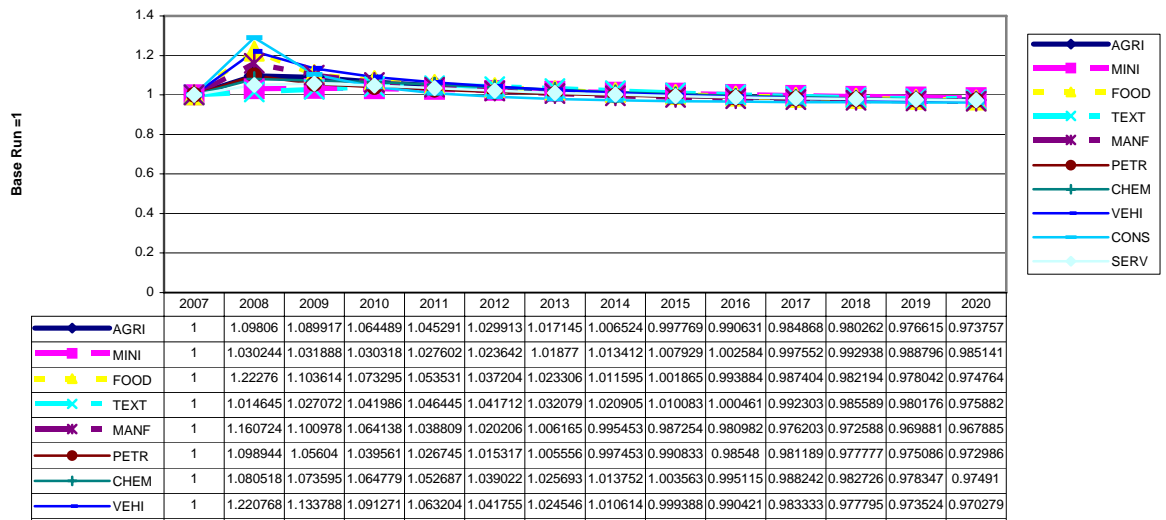


**Chart 19: Evolution of unskilled labour demand following trade liberalization and TFP improvements**

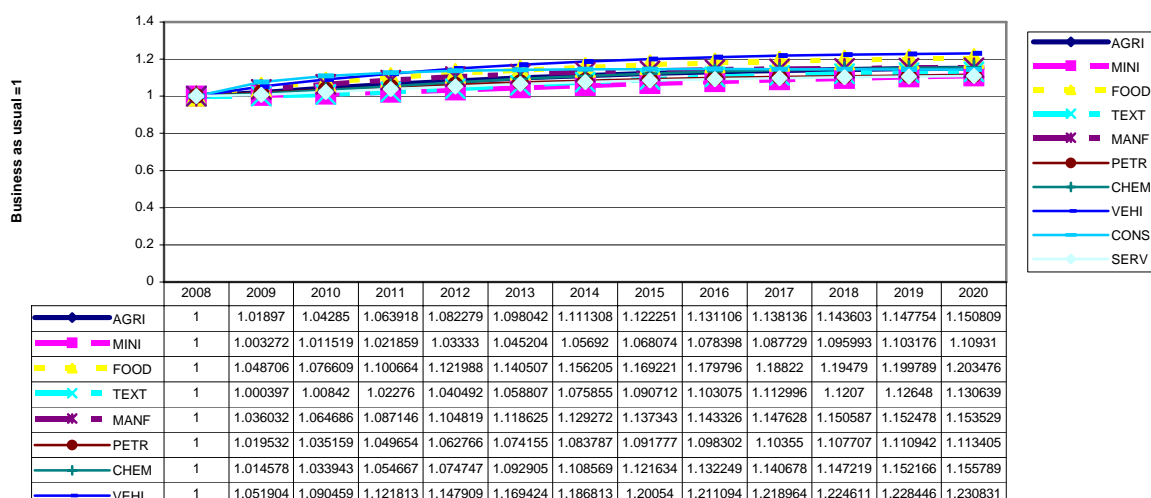


Together with increases in value added prices and wage rates, the return on capital increases for all sectors in the short run in all the sectors and subsequently declines for all sectors in the long run (Chart 20). However, the decline in the long run is relatively less than the decline in the user cost of capital. As a result, investment by origin increases in both the short and long run following a trade induced TFP increase (Chart 21).

