

# **A Gender-Aware Integrated Macro-Micro Model for Evaluating Impacts of Policies on Poverty Reduction in Africa: The Case of South Africa**

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## **1. OVERVIEW**

In recent years, developing countries, especially in Sub-Saharan Africa, have committed to undertake a variety of policy measures under the Millennium Development Goals (MDGs) of the United Nations and the Poverty Reduction and Growth Facility of the International Monetary Fund. These policies will clearly have important repercussions on the populations of these countries in terms of income distribution and poverty reduction.

There is also a growing recognition that macroeconomic and adjustment policies may have quite different effects on men and women. The Beijing Platform for Action from the 1995 Fourth United Nations World Conference on Women identified non-market work, which is most often performed by women, as a key area of policy intervention to improve the well being of men and women, and reduce poverty in developing countries.

The importance of macroeconomic policy, especially fiscal policy, in influencing women's welfare and their prospects for economic empowerment has been well documented in recent years. It can worsen or improve the living standards of women and contribute to narrowing or widening gender gaps in income, health, education, nutrition, etc. There has also been increasing concern about how gender inequality can constrain the outcomes of macroeconomic policy. For example, recent work (Haddad et al., 1995, Çagatay, Elson and Grown, 1995; Palmer, 1994) shows that economic reforms with decreased incentives can reduce women's output and restrict access to education, thus hindering women's ability to develop their human resources.

Households devote a large proportion of their time to produce "home" commodities, which can neither be purchased nor sold on the market and which, therefore, are consumed entirely by the household themselves. Many of these commodities have more or less close substitutes in the market economy. Conventional economics and most economic statistics exclude the enormous volume of unpaid work and the undeniably valuable output of services by the household or "care" economy. Economics is by and large blind to the unpaid work and production of women (and men) within households.

Analysts generally focus on the market side of the economy and ignore non-market goods and services produced by households. Research by Elson (1995), Sinha (1999 and 2000) and Fofana et al. (2005) observe that ignoring household non-market work may skew the

forecasted impacts of macro-economic policy by underestimating labor mobility and supply response, as well as the impacts on the demand for close market substitutes to home produced commodities. Therefore, interactions between male and female work, on the one hand, and market and non-market activities, on the other hand, may play key roles in the results of policy impact analysis.

Although these gender-related development issues have prompted serious debate, the absence of appropriate gender-aware macroeconomic analytical tools has handicapped any quantitative analysis. More generally, it must be recognized that operational tools are lacking, especially in Africa, to study the interaction between macroeconomic policy and microeconomic behavior, and to evaluate the implications for gender-disaggregated variables of different macroeconomic policy scenarios. A related constraint is the inadequate data and statistical indicators for effective policy-making, monitoring and evaluation (Latigo, A.A.R, 2004). Yet there is now increasing need for African governments to assess the impacts of their economic policies on welfare and poverty in order to ensure transparency and accountability, hence the need for a gender-aware macroeconomic model. This is contained in the principle of the New Partnership for Africa's Development (NEPAD)<sup>1</sup>.

To understand the likely distributional impacts of macroeconomic policies and shocks on African populations we need an appropriate macroeconomic analytical tool. Analysts generally rely on Computable General Equilibrium (CGE) Models, which simulate the working economy by taking into account its structure and interactions between sectors and agents, as well as the direct and indirect effects of policy measures.

Standard CGE models, which are becoming widely used in Africa and other developing countries for policy orientation, provide interesting insights on the likely impacts of macroeconomic shocks and policies on income distribution and poverty. However, these frameworks generally ignore gender dimensions of the economy, as well as non-market production occurring within the households, which requires an important amount of time from household members. They consider men and women as identical, in terms of job opportunities, wage earnings, access to production factors, etc. However, it has become clear that men and women can be affected very differently by macro shocks and policies, as they generally have different work activities and work in different sectors.

Consider the effects of policies and shocks on the first three MDGs (eradicating extreme poverty and hunger; achieving universal primary education, and promoting gender equality and empowering women), generally, results drawn from a standard CGE model will only be able to assess whether the policy is pro- or anti-poor (first goal). The second and third goals will be ignored. Therefore, based on results from a standard CGE model, analysts would recommend a pro-poor policy to policymakers, which would not necessarily contribute to achieving the other two MDGs and which may even be counter to these goals.

The contribution of a gender-aware CGE model comes at this point. It assesses the impacts of policy measures on poverty, as does the standard CGE model. Furthermore, it tells us

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<sup>1</sup> NEPAD is an initiative developed by African leaders based on a common vision and a firm and shared conviction and realization that eradication of poverty is imperative if African countries, individually and collectively, are to plan a path of sustainable development and to be globally competitive. The long-term objective of NEPAD is to eradicate poverty in Africa and to promote the role of women in all activities including poverty reduction.

whether the policy contributes to narrow gender inequalities and provides insights on the likely impacts on (boys and girls) education, at least on the demand side.

The second phase of this project goes beyond the representative household framework to integrate all actual households from the year 2000 national income and expenditure survey in a gender-aware CGE **microsimulation** model. The representative household model gives interesting insights on the average impacts on household groups. However, it cannot capture the substantial heterogeneity among households within a given group as CGE microsimulation models do.

Poverty analysis is generally performed at the household level as consumption expenditures and non labor income data are generally collected at this level. Men and women are considered poor if they belong to a household that is poor. Intra-household poverty remains ignored. However, the introduction and gender decomposition of time allocation in the model is an important step in analyzing another dimension of poverty – “leisure time poverty” – and provides a starting point for further intra-household poverty analysis.

In this way, the microsimulation approach is a first step toward the ultimate goal of performing individual-level welfare and poverty analysis, rather than current household level analysis. This approach was strongly recommended by the 2003 UNECA experts meeting in Addis Ababa, as well as by South African policy makers. The CGE microsimulation policy analysis will be more realistic, with more emphasis on the policy implications.

## **2. BACKGROUND**

In collaboration, the African Center for Gender and Development (ACDG) of the United Nations Economic Commission for Africa (UN-ECA) and economists from Laval University have developed a macroeconomic framework that integrates both market and non-market activities, while distinguishing male and female workers throughout, in order to evaluate impacts of policy reforms on poverty reduction and on the well-being of men and women in Africa. A pilot study was undertaken using a gender-aware (CGE) model with representative households applied to South Africa.

In that study, we first incorporated non-market activities (household production and leisure activities) in the standard structure of the South African Social Accounting Matrix (SAM) for 2000. We used national satellite accounts of household production (NSAHP) as suggested by the UN 1993 SNA in the national accounts. Then, we used the gender-aware SAM as a database to construct a gender-aware CGE model based on Laval University's<sup>2</sup> archetype, which incorporates the principal characteristics of models used in income distribution and poverty analysis of macroeconomic policies. The model was used to simulate the economy-wide and welfare/poverty impacts, decomposed by gender and population group, of the elimination of tariff barriers with an increase in direct taxes to compensate for lost tariff revenue. The only other quantitative analysis of the gender-differentiated welfare and poverty impacts of fiscal policy in an African country is an earlier study of the effects of trade policy on women in Zambia (Fontana, 2002).

Overall, our previous study demonstrated that a gender-aware modeling exercise can be used to quantify the impacts of macroeconomic policy shocks upon men's and women's market

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<sup>2</sup> EXTER model, Decaluwé, Martens and Savard (2001).

and domestic work activities, leisure time and wage rate, as well as the poverty and welfare consequences for their households. The analysis has generated important results and intuitions for policymaking in poverty reduction strategies that would be unnoticed in standard non gender-aware CGE model that excludes the household (or "twin") economy.

First, the construction of the gender-aware SAM and subsequent development of the model showed how important time use studies are to African governments for preparing NSAHP so that household production and services (non-market production and leisure) are integrated into the macroeconomic framework. The gender-aware SAM, as depicted in Part I of this report, was able to demonstrate numerically that women's contribution in non-market production is almost double that of men. Also, women were found to have 30-50 percent less time for personal care and leisure than men. Thus, for the first time in Africa, this initiative brought together economic and household information in a common framework to measure the contribution of household production to the overall economy and to assess the impact of the market economy on household production. The development of this model and its potential applications illustrated one practical approach for mainstreaming gender perspectives and household production in national accounts, budget and policies in Africa.

A second important result of the previous study was to show, through the gender decomposition of labor, that further trade liberalization in South Africa would have a much more positive effect on male real wages than on female real wage rates. A complete elimination of import tariffs generated a strong gender bias against women with a nominal wage reduction that was more than twice that of their male counterparts. This was due to the fact that male workers derive substantially more labor income from the export-oriented mining sectors where labor demand increases. In contrast, female workers are more concentrated in protected textiles and certain service sectors, where value added prices, production and, consequently, labor demand were all found to decrease with trade liberalization.

Third, trade liberalization was shown to increase the labor market participation of all workers, particularly male workers. Indeed, the three export-oriented mining sectors, where male workers predominate, experienced the greatest increase in labor demand as a result of trade liberalization. Thus, our results indicated that the existing gender bias in labor market participation would increase. Furthermore, we found that workers adjust primarily by reducing their leisure time, although domestic work time also fell. As male workers increased their labor market participation proportionately more, they also reduced their domestic work participation more, which accentuated the existing gender bias toward women performing domestic work. At the same time, male workers also experienced a much greater reduction than female workers in their pure leisure activities. All these strong results would go unnoticed if the model was not gender disaggregated.

The fall in leisure time and the increase in market work time are welfare-reducing. However, this is counteracted in part by an increase in real wages, once again primarily for male workers. As male labor market participation and real wages increase more than for their female counterparts, their share in household income, which is likely to reduce the bargaining power of females in their households, although this is not modeled explicitly in this exercise. Finally, at the household level, we note that trade liberalization brings about revenue losses for government that, in this case, we assume to be compensated through an increase in direct taxes, which explains the very small net negative impact on welfare.

Although the overall net negative impact of elimination of import tariff on national welfare is small, two key issues were found to require immediate government attention. First, the simulations showed that because of the many competing demands on women, they continue to suffer from a heavy time burden. Indeed, they spend roughly three times as much time as men in household production. It is therefore important to design complementary policies to reduce this time burden on women through measures that save time or improve the productivity of time use, such as women's access to education, land, credit, information, and technology. Second, the simulations showed that while government may offset revenue losses through an increase in indirect taxes, compensatory taxes that favor poor households and women, such as direct (income) taxes that primarily target the non-poor, would help to reduce poverty and inequality and increase welfare

The study concluded by highlighting areas of gender-aware macroeconomic analysis that might benefit from a more detailed application of this framework to poverty and welfare analysis. The conclusion also outlined some of the limitations of the model and underlined the need to explore the possibility of a micro-simulation approach, rather than the representative household approach used in the study.