**Chart 20: Evolution of capital return following trade liberalization and TFP increases**

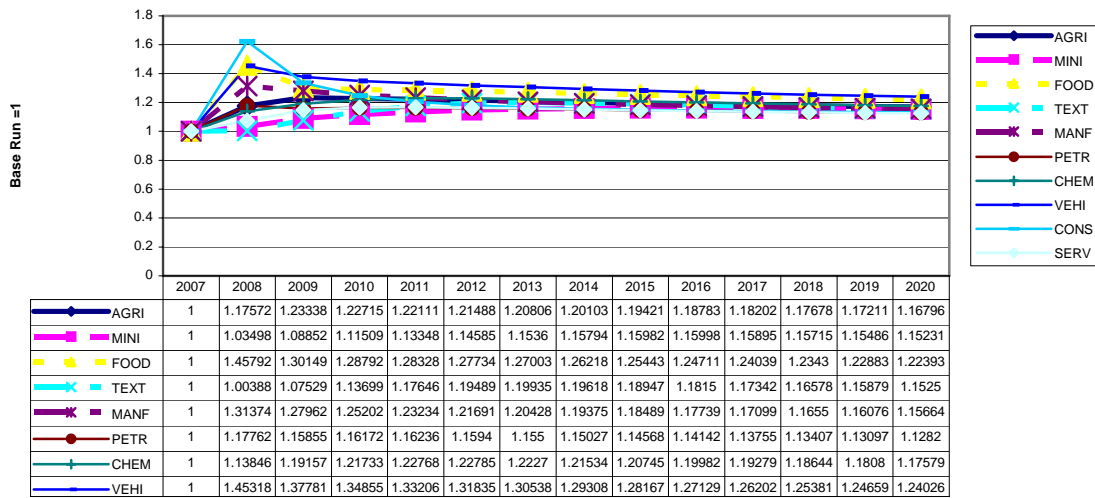


**Chart 21: Evolution of investment by origin following trade liberalization and TFP improvements**



Due to higher induced savings and the movements in capital rates of return and capital accumulation discussed above, trade induced TFP growth increases investment by destination for all sectors (Chart 22). The increases are higher in the short run than in the long run. Construction receives the highest positive stimulus to investment in the short run while in the long run capital accumulation is more evenly spread. Compared to the no TFP change trade liberalization scenario, we notice several important differences. The sharp short run decline in textiles investment observed in the no TFP increase scenario is now absent while the Mining sector has moved from being the sector that benefits the most from investment to one that receives the least gains. In the long run, investment has gone up roughly by an average of 14 percent for each sector compared to the business as usual path whereas it only went up by a mere 0.75 percent in the no TFP increase trade liberalization scenario.