Indeed, the representative household model gives interesting insights on the average impacts on household groups. However, it cannot capture the substantial heterogeneity among households within a given group. Furthermore, standard CGE models typically include a small number of household categories (representative households), thereby limiting their usefulness for analyzing poverty and the income distribution. Indicators used for the analysis of poverty and income distribution - the density function, Lorenz curves, dominance analysis, the Atkinson and Gini inequality coefficients, FGT poverty indices, etc. - generally use household - or individual-level data. Thus a large number of households are required for an adequate analysis of the impacts of macroeconomic policies on poverty and the income distribution. An increasing number of analysts are opting for micro-simulations within a CGE framework in order to reconcile the use of CGE models with poverty and income distribution analysis. This involves directly modeling each and every household from a national representative household surveys within a CGE model. This approach is equivalent to building a CGE model in which the number of household categories equals the number of participants in the household survey, thereby eliminating the assumption of representative agents.

In poverty analysis, which is generally performed at the household level, men and women are considered poor if they belong to a household that is poor. Intra-household poverty still remains ignored. However, the introduction of gender-decomposed of time allocation in the model is an important step in analyzing another dimension of poverty: "leisure time poverty". It also provides a starting point for intra-household poverty analysis. In this way, the micro-simulation approach is a first step toward the ultimate goal of performing gender-disaggregated individual level welfare and poverty analysis, rather than the current household level (or even household group level) analysis.

### **3. BUILDING A GENDER-AWARE INTEGRATED MACRO-MICRO MODEL**

Our gender-aware integrated micro-macro model is constructed in three steps. First, we prepare an accounting framework that brings together market and non market activities using macro- and micro- economic datasets for South Africa. Then, we incorporate into a standard CGE model labor market segmentation between male and female workers. These are

considered as different factors of production in the same way workers are differentiated according to skill or geographical location in other contexts. Finally, we introduce non market activities and leisure time into the model with the recognition that women are more likely to perform household work while men are more active in the labor market and have more leisure time.

### **3.1 Building a Gender-Aware Social Accounting Matrix with Household-Level Data**

A CGE model is generally built on the basis of a social accounting matrix (SAM). A SAM is a consistent quantitative macroeconomic data framework composed of a square matrix representing all transactions between the different sectors, factors and agents in an economy during a given period. A gender-aware SAM further distinguishes labor factors by gender. Integrating real households from a representative survey of the population requires vectors of household income and expenditures, as well as data on their market and non market allocation of time. In this process, we use both macro- and micro-level datasets, which we reconcile in a single framework.

Figure 1 illustrates the procedure used in building a gender-aware SAM with household-level data on income, expenditures, and the allocation of time to various activities. We first bring together the Supply and Use Tables (SUT) and the integrated economic accounts (IEA), both for year 2000, in a single framework: a standard SAM (step one). Then, household-level data on income and expenditure as well as male and female market work, are computed from household surveys, i.e. the Income and Expenditure Survey (IES) and the September Labor Force Survey<sup>3</sup> (LFS), once again both for year 2000 (step two). We then reconcile these household-level data and the standard SAM to generate a gender-disaggregate SAM (step three). Fourth, the time use survey (TUS) for year 2000 is combined with household income and expenditure data, and individual market work data, to impute time spent by individuals in non market activities, i.e. domestic work, and leisure and personal care activities (step four). Fifth, household non market work, leisure and personal care time are incorporated into the gender-disaggregate SAM to generate a gender-aware SAM (step five). The concept of a National Satellite Account of Household Production (NSAHP) is used to incorporate non market activities (household production of services and leisure activities) into the standard SAM as recommended by the 1993 System of National Accounts of the United Nations. The sixth and final stage is to distinguish each individual household within the SAM in order to obtain a gender-aware SAM with real households.

In this procedure, time spent by individuals on non-market work and leisure activities is converted into monetary value by assigning a price. The opportunity cost approach is used to impute a unitary value to the time spent by individuals on various non-market activities. This price is approximated to the “expected” wage rate that an individual would have received if he or she had sold his/her time (or labor services) to the market rather than performing non-market activities. The expected wage rate is predicted for each individual in the household based on individual characteristics (age, gender, etc.).

The estimated value of non-market labor is used as an indicator of the value of household production. Therefore, home-produced goods “directly” require neither capital nor inputs by assumption. Substitution and complementarity between durable and non durable goods in the

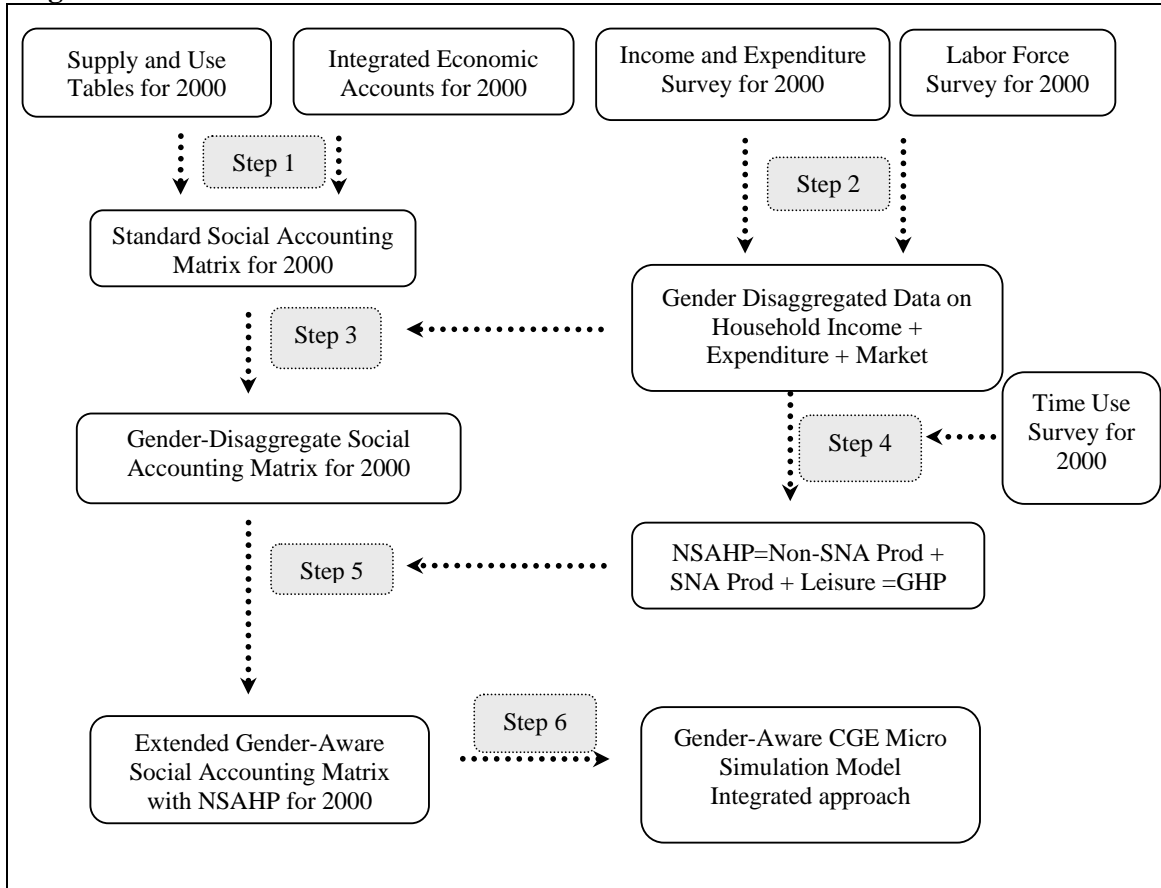
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<sup>3</sup> The year 2000 Income and Expenditure Survey (IES) is based on the same sample of households as the September 2000 Labor Force Survey (LFS: 2).

home production of services are “indirectly” integrated in the consumption decisions of households.

Details on the technical aspects are provided in the interim report “*Technical Report on the Building of a Gender-Aware Social Accounting Matrix with Household-Level Data*”. This accounting framework is used to build the gender-aware integrated CGE microsimulation model that we present in the next section.

**Figure 1: From NSAHP to a Gender-Aware CGE Micro Simulation Model**



### 3.2 The Gender-Aware Integrated Macro-Micro Model

This study uses a CGE model based on the neoclassical-structuralist specification presented in Decaluwé, Martens and Savard (2001). The model seeks to explain production, consumption and prices in an economy in which consumers and producers respond to relative prices based on welfare and profit maximizing consumption and production behaviour, and markets simultaneously adjust relative prices in order to clear markets. Though, most of the equations have strong microeconomic foundations, the conceptualization of the economy also allows a strict macroeconomic analysis such that the behaviour of agents is consistent with the macroeconomic constraints.

The model incorporates additional features of particular interest for developing countries. The model explicitly treats trade and transportation margins for commodities that enter the market

sphere. A constant trade and transportation margins coefficient is added to each transaction, included in the price, and the corresponding revenues generated are a source of demand for the trade and transportation sector.

Labor markets have been treated to reflect empirical evidences in developing countries and South African specificities. Initially, there are eight categories of workers distinguish by their residential area (urban and rural), age (child and adult), and skill categories in the case of adult workers (high, medium and low). The model explicitly treats unemployment as a consequence of labor market imperfections in South Africa.

#### a) Gendering the Standard CGE Model

Most standard CGE models make the implicit assumption that male and female workers are perfect substitutes in market production and thus do not distinguish them. However, many studies underline the fact that there is segmentation in the labor market between men and women, and different levels of market work flexibility according to the domestic tasks they perform. Also, it is observed that male and female workers tend to concentrate in different sectors and occupations, which further undermines the hypothesis of perfect substitutability. Finally, it is widely recognized that there is often a gender bias against women in the labor market in term of wage earnings and job opportunities. Indeed, the 2002 report on men and women in South African shows that the unemployment rate is higher for women than for men within each population group, and in both urban and rural areas. Formal sector work is far more common for men than for women. Employed women tend to cluster into a small number of industries compared to men; and women are significantly more likely than men to be employed in clerical jobs while men are primarily employed as operators. Mean hourly earnings are higher for men than women across all population groups.

Thus, in our analysis, the labor market is segmented into male and female labor markets and workers are separated by gender. Male and female workers are considered as different factors of production in the same way workers are differentiated according to skill or geographical location in other contexts.

The first step in incorporating gender dimensions into a standard CGE model consists in the segmentation of the labor market into male and female workers where male labor ( $LM_i^{mal}$ ) and female labor ( $LM_i^{fem}$ ) are treated as imperfect substitutes in sectoral aggregate labor demand ( $LM_i$ ):

$$LM_i = f(LM_i^{mal}, LM_i^{fem})$$

The gross earnings of male and female workers are equal to the volume of labor employed multiplied by the market wage index. Household labor income consists of the sum of male and female wage incomes. Assuming labor market imperfections and the presence of unemployment, only a proportion of the total hours supplied by household to the labor market is hired.

We also introduce non market activities into the model with the recognition that women are more likely to perform household work while men are more active in the labor market and



have more leisure time. Furthermore, modeling non market activities alongside market activities makes it possible to assess:

- the importance of household production of services which are intensive in female work;
- the impact of constraints faced by women at the household level (because of their involvement in family tasks), which may negatively affect their labor market participation and the performance of the overall economy;
- the impacts on male and female leisure time, where increased participation in the labor force will not necessary improve welfare if, especially in the case of women, they still must perform most of the domestic work and therefore reduce their leisure time;
- the impact on child education at the household level where children, especially girls, are often required to assume household tasks of female adults who have entered the labor market, to the detriment of their education and leisure time.

Men and women substitute their time devoted to leisure and to domestic work. Male labor ( $LZ_h^{mal}$ ) and female labor ( $LZ_h^{fem}$ ) are imperfect substitutes in home good production ( $Z_h$ ) which, by assumption, requires neither intermediate goods nor capital<sup>4</sup>.

$$Z_h = f(LZ_h^{mal}, LZ_h^{fem})$$

The relative demand for male and female labor in home production depends on their initial relative share in home production, male and female expected wage rates, and the degree of trade-off between men and women in home production represented by the elasticity of substitution<sup>5</sup>.

The value of home produced goods is equal to the value of the labor devoted to its production where non-market labor is valued at its opportunity cost as measured by expected market wage rates.

An extended linear expenditure system is specified where utility, which is a function of the consumption of market and home goods, as well as male and female leisure time, is maximized subject to a full income constraint ( $FYH_h$ ):

$$U_h = f(C_{h,i}^m, C_h^z, \ell_h^{mal}, \ell_h^{fem})$$

$$FYH_h = R_h + wm \cdot \bar{T}_h^{mal} + wf \cdot \bar{T}_h^{fem} = YH_h + wm \cdot \ell_h^{mal} + wf \cdot \ell_h^{fem}$$

where  $\bar{T}_h^{mal}$  and  $\bar{T}_h^{fem}$  are maximum male and female time available for work and leisure,  $\ell_h^{mal}$  and  $\ell_h^{fem}$  represent male and female leisure time,  $wm$  and  $wf$  are male and female wage rates,  $YH_h$  and  $R_h$  are household real income and non-labor income and, finally,  $C_h^z$  and  $C_{h,i}^m$  represent the consumption of home produced and market goods, respectively.

<sup>4</sup> Domestic paid labor, capital goods and intermediate goods are included in the household utility function and indirectly substitute with domestic unpaid labor, which is used to produce home goods.

<sup>5</sup> We assume that there are very limited substitution possibilities between men and women in the production of home goods, reflected by a low elasticity of substitution (0.5) between male and female domestic work.

The household entirely consumes the goods it produces at home, as there is no market for these goods, although they are considered to be imperfect substitutes for market goods<sup>6</sup>. Men and women allocate their total available time in two steps. First, the total exogenous time (hours) available for market and non market activities are allocated to domestic activities (according to home good production requirements and the degree of substitutability between men and women in home production), to leisure activities (the demand for male and female leisure is derived from the utility function), and to market labor activities. Second, the available hours of market labor supply is allocated between work and unemployment<sup>7</sup>.

## b) Overview of the Model

### *Production*

The production function technology is assumed to be of constant returns to scale and is presented in a four-level production process. At the first level, output (XS) is a Leontief input-output function of value added (VA), and composite intermediate consumption (CI):

$$\begin{aligned} XS_i &= VA_i / v_i \\ CI_i &= io_i \cdot XS_i \end{aligned}$$

where  $v$  and  $io$  represent the fixed input-output coefficients. Intermediate demand (DI) for commodity  $i$  by sector  $j$  is derived from the Leontief input-output function:

$$DI_{i,j} = a_{ij} \cdot CI_i$$

where  $a_{ij}$  are the disaggregate input-output coefficients in total intermediate demand. Total intermediate demand (DIT) is equal to the sum of sectoral demands:

$$DIT_i = \sum_j DI_{i,j}$$

At the second level, a CES function is used to represent the substitution between sectoral composite labor (LD) and capital (KD) in the value added function (VA):

$$VA_i = A_i \cdot \left[ \alpha_i \cdot LD_i^{-\rho_i} + (1 - \alpha_i) \cdot \overline{KD}_i^{-\rho_i} \right]^{\left( \frac{1}{\rho_i} \right)}$$

where  $A$ ,  $\rho$ , and  $\sigma$  represent scale, labor share, and elasticity parameters. Assuming all firms in the sector strive to maximize profits and face perfect competition in both input and output markets, the conditional sectoral demand for labor is given by the following equation:

$$\frac{LD_i}{\overline{KD}_i} = \left[ \left( \frac{\alpha_i}{1 - \alpha_i} \right) \left( \frac{r_i}{w_i} \right) \right]^{\left( \sigma_i \right)}$$

<sup>6</sup> Gronau (1977) and Solberg and Wong (1992) assume that home goods are perfect substitutes for market goods. However, in other versions of Gronau's model, these goods are imperfect substitutes. For other assumptions to simplify the modeling aspects, see Fofana, Cockburn, and Decaluwe (2003 and 2004).

<sup>7</sup> For details on technical aspects, please refer to ECA (2004b).

Composite labor demand (LD) is also a CES function of composite male labor (MLD) and composite female labor (FLD),

$$LD_i = A_i \cdot \left[ \alpha_i \cdot FLD_i^{-\rho_i} + (1 - \alpha_i) \cdot MLD_i^{-\rho_i} \right]^{\left(\frac{-1}{\rho_i}\right)}$$

and yields the following conditional labor demand:

$$\frac{FLD_i}{MLD_i} = \left[ \left( \frac{\alpha_i}{1 - \alpha_i} \right) \left( \frac{wm_i}{wf_i} \right) \right]^{\sigma_i}$$

where  $wm$  and  $wf$  are male and female sectoral wage rates. The Cobb-Douglas (CD) function implies unitary substitution elasticity between the various categories (lab) of male labor (MFD) and female labor (FFD) in aggregate male (MLD) and female (FLD) labor:

$$MLD_i = A_i \cdot \left[ \prod_{lab} MFD_{lab,i}^{\sigma_{lab,i}} \right]$$

$$FLD_i = A_i \cdot \left[ \prod_{lab} FFD_{lab,i}^{\sigma_{lab,i}} \right]$$

where  $A$  and  $\sigma$  represent scale and labor share parameters. The conditional demand of male labor by category depends on its initial sectoral share  $\sigma$  and the sectoral wage rates ( $wm$  and  $wf$ ):

$$MFD_{lab,i} = \sigma_{lab,i} \cdot wm_i \cdot MLD_i / wm_{lab}$$

$$FFD_{lab,i} = \sigma_{lab,i} \cdot wf_i \cdot FLD_i / wf_{lab}$$

### ***External trade***

The relationship between the rest of the world and the domestic economy is determined by the substitutability between imported and domestic goods on the consumption side, and by the substitutability between the domestic and international markets on the production side. The relative prices of foreign goods – defined by international prices, the exchange rate, and government interventions (taxes, subsidies, and tariffs) – determine the allocation of supply and demand between the domestic and international markets.

The model allows for imperfect substitution in consumption and production between domestic and foreign goods. For import-competitive commodities (m), local-produced commodities (D) and imports (IM) are assumed to be imperfect substitutes in total supply (Q) to the domestic market following the Armington assumption, which is specified by a CES function:

$$Q_m = A_m \cdot \left[ \alpha_m \cdot IM_m^{-\rho_m} + (1 - \alpha_m) \cdot D_m^{-\rho_m} \right]^{\left(\frac{-1}{\rho_m}\right)}$$

The demand for imports relative to domestically-produced goods is derived from cost minimization subject to the CES function:

$$\frac{IM_m}{D_m} = \left[ \left( \frac{1-\alpha_m}{\alpha_m} \right) \left( \frac{pm_m}{pd_m} \right) \right]^{(\sigma_m)}$$

where  $\sigma$  is the Armington elasticity, and pm and pd are the import and domestic good prices. For non-importable sectors (nm), only domestic goods are consumed.

$$Q_{nm} = D_{nm}$$

In exportable sectors (xs), domestically produced goods (XS) are allocated between exports (EXS) and the local market (D) according to a CET function:

$$XS_x = \Lambda_x \cdot \left[ \alpha_x \cdot EXS_x^{p_x} + (1-\alpha_x) \cdot D_x^{p_x} \right]^{(1/\rho_x)}$$

Export supply is derived from profit maximization subject to the CET function:

$$\frac{D_x}{EXS_x} = \left[ \left( \frac{1-\alpha_x}{\alpha_x} \right) \left( \frac{pe_x}{pd_x} \right) \right]^{\epsilon_x}$$

where  $\sigma$  is the CET elasticity of transformation, and pe and pd are the prices for export and local sales, respectively. In the non-exportable sectors (nx), all domestic output is sold on the local market:

$$XS_{nx} = D_{nx}$$

Export supply is constraint by export demand, which is assumed to have a finite elasticity reflecting the competitiveness of local products on the international market. Consequently, export demand (EXD) depends on the initial export demand ( $\overline{EXD0}$ ), world prices for the exports in question (pwe), the domestic border price of South African exports (pfob), and the export demand elasticity  $\epsilon$ .

$$EXD_x = \overline{EXD0}_x \left[ \frac{pwe_x}{pfob_x} \right]^{\epsilon_x}$$

### ***Taxes and subsidies, margins, and prices***

Government derives revenue from various sources. Import duties (MTAX) are equal to the tariff rate (tm) levied on imports (IM) expressed in domestic prices using the nominal exchange rate (e), where pwm is the world price imports. Production taxes (PRDTAX) are collected at the rate tp, which is applied to sectoral production valued at factor prices. Sales taxes (SALTAX) on import-competitive commodities are applied to the value, including trade and transportation margins (mmg), of domestic production and imports sold on

domestic market, where  $tx$  is the fixed sales tax rate. Sales taxes on non import-competitive commodities are solely applied to domestically-produced goods sold on the domestic market. Direct taxes are collected from both firms (DTF) and households (DTH) as a fixed proportion of their income, where  $YH$  and  $YF$  are household and firm incomes, respectively:

$$\begin{aligned} MTAX_m &= tm_m \cdot pwm_m \cdot e \cdot IM_m \\ PRDTAX_i &= tp_i \cdot p_i \cdot XS_i \\ SALTAX_m &= tx_m \cdot [1 + mmg_m] \cdot [pl_m \cdot D_m + pm_m \cdot IM_m] \\ SALTAX_{nm} &= tx_{nm} \cdot [1 + mmg_{nm}] \cdot [pl_{nm} \cdot D_{nm}] \\ DTH_h &= tyh_h \cdot YH_h \\ DTF &= tyf \cdot YF \end{aligned}$$

We explicitly model trade and transportation margins for commodities that enter the market sphere. Constant trade and transportation margins coefficients ( $mmg$  and  $xmg$ ) are added to the price of all domestically-produced and imported commodities sold on the domestic market, as well as on all exported goods. The corresponding revenues (MMRG and XMRG) generated constitute the demand for trade and transportation production. In the case of the trade and transportation sectors, these margins are negative and constitute revenues for these sectors. They are also endogenous in order to balance the demand and supply for trade and transportation:

$$\begin{aligned} MMRG_m &= mmg_m \cdot [pl_m \cdot D_m + pm_m \cdot IM_m] \\ MMRG_{nm} &= mmg_{nm} \cdot [pl_{nm} \cdot D_{nm}] \\ XMRG_x &= xmg_x \cdot pe_x \cdot EXS_x \\ \left[ \sum_i MMRG_i + \sum_x XMRG_x \right] &= 0 \end{aligned}$$

Import prices ( $pm$ ) are equal to world prices for these imports ( $pwm$ ) converted into domestic prices by the exchange rate ( $e$ ) and adjusted for import taxes ( $tm$ ), trade and transportation margins ( $mmg$ ), and sales taxes ( $tx$ ). Export prices ( $pe$ ) are equal to the border world prices for South African exports ( $pfob$ ) converted into domestic prices by the exchange rate and adjusted for trade and transportation margins ( $xmg$ <sup>8</sup>).

$$\begin{aligned} pm_m &= [1 + tx_m] \cdot [1 + mmg_m] \cdot [(1 + tm_m) \cdot e \cdot pwm_m] \\ pe_x &= pfob_x \cdot e / [1 + xmg_x] \end{aligned}$$

Sectoral output valued at producer (basic) prices is equal to the production at factor cost augmented by production taxes (net of subsidies).

$$XXS_i = XS_i \cdot (1 + tp_i)$$

The composite producer price ( $p$ ) in exportable sectors is equal to a weighted average of producer prices for domestic and export sales, where the weights are equal to the respective volume shares of these sales in total production. In non-exportable sectors, the composite producer price is simply equal to the price of domestic goods ( $D=XXS$ ).