**Chart 22: Evolution of investment by destination following trade liberalization and TFP improvements**

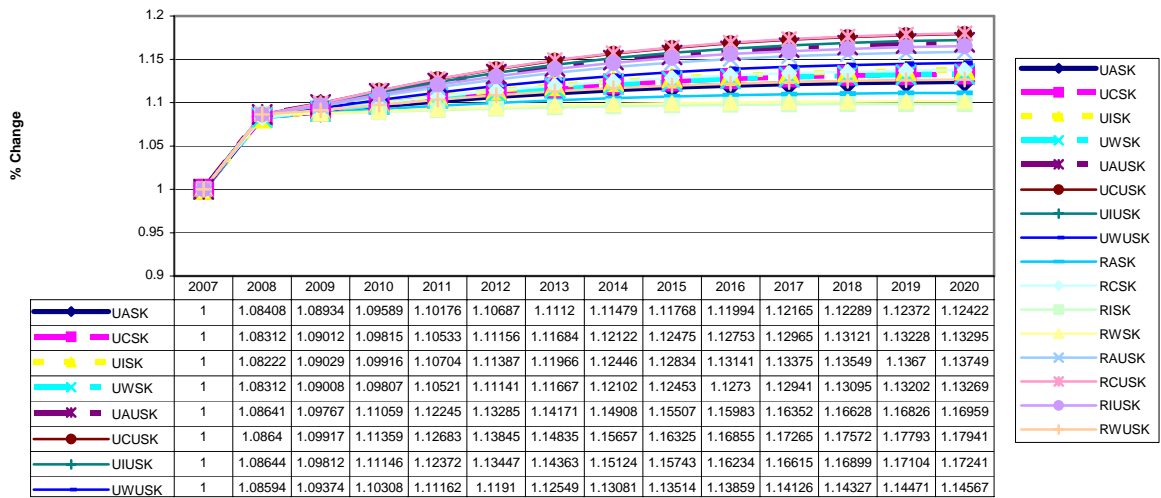


*Welfare effects*

We have observed that a main consequence of trade induced TFP growth is the increase in factor prices. Given that factor prices are the main driving force behind household income, it is not surprising that the trade induced TFP intervention results in all household incomes increasing (Chart 23). The gain is higher in the long run compared to the short run and much higher than was the case in the no TFP increase trade liberalization scenario. African, Indian and Coloured Unskilled households reap most of the benefits while Rural White households benefit the list<sup>9</sup>.

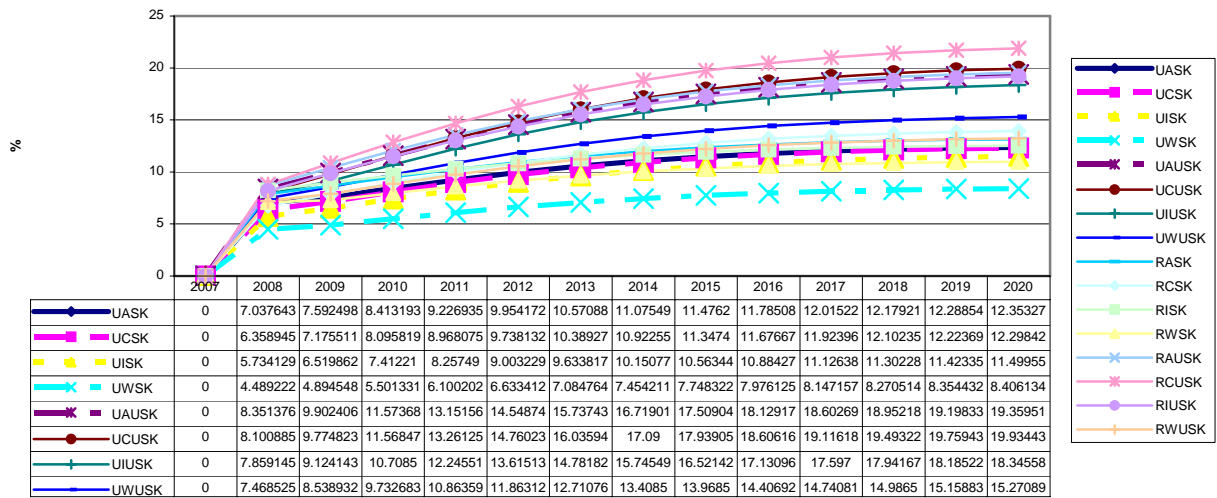
<sup>9</sup> We should not make much from this observation given the small size in the sample of this group.

**Chart 23: Evolution of household income following trade liberalization and improvements in TFP**



The increase in household income is higher than the increase in consumer price index in the short run so that real consumption and welfare increases for all households (Chart 24). In the long run, the falling consumer price index reinforces the income effects so that the equivalent variation goes up by even more for all households. Total household consumption follows the same trend as household incomes, increasing for all households both in the short run and in the long run. Unskilled households gain more than skilled households while rural households stand to gain more than urban households.

**Chart 24: Percent change in equivalent variation following trade liberalization and TFP improvements**



*Poverty effects*

Trade induced TFP increase has a more significant impact on poverty reduction than trade liberalization without induced TFP growth as shown in Table 8. The poverty headcount ratio falls by 0.54 percent in the short run and by 5.34 percent in the long run. Most of the poverty reduction is felt amongst African and Coloured households while urban households benefit less than their rural counterparts from the ensuing fall in poverty. Once again the average poverty gap and the squared poverty gap also follow a similar pattern to the headcount ratio.

<Table 8>: Impact of trade liberalization on poverty (in percent of BAU)

	Short Run =2009			Long Run =2020		
	<i>P0</i>	<i>P1</i>	<i>P2</i>	<i>P0</i>	<i>P1</i>	<i>P2</i>
<b>South Africa</b>	-0.54	-0.20	-1.30	-5.34	-4.30	-7.78
<b>Residential Area</b>						
Urban	-0.33	-0.15	-1.67	-5.22	-5.16	-6.45
Rural	-0.56	-0.46	-1.34	-7.46	-6.60	-8.30
<b>Ethnic group</b>						
African household	-1.15	-1.30	-2.20	-6.44	-5.42	-7.70
Coloured household	-1.31	-0.78	-1.80	-7.92	-7.20	-8.20
Indian household	-0.50	-0.10	-1.45	-5.77	-4.32	-7.20
White household	-0.21	-0.10	-1.78	-4.25	-3.21	-5.40
<b>Region, Ethnic and skill group</b>						
Urban African Skilled	0.00	0.00	0.00	0.00	0.00	0.00
Urban Coloured Skilled	0.00	0.00	0.00	0.00	0.00	0.00
Urban Indian Skilled	0.00	0.00	0.00	0.00	0.00	0.00
Urban White Skilled	0.00	0.00	0.00	0.00	0.00	0.00
Urban African Unskilled	-0.70	-0.40	-1.45	-9.36	-11.40	-12.30
Urban Coloured Unskilled	-1.20	-0.54	-1.84	-9.90	-12.80	-16.60
Urban Indian Unskilled	-0.12	-0.55	-1.65	-2.30	-3.80	-5.60
Urban White Unskilled	-0.13	-1.62	-1.92	-1.34	-3.30	-8.80
Rural African Skilled	0.00	0.00	0.00	0.00	0.00	0.00
Rural Coloured Skilled	0.00	0.00	0.00	0.00	0.00	0.00
Rural Indian Skilled	0.00	0.00	0.00	0.00	0.00	0.00
Rural White Skilled	0.00	0.00	0.00	0.00	0.00	0.00
Rural African Unskilled	-1.40	-1.30	-1.93	-10.52	-9.98	-11.20
Rural Coloured Unskilled	-1.86	-2.30	-2.23	-10.91	-8.87	-12.15
Rural Indian Unskilled	-0.87	-0.72	-1.78	-4.19	-2.40	-6.40
Rural White Unskilled	-0.67	-0.57	-1.83	-3.23	-3.2	-5.6

## 5. CONCLUSIONS

South Africa has undergone significant trade liberalization since the end of apartheid. Average protection has fallen while openness has increased. The macroeconomic performance in this era of liberalizing trade has been unimpressive, with GDP growing by insufficient amounts to make inroads into the high unemployment levels. Poverty levels have also risen. This paper examines the impact of unilateral trade policy reforms on the economy with and without trade induced TFP increases. The study advances existing CGE work in South Africa in at least two ways. Firstly, it uses a top down approach based on the 2000 household survey to model explicitly poverty effects of policy. Secondly, it employs a

sequential dynamic CGE model to carry out the sequential “top down” poverty micro simulation.

Trade liberalization alone has very minimal short run macroeconomic consequences. The outcome for the long run macroeconomic developments is positive for tariff removal although the magnitude of the impacts is still very small. The sectoral results indicate that sectors which initially faced high protection levels tend to be the ones to lose out disproportionately more from trade liberalization. The biggest winner is Mining while the biggest loser is Textiles. The picture reverses when we allow for trade induced TFP increases, with bigger and positive impacts on the macroeconomy. Mining is no longer the main beneficiary of the reform.

The welfare outcomes are initially negative in the short run but turn positive if we allow for trade induced TFP increases. The welfare gains are positive in the long term in all scenarios. Although all households benefit in the long run, African and Coloured poor households in general and especially those residing in rural areas reap the most benefits. Trade liberalization policy has been found to be progressive – highest gains accrue to the poorest groups – despite the low level of tariff protection remaining in South Africa.

In terms of poverty, trade liberalization has no appreciable impact on poverty in the short run even if we allow for trade induced TFP increases. However, in the long run poverty reduces even in the case when we do not allow for TFP increases. Again, African and Coloured households gain the most in the long run in terms of numbers being pulled out of absolute poverty, especially if the trade measure were to induce TFP increases.

Some useful policy conclusions emerge from these results. Without exception, there is still substantial scope to lower prices and raise household welfare through stronger unilateral tariff liberalization. However, there is an asymmetry in the timing of the welfare gains that can only be picked by dynamic analysis. If trade liberalization induces TFP increases, the gains are magnified. These results point to a future role for trade policy in South Africa. They suggest that short-term temporary measures such as transfers to poor households may

be justified to ameliorate the transitory negative effects on the poor before the long-term gains are realized. They also suggest that measures should be put in place so as to increase the chances that future tariff cuts generate substantial TFP growth. Such measures could include training programs.



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