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<sup>8</sup> The government does not levy export taxes in South Africa.

$$p_x = [p_{l_x} \cdot D_x + p_{e_x} \cdot EXS_x] / XXS_x$$

$$p_{nx} = [p_{l_{nx}} \cdot D_{nx}] / XXS_{nx}$$

Domestic prices are then obtained by adjusting for trade and transportation margins rate (mmg) and sales taxes (tx):

$$pd_i = p_{l_i} \cdot [1 + tx_i] \cdot [1 + mrg_i];$$

The composite consumer price (pc) in importable sectors is defined as the weighted average of domestic and import prices, the weights being the share of domestic and imported volumes in the composite commodity. In non-importable sectors this price is simply equal to the price of domestic goods (D=Q).

$$pc_m = [pd_m \cdot D_m + pm_m \cdot IM_m] / Q_m$$

$$pc_{nm} = [pd_{nm} \cdot D_{nm}] / Q_{nm}$$

The value-added price (pv) is the ratio of total output valued at factor costs less intermediate input costs to the volume of value added in the sector.

$$pv_i = [p_i \cdot XS_i - \sum_j pc_j \cdot DI_{j,i}] / VA_i$$

The average sectoral wage index for composite labor is the sum of male and female labor costs divided by the total volume of composite labor.

$$w_i = [wm_i \cdot MLD_i + wfem_i \cdot FLD_i] / LD_i$$

The value added price index (pindex) is the weighted average of domestic value added prices, where the weights are given by the share of each sector in the total volume of value added.

$$\overline{pindex} = \sum_i \left[ pv_i \cdot \left( \frac{VA_i}{\sum_i VA_i} \right) \right]$$

As this is the numeraire of the model, it is exogenous.

The zero profit condition is given by the following equation:

$$r_i = (pv_i \cdot VA_i - w_i \cdot LD_i) / \overline{KD}_i$$

### ***Income, savings and demand for commodities***

The model distinguishes three sources of (real) income, labor income (salaries and wages, and imputed self-employed labor income), capital income and transfer income from institutional sectors (households, firms, government and rest of the world). This section

briefly discusses income generation, which is an important component of the mechanism of transmission of macroeconomic policies and shocks to poverty and income inequality.

Note that total gross wage income is equal to the total volume of male and female labor employed in all sectors valued at the gender-specific wage rates (wmal and wfem). According to the characteristics of the labor market in South Africa we assume that public employment is exogenous. The wage rate in general government services (ggs) is indexed to the economy wide value added price index.

$$\begin{aligned} wmal_{lab,ggs} &= \overline{wmal0}_{lab,ggs} \cdot \overline{pindex} \\ wfem_{lab,ggs} &= \overline{wfem0}_{lab,ggs} \cdot \overline{pindex} \end{aligned}$$

All transfers (INTRF) are fixed in real terms.

**Firm** income (YF) is equal to sum of their share in sectoral capital incomes plus the sum of their shares in all in-transfers. After firms pay income tax (DTF) to government and makes out-transfers (dividends, interest payments, etc.) to other agents that are fixed in real terms, their remaining income constitutes their savings (SF).

$$YF = \left[ \sum_i \lambda_{firm,i}^r \cdot r_i \cdot KD_i \right] + \left[ \sum_t \lambda_{firm,t}^t \overline{INTRF}_t \cdot \overline{pindex} \right]$$

$$SF = YF - DTF - \left[ \sum_t \lambda_{firm,t}^t \overline{OUTRF}_t \cdot \overline{pindex} \right]$$

**Government** revenue is composed of direct taxes on household income and firm (net) earnings, import tariffs, indirect taxes on domestic production and sales, and indexed transfer receipts (including dividends, concessionary sales, foreign aid, etc.). Government savings (SG; the public deficit) are equal to government income less its consumption and its indexed transfer payments. Note that government spending is exogenous in real terms, although nominal expenditures are endogenous as a result of price changes.

$$YG = \left[ \sum_h DTH_h + DTF \right] + \left[ \sum_M MTAX_M + \sum_i PRDTAX_i + \sum_i SALTAX_i \right] + \left[ \sum_t \overline{INTRF}_{gov,t} \cdot \overline{pindex} \right]$$

$$SG = YG - \left[ \sum_i G_i \right] - \left[ \sum_t \overline{OUTRF}_{gov,t} \cdot \overline{pindex} \right]$$

**Household** income is derived from wage earnings from its different categories of male and female workers, capital income and transfer incomes. Household h receives a fixed share of total wage income where the proportion lambda\_w is equal to its share of total labor employment in each category. In other words, we assume that employment in public and other sectors is rationed on the demand side, whereas the number of hour supplied by each household is endogenous. Therefore, only a proportion of the total hours supplied by household to the labor market is hired. Therefore, households will be affected differently by macroeconomic policies or shocks depending on the market labor and investment activities they perform.

Note also that, in the case of households with negative savings (DISH, dissavings), these are fixed in real terms and indexed to the general price level. Disposable income (YDH) is equal to household income net of income taxes and indexed household transfer payments.

Household savings (SH) is a fixed proportion of its disposable income. Total household income allocated to consumption (CTH) is equal to disposable income less savings. Household sectoral consumption is modeled by an extended linear expenditure system (ELES) and subject to its budget constraint. Consequently, sectoral consumption depends on total consumption, specified (exogenous) minimum consumption levels (CMIN) and the vector of consumer prices.

$$YH_h = \left[ \sum_{lab} \sum_i \lambda_{h,lab}^{wmal} \cdot wmal_{lab} \cdot MFD_{lab,i} \right] + \left[ \sum_{lab} \sum_i \lambda_{h,lab}^{wfem} \cdot wfem_{lab} \cdot FFD_{lab,i} \right] \\ + \left[ \sum_i \lambda_{h,i}^r \cdot r_i \cdot KD_i \right] + \left[ \sum_i \overline{INTR}_{h,t} \cdot \overline{pindex} \right] + \left[ \overline{DISH}_h \cdot \overline{pindex} \right]$$

$$YDH_h = YH_h - DIH_h - \left[ \sum_i \overline{OUTR}_{h,t} \cdot \overline{pindex} \right]$$

$$SH_h = \phi_h \cdot YDH_h$$

$$CIH_h = YDH_h - SH_h$$

$$C_{h,i} = \overline{CMIN}_{h,i} + \frac{\beta_{h,i} \cdot \left[ CTH_h - \sum_i pc_i \cdot \overline{CMIN}_{h,i} \right]}{pc_i \cdot \left( 1 - \sum_{lab} \beta_{h,lab}^{mal} - \sum_{lab} \beta_{h,lab}^{fem} - \beta_h^z \right)}$$

**Real demand for investment goods (INV)**, finally, is exogenous.

### *Non market work and the production and consumption of home goods*

The home good production function is a nested CES function of the different categories of male and female labor. By assumption, it requires neither intermediate goods nor capital. At the first level, aggregate home good production is modeled by a CES function representing the substitutability between composite male (MLZ) and female (FLZ) laborers:

$$Z_h = A_h \cdot \left[ \alpha_h \cdot FLZ_h^{-\rho_h} + (1 - \alpha_h) \cdot MLZ_h^{-\rho_h} \right]^{\left( \frac{-1}{\rho_h} \right)}$$

where  $A$ ,  $\rho$ , and  $\sigma$  have the same definition as in market activities.

The relative demand for male and female labor in home production depends on the share parameter in the home production function, the relative unitary cost of their time ( $cm$  and  $cf$ ), and the elasticity of substitution.

$$\frac{FLZ_h}{MLZ_h} = \left[ \left( \frac{\alpha_h}{1 - \alpha_h} \right) \left( \frac{cm_h}{cf_h} \right) \right]^{\sigma_h}$$

The value of home produced goods (PZ) is equal to the cost of time devoted to its production valued at its opportunity cost as measured by the expected market wage rates:

$$pz_h = \left[ cm_h \cdot MLZ_h + cf_h \cdot FLZ_h \right] / CZ_h$$



As we will see below, expected market wage rates differ by household and by labor category.

At the second level, CD functions are used to represent the substitution between male (MFZ) and female (FFZ) labor categories. Consequently, the category-specific demand for non-market labor depends on total non-market labor demand and the relative opportunity cost of each worker category.

$$\begin{aligned} MLZ_h &= A_h \cdot \left[ \prod_{lab} MFZ_{h,lab}^{\sigma_{h,lab}} \right] \\ FLZ_h &= A_h \cdot \left[ \prod_{lab} FFZ_{h,lab}^{\sigma_{h,lab}} \right] \\ MFZ_{h,lab} &= \sigma_{h,lab} \cdot cm_h \cdot MLZ_h / cmal_{h,lab} \\ FFZ_{h,lab} &= \sigma_{h,lab} \cdot cf_h \cdot FLZ_h / cfem_{h,lab} \end{aligned}$$

Household demand for home goods is derived from the extended linear expenditure system (ELES) presented in section 3.2a) above and subject to the full income constraint. The household entirely consumes the goods it produces at home, as there is no market for these goods.

$$\begin{aligned} CZ_h &= \overline{CZMIN}_h + \frac{\beta_h^z \cdot \left[ CTH_h - \sum_i pc_i \cdot \overline{CMIN}_{h,i} \right]}{pz_h \cdot \left( 1 - \sum_{lab} \beta_{h,lab}^{mal} - \sum_{lab} \beta_{h,lab}^{fem} - \beta_h^z \right)} \\ Z_h &= CZ_h \end{aligned}$$

### ***Time allocation and labor supply***

Men and women allocate their total available time (TMAL and TFEM) between market labor supply (MFS and FFS), domestic work (LZMAL and LZFEM) and leisure. As domestic work is determined by home good production requirements and leisure time is derived from the ELES utility function, market labor supply is a residual:

$$\begin{aligned} MFS_{h,lab} &= \overline{TMAL}_{h,lab} - MFZ_{h,lab} - \frac{\beta_{h,lab}^{mal} \cdot \left[ CTH_h - \sum_i pc_i \cdot \overline{CMIN}_{h,i} \right]}{cmal_{h,lab} \cdot \left( 1 - \sum_{lab} \beta_{h,lab}^{mal} - \sum_{lab} \beta_{h,lab}^{fem} - \beta_h^z \right)} \\ FFS_{h,lab} &= \overline{TFEM}_{h,lab} - FFZ_{h,lab} - \frac{\beta_{h,lab}^{fem} \cdot \left[ CTH_h - \sum_i pc_i \cdot \overline{CMIN}_{h,i} \right]}{cfem_{h,lab} \cdot \left( 1 - \sum_{lab} \beta_{h,lab}^{mal} - \sum_{lab} \beta_{h,lab}^{fem} - \beta_h^z \right)} \end{aligned}$$

Market labor supply by household members is employed according to market demand. The remaining market labor supply is unemployed at the following household-specific rates:

$$\mu_{h,lab}^{mal} = 1 - \left[ \frac{\lambda_{h,lab}^{wmal} \cdot \sum_i (wmal_{lab} \cdot MFD_{lab,i})}{MFS_{h,lab}} \right]$$

$$\mu_{h,lab}^{fem} = 1 - \left[ \frac{\lambda_{h,lab}^{wfem} \cdot \sum_i (wfem_{lab} \cdot FFD_{lab,i})}{FFS_{h,lab}} \right]$$

The opportunity cost of time not devoted to market work (i.e. time spent in leisure and domestic activities) is equal to the corresponding **expected** market wage rate. Male and female expected market wage rates are defined as their corresponding market wage rates ( $wmal$  and  $wfem$ ) adjusted by the probability of being employed. Workers have different unemployment rates according to their characteristics (level of education, demographical composition, welfare, etc.), as shown by the South Africa 2000 Labor Force Survey. Worker-specific probability of being unemployed is determined by the corresponding economy-wide rate of unemployment ( $umal$  and  $ufem$ ) adjusted by the worker-specific rate of unemployment  $\mu_{h,lab}^{mal}$  ( $\mu_{h,lab}^{fem}$ ). We thus obtain the following expressions for the opportunity cost of non-market time:

$$cmal_{h,lab} = \left[ 1 - (umal_{lab} \cdot \mu_{h,lab}^{mal}) \right] \cdot wmal_{lab}$$

$$cfem_{h,lab} = \left[ 1 - (ufem_{lab} \cdot \mu_{h,lab}^{fem}) \right] \cdot wfem_{lab}$$

Thus,  $\mu_{h,lab}^{mal}$  and  $\mu_{h,lab}^{fem}$  are equal to zero when the worker is fully employed,

$$\lambda_{h,lab}^{wmal} \cdot \sum_i (wmal_{lab} \cdot MFD_{lab,i}) = MFS_{h,lab}$$

and 1 when worker is unemployed,

$$\lambda_{h,lab}^{wmal} \cdot \sum_i (wmal_{lab} \cdot MFD_{lab,i}) = 0$$

### **Macroeconomic closure**

CGE analysis depends crucially on the realistic choice of macroeconomic closure, which specifies (i) factor, commodity and foreign exchange market-clearing rules, (ii) the government budget adjustment, and (iii) the savings and investment balancing mechanism.

Our model explicitly treats unemployment as a consequence of labor market imperfections in South Africa. Total male and female labor supply ( $MFS_{h,lab}$  and  $FFS_{h,lab}$ ) to private sectors  $iprv$ , after deduction of labor supply to the public sector ( $MGOV_{h,lab}$  and  $FGOV_{h,lab}$ ), is greater than total private labor demand. Consequently, there is an excess supply of labor which is unemployed at the following rates:

$$\text{umal}_{lab} = 1 - \left[ \frac{\sum_{iprv} \text{MFD}_{lab,iprv}}{\sum_h (\text{MFS}_{h,lab} - \text{MGOV}_{h,lab})} \right]$$

$$\text{ufem}_{lab} = 1 - \left[ \frac{\sum_{iprv} \text{FFD}_{lab,iprv}}{\sum_h (\text{FFS}_{h,lab} - \text{FGOV}_{h,lab})} \right]$$

The relationship between the wage and unemployment rates is modeled by a wage curve<sup>9</sup>. This concept emerged from a series of empirical studies carried out with data compiled from several countries, which showed a downward-sloping relationship between the unemployment and wage rates:

$$\frac{\text{wmal}_{lab}}{\text{Pindex}} = \beta_{lab} \cdot (\text{umal}_{lab})^{\pi_{lab}}$$

$$\frac{\text{wfem}_{lab}}{\text{Pindex}} = \beta_{lab} \cdot (\text{ufem}_{lab})^{\pi_{lab}}$$

where  $\pi$  is the elasticity of the wage rates with respect to local unemployment rates.

Research by Kingdon and Knight (2005) show that the elasticity of wages to local unemployment rates in South Africa is -0.1, similar to that found by Blanchflower and Oswald (1995) in other countries.

Capital is sector-specific and exogenously set at the base year level. Consequently, returns to capital vary by sector.

All commodity markets follow the neoclassical market-clearing price system in which simultaneously determined producer and consumer prices vary only by given tax/subsidy and margins rates. Each market is cleared when supply equals demand.

$$Q_i = \sum_h C_{h,i} + CG_i + DIT_i + \overline{INV}_i$$

The foreign exchange market balances via adjustments in the real exchange rate. The current account balance is exogenous and set equal to its base year level. Hence, with fixed foreign capital transfers, higher imports of some good will require higher exports and/or lower imports of other goods in order to keep the current account balanced. Pressures to change export or import quantities - demand and supply of foreign currency - are accommodated by adjustments in the real exchange rate.

$$\overline{CAB} \cdot e = \left[ \sum_m (\overline{pwm}_m \cdot e \cdot \text{IM}) - \sum_x (\text{pfob}_x \cdot e \cdot \text{EXS}_x) \right] + \left[ \sum_t (\overline{\text{INTRF}}_{row',t} \cdot \overline{pindex}) - \sum_t (\overline{\text{OUTRF}}_{row',t} \cdot \overline{pindex}) \right]$$

Export demand and supply balance through adjustments in the export f.o.b. prices.

$$\text{EXS}_x = \text{EXD}_x$$

<sup>9</sup> Blanchflower and Oswald (1995); and Card, D. (1995).

The model solves for a short-run equilibrium where capital is assumed to be immobile or sector-specific. In order to abstract from welfare affects associated with decreasing investment, or vice versa, real investment is fixed at its benchmark value and savings are investment driven:

$$\sum_i \overline{INV}_i \cdot pc_i = \sum_h (\overline{SH}_h - \overline{DISH}_h \cdot pindex) + \overline{SF} + \overline{SG} + \overline{CAB} \cdot e$$

Total savings are equal to the sum of household, firm, government and foreign savings. Household savings are a fixed proportion of disposable income less the exogenous dissavings of some households. Firm savings is a residual after deduction of dividend payments and other transfers from firm income. Foreign saving (or the current account balance) is exogenous in foreign currency terms. Public savings thus act as the adjustment variable to balance investment given changes in prices as well as household and firm savings.

Government is passive in our model, i.e. it does not optimize an objective function. It simply collects revenue, consumes, makes transfers and saves or borrows. Real government expenditure, i.e. consumption and transfers, is fixed in real terms (CG) to abstract from its impacts on welfare and poverty:

$$G_i = \overline{CG}_i \cdot pc_i$$

Nominal government revenue (YG) adjusts to losses in tariff revenue, changes in consumer prices (for public expenditure) and variations in public savings required to ensure investment-savings equilibrium. This is achieved through the introduction of a variety of compensatory tax adjustments.

The model is homogenous of degree one in all prices and nominal values. Our numeraire is the aggregate value added price, which is fixed at its initial level, and all nominal values are thus measured relative to this price. The model solves for a short-run equilibrium and results are interpreted in comparative static terms.

#### 4. SOUTH AFRICA'S SOCIOECONOMIC CHARACTERISTICS

South Africa was reintegrated back into the world economy following a credible transition to democracy symbolized by the elections in 1994. The new South African government immediately adopted a Reconstruction and Development Program (RDP), which set the broad framework of the new government's economic and social policy. This was followed in 1996 by the launching of the Growth, Employment, and Redistribution (GEAR) program, which defined policy instruments and objectives for the five years until 2001. However, despite the implementation of these economic reform initiatives, the country has not yet been able to achieve stable and sustained macroeconomic performance. As well, little is known about how these policies have contributed to the existing gender disparities. In light of the above, the main objective of this section is to provide an overview of macroeconomics and gender issues in South Africa.

## 4.1 Macroeconomic Policy

During the apartheid years, monetary and exchange rate policy were strongly influenced by the interests of the gold mining industry, especially during the period 1976-1989. As the price of gold fell, the value of the Rand was allowed to fall. Upon coming to power, the new ANC-led government immediately focused its attention on reversing the decline in gross domestic product growth, the large fiscal deficit and high inflation. The macroeconomic policies adopted in the early phase of majority rule included (i) establishment of a credible and prudent fiscal stance, (ii) a WTO-linked program for trade liberalization and (iii) reunification of the dual exchange rate system (Hartzenberg and Stuart, 2002). The GEAR macroeconomic framework adopted in 1996 emphasized fiscal tightening, continued exchange rate liberalization, acceleration in tariff reductions and privatization and restructuring of state owned assets. It also stressed greater labor market efficiency. The government's policy stance has not changed much since the adoption of GEAR and substantial stabilization has been attained. Table 1 shows details on the GEAR macroeconomic framework and the expected outcomes.

**Table 1: Growth, Employment, and Redistribution (GEAR) macroeconomic framework**

<b>Policy</b>	<b>Policy measures</b>	<b>Expected outcome</b>
<b>Fiscal</b>	<ul style="list-style-type: none"> <li>- Deficit reduction</li> <li>- Income tax revision</li> <li>- Decrease government consumption expenditure</li> <li>- Decrease tax to GDP ratio</li> </ul>	<ul style="list-style-type: none"> <li>- Contain debt service</li> <li>- Counter inflation</li> <li>- Free resources for investment by decreasing government dissaving</li> <li>- Promote redistribution</li> <li>- Correct fiscal drag</li> </ul>
<b>Monetary</b>	<ul style="list-style-type: none"> <li>- Tight monetary policy</li> <li>- Relaxation of exchange controls</li> <li>- Relax access to domestic credit by foreign investors</li> <li>- Doubling limit for institutional investors to obtain foreign assets via asset swaps</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce inflation</li> <li>- Stabilize REER</li> <li>- Increase domestic saving and investment</li> <li>- Promote higher economic growth</li> <li>- Increase employment opportunities</li> <li>- Promote equitable income distribution</li> </ul>
<b>Trade</b>	<ul style="list-style-type: none"> <li>- Accelerate tariff reform</li> <li>- Tax incentives</li> <li>- Competition policy</li> <li>- Offset import cost against exports</li> <li>- Replace quantitative restrictions with tariffs</li> <li>- Phase out GEIS</li> <li>- Accelerated depreciation for new manufacturing investments</li> <li>- Promote SMMEs</li> </ul>	<ul style="list-style-type: none"> <li>- Contain input prices</li> <li>- Facilitate industrial restructuring</li> <li>- Stimulate new investment</li> <li>- Rise in non-gold exports</li> <li>- Rise in private investment</li> <li>- Rise in manufacturing</li> <li>- Increase foreign fixed investment</li> <li>- Develop SMMEs</li> </ul>
<b>Labor market</b>	<ul style="list-style-type: none"> <li>- Increase labor market flexibility</li> <li>- Reduce indirect wage cost</li> <li>- Increase incentives for more shifts, job-sharing, and increase job flexibility</li> <li>- Productivity linked wage increases</li> <li>- Wage moderation</li> <li>- Flexible regulatory labor market framework</li> </ul>	<ul style="list-style-type: none"> <li>- Rise in competition and labor intensive growth path</li> <li>- Accelerate investment and employment</li> <li>- Lower inflation pressures</li> <li>- Flexible collective bargaining structures</li> <li>- Wage and salary rises limited by productivity growth</li> </ul>

Source: South Africa Human Development Report 2003, p. 189.

## 4.2 GDP Structure and Performance

South Africa's economy is very diverse as illustrated in Table 2. The service (tourism, transport and communication) and manufacturing sectors are the two most important sectors. The South African economy has been substantially transformed in the past four decades with a decline in agriculture and a rise in services, particularly towards the end of the 1990s (SSA, 2002). Although the mining industry has historically occupied a dominant role in the economy, its importance in terms of contribution to overall output in the past decade has declined from about 20 percent between 1975 and 1989 to roughly 10 percent of GDP. A sophisticated industrial structure developed alongside an underdeveloped "informal" economy. The "informal" sector represents both untapped potential and a developmental challenge for South Africa (SAPC, 1999).

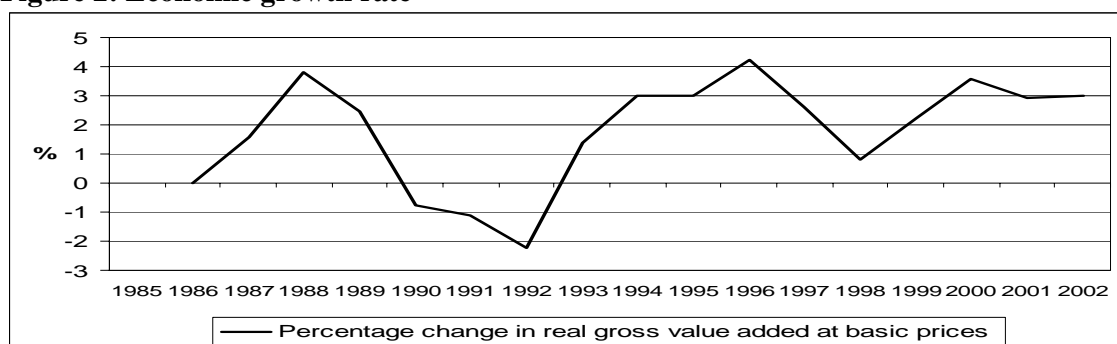
**Table 2: South African Economy: GDP Contribution by Sector: (1993-2002)**

Sector	Percentage contribution
Agriculture and Forestry	7
Mining and Quarrying	10
Manufacturing	33
Electricity and Water	6
Construction	5
Tourism	22
Transport and Communication	16

Source: Statistics South Africa

Globalization and liberalization should lead to an acceleration of growth and productivity through greater allocative efficiency and better resource allocation. In practice, as Figure 2 shows, despite significant trade liberalization and macroeconomic stabilization, the real GDP growth record has not been impressive. Growth in GDP has fallen from an average of 4.9 percent per annum for the period 1960 to 1975 to 2.3 percent during the period 1976 to 1989 and to 1.3 percent during the 1990s. After an impressive average real growth rate of 3.3 percent in 1995-1996, the economy experienced a sudden slowdown until 1998. According to Hartzenberg and Stuart (2002), the short-lived recovery between 1994 and 1996 raises an important question of sustainability and the role of inherent structural weaknesses in the economy to be considered in the design of policies to ensure the achievement of a stable growth pattern. Given a sustained population growth in excess of 2.2 per cent per annum, growth in per capita income was negative for all of the 1980s and the first half of the 1990s, only improving marginally during the latter half of the 1990s.

**Figure 2: Economic growth rate**



Source: South African Reserve Bank, Quarterly Bulletin, various issues.

### 4.3 Employment and Unemployment Performance

Unemployment, currently affecting 25 to 35 percent of the economically active population, constitutes one of the major economic policy challenges to the South African economy. According to the ECA (2002) report, in 1995 industry accounted for 32 percent of formal employment in South Africa. Between 1995 and 2001, industrial employment fell by around 14 percent, compared with a drop in total non-agricultural employment of around 10 percent. In the construction and mining sectors, employment fell by 37 percent and 30 percent respectively, mainly reflecting a shift towards casual labor in the former (ECA, 2002). Figure 3 shows that employment growth was on an erratic but downward trend between the mid-1960s and the mid-1990s and that the picture has not altered much since 1994. In the first half-decade after the ANC took power, there was a brief economic recovery that was sufficient to temporarily reverse the decline in formal employment that had occurred since 1989, although from 1996 the record is mixed. This suggests that the liberalized economy was not sustainably creating jobs. Figure 3 indicates, as we might expect, that employment is driven primarily by economic growth. However, the relationship appears to have weakened since 1996 with periods where economic growth was accompanied by a **reduction** in employment. This is indicative of what has now become known as the jobless growth phenomenon.

**Figure 3: Economic growth and formal employment**



Source: South African Reserve Bank, Quarterly Bulletin, various issues.

Based on the so-called “narrow” definition of unemployment, rates of unemployment were quite low in the early 1970s for all classes of labor. However, since 1976 unemployment rates for unskilled and semi-skilled labor have increased, reaching a climax in 1995 and continuing to rise in the latter 1990s. Note that in sharp contrast the unemployment rate for highly skilled workers has been negligible throughout the period. The unemployment rate for skilled labor has even begun to rise in recent times.

As pointed out in Arndt and Lewis (2001), total employment (including formal and informal sectors) of unskilled and semi-skilled laborers in 1999 was only 92 percent of its level in 1970. The decline was due entirely to a decline in formal sector employment of unskilled and semi-skilled laborers since employment in the informal sector and that of skilled labor has been growing. The trend towards reductions in formal sector employment of unskilled and semi-skilled labor appears unaffected by the demise of apartheid.

Arndt and Lewis (2001) contribute another explanation for the poor employment performance. This is the large differences in wage rate trends across labor classes. In 1999, real remuneration of highly skilled workers was at 90 percent of the 1970 level while real remuneration of skilled workers increased to 110 percent of the 1970 level. In contrast, real remuneration of unskilled and semi-skilled workers in 1999 had grown to 250 percent of the 1970 level. Based on these data, Arndt and Lewis conclude that it's the cost of unskilled and semi-skilled labor that has contributed to the resulting employment fall. Contrary to the case of skilled workers, for whom employment growth was associated with slow growth in wage rate, slow employment growth among unskilled workers was associated with substantial growth in wages.

#### **4.4 Income Distribution and Poverty**

South Africa has one of the worst income distributions in the world. The Gini coefficient, which measures the degree of income inequality, was 0.56 in 1995 and 0.57 in 2000, implying that the inequality has been increasing. The Gini coefficient is not only high for the country as a whole, but also for all population categories, suggesting substantial inequality within each major ethnic group. This said, the Gini coefficient is higher for Africans than for Whites. More significantly, according to ILO (1999), income distribution within and between population groups worsened between 1990 and 1995. This may reflect the fact that the end of apartheid-based discrimination has created new employment opportunities for highly skilled Africans. Income is also unevenly distributed among rural and urban areas.

There is general agreement that poverty has grown worse since liberalization. The World Bank (1999) notes that extreme poverty is concentrated mainly in rural areas where over 75 per cent of the households cannot meet minimum food requirements. In urban areas poverty is much less acute, with only about 10 per cent of the households below the poverty line. The same study argues that poverty has a strong gender dimension, showing that female headed households have a 50 percent higher poverty rate than male headed households. In addition, unemployment figures have shown that females suffer more from unemployment than males. Although no concrete evidence is available, there is a general consensus that this pattern has persisted over time. The UNDP (2000) measures the poverty headcount at 45 percent. This is despite the fact that South Africa is classified as an upper middle-income country.

Poverty differs greatly by region and by race, with the majority of the poor being Black Africans. According to Klassen and Woolard (1998), there is a strong correlation between unemployment and poverty. They estimate that the unemployment rate among the poorest 20 per cent of households is 53 per cent compared to 4 per cent in the case of the richest 20 per cent of households. The problem is not restricted to persons with low levels of formal education. Although education reduces the likelihood of unemployment, rates are extremely high amongst African women, irrespective of whether or not they have completed secondary education. It should be noted, however, that significant differences exist in the quality of education that has been provided to different population groups. This is a legacy of deliberate discrimination under the apartheid system. Only tertiary education seems to substantially reduce the risk of unemployment for both men and women.

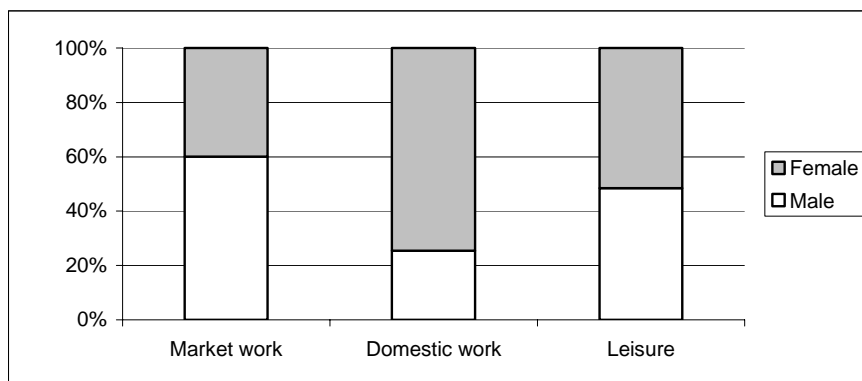
Further analysis of South African poverty and inequality, using household survey data, is provided in section 7.5 below.



## 5. GENDER IN THE SOUTH AFRICAN ECONOMY

Male and female time allocation is presented in Figure 4. At the national level, men are more active in the labor market than women and contribute roughly 60 per cent of total market labor. Women, meanwhile, perform more than 75 per cent of domestic unpaid work. Leisure time appears to be shared relatively equally between men and women.

**Figure 4: Gender time allocation in year 2000 (in hours)**



Source: South Africa Time Use Survey, 2000.

We note that, in broad terms, women are concentrated in informal services and informal trade. In 1995 33 percent of the economically active African women were own account workers compared to 6 percent of African men. Women are generally concentrated within the low profit activities, generally earn less and tend to have smaller activities in the informal sector, (Baden et al., 1998). Although in general more women than men work in the informal sector, the sectoral distribution of men and women in the informal sector as well as the occupations are very similar to the formal sector (Valodia, 2000).

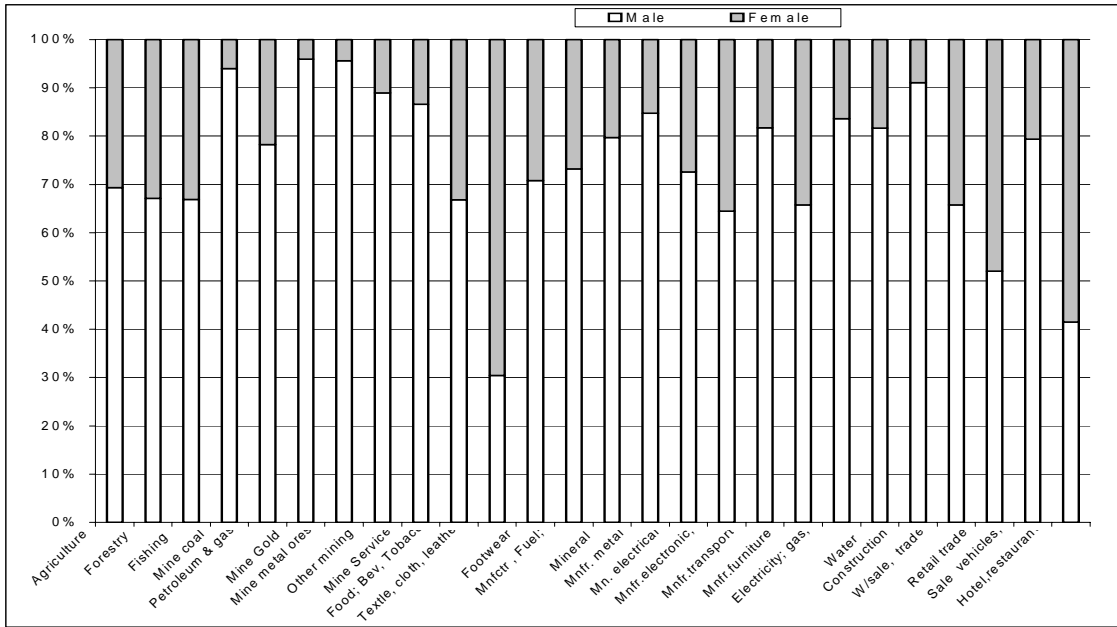
A broad look at the apartheid, transition and liberalized periods suggests that female labor formal market participation rates have been on the increase. Standing *et al* (1996) show that this trend started in the apartheid era, with female labor force participation increasing from 23 percent to 41 percent between 1960 and 1991. According to the World Bank (2002), female labor force as a percentage of total labor force has risen slightly from 37 percent in 1990 to 38 percent in 2000. According to Casale and Posel (2002), the post-apartheid period 1995 to 1999 has witnessed a dramatic feminization of the labor force in South Africa. In 1995, 38 percent of all females between the ages of 15 and 65 were either working or actively looking for work; by 1999, this had increased to 47 percent.

A gender segregated labor market in South Africa may be explained by discrimination against women in education and training during the apartheid period, which was removed after 1994. However, the evidence in the post apartheid education primary and secondary enrolment and literacy ratios suggest a substantial improvement in these indicators for women (World Bank, 2004).

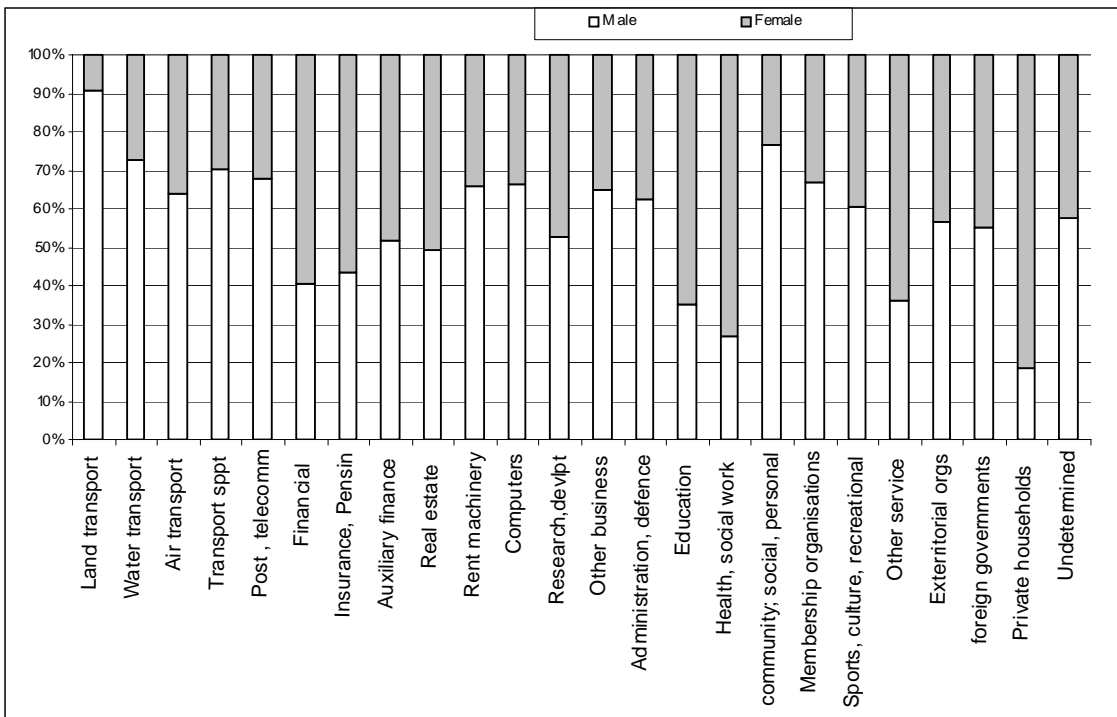
Men and women tend to work in different sectors. Some sectors are male-oriented (i.e. mining, food, beverage and tobacco heavy manufacturing and construction), while others are female-oriented (i.e. textile, privates services). Women are engaged primarily in tertiary activities, while men are spread throughout primary and secondary activities of the economy.

This trend between men and women has not changed much as seen in the 2001 census data represented in Figure 5.

**Figure 5 : Employment by sector and gender**



**Figure 5: Employment by sector and gender (continued)**



Source: Calculation from the 2001 Census

As shown in Table 3, unemployment rates are higher for women than for men, especially in urban areas and among Asians. Higher female unemployment may be explained, inter alia, by lower school enrolment and literacy rates. Since access to formal employment is restricted to a few occupations, in situations of declining demand during the liberalized and deflationary period, women were pushed into the informal sector small-scale activities.

**Table 3: Unemployment rate (official definition) by race and gender (2001)**

	<b>Male</b>	<b>Female</b>
<b>All population groups</b>	<b>24.8</b>	<b>28.0</b>
Urban	24.1	28.6
Non urban	26.4	26.9
<b>African</b>	<b>30.0</b>	<b>32.3</b>
Urban	31.0	35.7
Non urban	28.6	27.9
<b>Colored</b>	<b>21.1</b>	<b>22.8</b>
Urban	23.9	23.7
Non urban	8.8	17.1
<b>Asian</b>	<b>13.9</b>	<b>23.0</b>
Urban	13.5	22.9
Non urban	31.4	30.1
<b>White</b>	<b>5.6</b>	<b>7.8</b>
Urban	5.7	8.0
Non urban	4.9	5.4

Source: Statistics South Africa, Labor Force Survey, September 2001

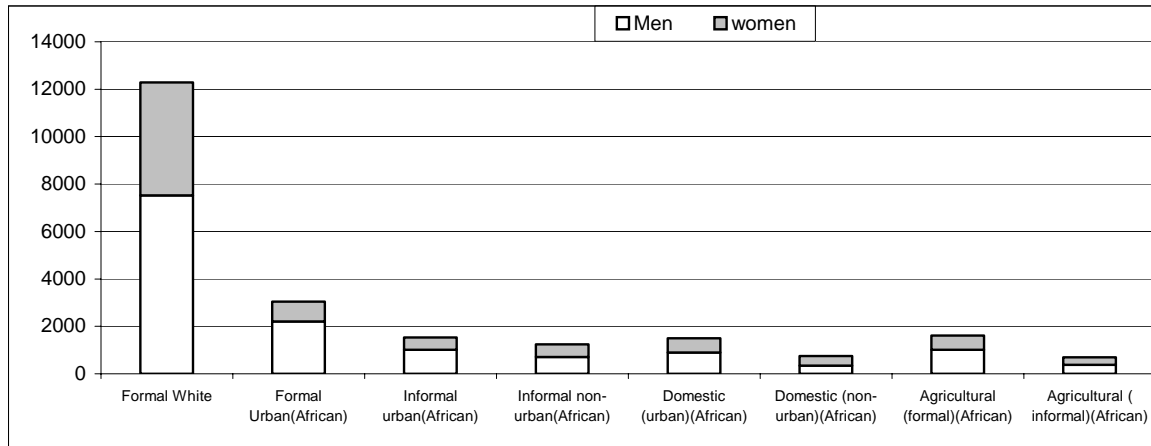
Overall, it appears that the post apartheid period and associated globalization have been associated with higher female participation rates in the labor force. Looking closer, however, we notice that the continued feminization of the labor force is associated particularly with an increase in female unemployment. Where employment has grown, this seems to have been mostly in self-employment in the informal sector. Accordingly, given that there has been no appreciable increase in the demand for female labor in the formal sector, these findings may reflect an increasing number of women who are “pushed” into the labor market (Casale and Posel, 2002).

Data on earnings distribution by gender in the apartheid period are sparse but are generally thought to confirm discrimination along racial lines. Fallon and Lucas (1998) find that, while education and experience are important determinants of earnings, other factors such as discrimination by race and gender and barriers to mobility (i.e. geographic location and formal/informal economic activity) are associated with larger differentials than usually found in studies for other countries. In a recent study, Rospabe (2002) shows that black Africans earn the least in income followed by Coloreds and Asians while Whites have the highest earnings.

According to the 1997 October Household Survey, African workers earned, on average, 63 per cent less than White workers. The gap has tended to narrow in the long run, although data should be interpreted with caution due to methodological changes (Hofmeyr, 1993; and Crankshaw, 1997). According to the ILO (1999), during the last few years the gap seems to have remained unchanged. The continuing increase in the relative wages of African workers in community services may be due to policy changes in the public sector after the end of apartheid.

The same racial narrowing has not been perceived in the gender wage gaps from the available anecdotal evidence. There is a growing literature showing gender differences in terms of earnings. According to Figure 6, mean incomes are in favor of men.

**Figure 6: Mean monthly income by gender (1999)**



Source: Statistics South Africa, October Household Survey 1999

Women generally earn less than men in formal sector employment. Women’s earnings were estimated to be 65-95 percent of men’s (Valodia, 1996). Using the October household survey for 1999, Rospabe (2002) shows that the cumulative earnings distribution of female workers is first order dominated by the distributions of income for male workers. Further, it was found that women’s earnings were 73 percent of men’s in metropolitan areas. This is mainly because of the lower positions of women (Pillay, 1993 cited in Bundlender, 1995). Bundlender (1997) also found that, even for those with the same qualification, there was substantial discrimination in earnings between men and women. Rospabe (2002) estimated the average earnings gap between males and females to be about 20 percent. These differences are attributed to differences in productivity between the two genders and to labor market discrimination against women, (Rospabe, 2002).

## 6. TRADE POLICY RESPONSE

### 6.1 Overview

South Africa is a member of the WTO since 1995. The pace of trade liberalization quickened after South Africa became a signatory to the Marrakech Agreement. Initial progress in rationalizing the very complex tariff regime and in lowering the overall level of nominal and effective protection was relatively fast. Between 1990 and 1999, the number of tariff lines was reduced from 12500 in 200 tariff bands to 7743 in only 47 tariff bands. In fact, if the considerable number of zero tariffs is ignored, the number of tariff lines had been reduced to fewer than 2500 by 1999. At the same time the maximum existing tariff was reduced from almost 1400 to 55 percent and the average economy-wide tariff fell from 28 to 7 percent.

South Africa also has a number of bilateral trade ties, mainly in the form of free trade areas (FTA). The European Union–South Africa FTA was agreed in 2000. It is asymmetric in nature. The agreement was that the EU would liberalize 95 percent of its imports from South

Africa between 2000 and 2003, and that by 2010 almost all its imports from South Africa should be liberalized. There are certain exceptions including certain agricultural products, wines and spirits and some aluminum products. On the other hand, South Africa is to liberalize 86 percent of tariffs on imports (effectively 73 percent of all industrial sector tariff lines) from the EU over a 12 year period. Exempted products include certain commodities in the textile and garments, footwear and automotive products sectors for which tariffs are scaled down but not completely removed.

The Southern Africa Development Community (SADC) Protocol came into effect in August 1996 grouping 13 Southern African countries. According to this FTA, 97 percent of imports from SADC countries will generally qualify for duty free access into South Africa by 2005. It is envisaged that 85 percent of the FTA will be in effect by 2008 with full liberalization set for 2012. Since 1969, South Africa is also a dominant member of the Southern African Customs Union (SACU), which brings together five Southern African countries. There are other planned FTAs with India, Brazil and the United States of America.

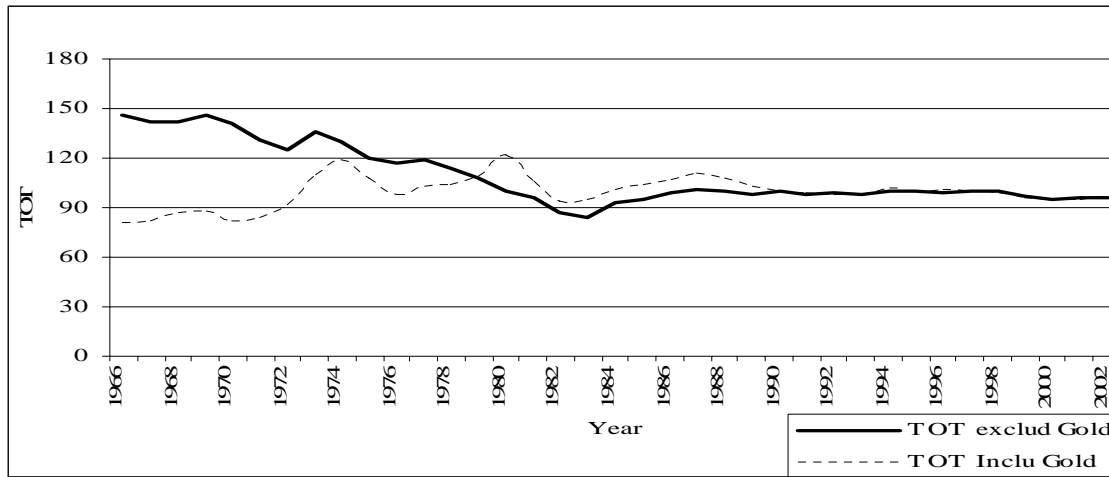
Trade liberalization emerges as one of the key policy issues of the GEAR agenda discussed in the previous sub-section. The aggregate trade response has been quite dramatic. The trade ratio as measured by the sum of export and import values to GDP (in current prices) had an average annual growth rate of 5.5 percent between 1993 and 1996, a slowdown to 0.8 percent between 1997 and 1999 and a rebound to 9.8 percent between 2000 and 2002 (Davies and van Seventer, 2003). 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 end of the impetus provided by the removal of international boycotts. The acceleration after 1999 may reflect both world recovery and domestic liberalization policies starting to make an impact.

A broad look at the performance of exports in the apartheid, transition and liberalized periods suggests that the reforms may have stimulated export growth. During the pre-democracy period (1981-90) the value of exports declined by an average of 2.6 percent. Between 1991 and 1996 export growth has averaged 6.4 percent per year. During the liberalized period (1997-2002) exports have grown by only 3.7 per cent per annum. However, this latter figure is largely due to a sharp downturn in the mining sector in recent years. As to the composition of exports, the share of manufacturing products increased from 41.2 per cent in 1991-96 to 53.3 per cent in 1997-2001, while the share of mining diminished from 42.3 percent in 1991-96 to 26.9 percent in 1997-2001. Gold, the main South African export product, still accounted for more than 20 per cent of total exports in 1997-2001, down from more than 35 per cent in 1991-96 (TIPS 2002). The performance of imports in the transition and liberalized periods suggests that the reforms may have also stimulated import growth, albeit marginally. TIPS (2002) shows that in the transition period imports grew by an average of 11.7 percent between 1991 and 1996 but then grew by only 0.1 percent between 1997 and 2001. The relatively low growth in the latter years is puzzling given that tariffs were falling in this period, although GDP growth was muted. Imports, just as exports, are dominated by manufactured and mining imports, accounting for over 86 percent of imports over the two periods.

In terms of trade competitiveness, South Africa has on average experienced a 50 percent decline in terms of trade with the exclusion of gold (Ndhlela and Nkala, 2003). Although the terms of trade inclusive of gold have increased by about 20 percent during the same period,

the overall decline in the terms of trade reflects a critical weakness in the structure of the country's trade composition (Figure 7).

**Figure 7: Terms of Trade Developments: 1960-2002**



Source: Statistics South Africa; Legend: TOT=Term of trade

As Ndhlela and Nkala (2003) point out, the main structural weakness in South Africa's trade composition is the fact that the country is a major exporter of primary and intermediate commodities to industrialized country markets. Like all developing countries, a large proportion of exports consists of unprocessed raw materials, with the mining industry contributing the greatest proportion of the country's total exports. The proportion of manufactured goods in exports has however experienced a significant rise with a higher proportion of raw materials being processed before export. Major export commodities are gold, diamonds, platinum, wool, sugar, manganese and chrome ores, asbestos, atomic energy materials and base minerals such as coal, antimony, copper and iron ore. Exports of chemicals, metal products, machinery, transport equipment and manufactured goods have increased, particularly to Africa, in recent years.

In this section we give brief background to what are considered to be some of the pressing international trade issues for South Africa. These issues greatly inform the simulations that will be performed later on. The issues pertain to agriculture, textiles and heavy manufacturing liberalization.

## 6.2 Food and Agricultural Trade Liberalization

In addition to the Uruguay Round of the GATT, food and agriculture are surprisingly big agenda items for South Africa at the WTO given the small contribution of the sector to value added. The country is a signatory to the agreement on agriculture that was made under the Doha declaration in 2001. The Doha Development Agenda (DDA) set out three pillars, namely substantial improvement in market access, reductions of and eventual phasing out of all forms of export subsidies, and substantial reductions in trade-distorting domestic support. With respect to market access, the modalities take up the Doha Declaration's call for "substantial improvements in market access". This was to be achieved through tariff reductions using a tiered formula. With regards to grain trade, tariff reductions are made from bound rates. However, since applied tariffs in most countries are already significantly below

the bound rates, this is unlikely to lead to substantial improvements in market access for grain products. This prioritization of agriculture raises an important question and one that is addressed in this study on how important (relative to other potential reforms) is agricultural trade liberalization for the welfare and poverty reduction in South Africa.

### **6.3 Textiles and Footwear Trade Liberalization**

The South African textile, clothing and footwear industries were developed under a highly protectionist structure imposed by the apartheid government and through direct investment subsidies from the state-owned Industrial Development Corporation (IDC). Almost all products were sold on the domestic market and exports formed only six percent of domestic production in the 1970s. Exports increased to 15 percent in 1989, but trade was restricted significantly by international sanctions during the latter part of the apartheid era. From 1994 the South African textile sector has undergone rapid and significant restructuring through a program of progressive trade liberalization under the auspices of the Agreement of Textile and Clothing (ATC). The ATC sets out procedures for integrating the trade in textiles and clothing fully into the GATT system by requiring countries to remove the restrictions in four stages over a period of 10 years ending on January 1, 2005. There are several concerns for South Africa following ATC phase out. The first is the anticipated reduction in textile profitability due to a decline in world prices. According to the local popular press, the two main threats to the textile industry are perceived to be competition from cheap Asian imports and the high cost of production due to rigid labor laws in the country. Lobby groups have indeed lobbied government recently for policies that protect the textile industry from what is perceived to be unfair international trade practices, especially in the case of China.

### **6.4 Other Manufacturing Liberalization**

While agriculture, mining and other primary industries are important for South Africa, the country has dramatically diversified its industries and moved up the value-added ladder. The share of heavy manufacturing in value added, trade and employment is now very high. South African manufacturing has undergone substantial liberalization since 1994 and one may be tempted to think that there are little gains remaining from further trade negotiations on industrial products. We have seen that while average tariff rates have fallen and are low, the aggregate data hides the existence of tariff peaks and huge dispersion. Such tariff distortions are not only unfair but tend to restrict industrial diversification. There does appear to be some welfare gains to South Africa to be derived from the liberalization of trade in manufactures.

## **7. TRADE POLICY SIMULATIONS AND RESULTS**

Our first simulation involves the elimination of all import tariffs where government revenue is held constant through the introduction of an endogenous adjustment in indirect taxes. Trade liberalization emerges as one of the key policy issues of the GEAR agenda discussed in previous sections. Although other trade barriers still exist, tariffs constitute the principal protectionist measure in South Africa.

The removal of tariffs in South Africa modifies the entire price structure and, consequently, factor returns. The impact on households depends on their factor endowments and their consumption patterns. Trade liberalization also has differential impacts on men and women depending on the sectors in which they are intensively employed and the household they belong to.

The following sections trace in detail the impacts of trade liberalization as it channels through changes in import prices, the sectoral allocation of production and inputs, factor prices, household time allocation, income, consumer prices and, finally, poverty and welfare.

### 7.1 Trade and Output Effects (Table 4)

In the year 2000, South Africa had a very discriminatory trade regime. Although the average overall observed<sup>10</sup> tariff rate was 2.5 percent, average tariff rates in specific sectors ranged up to 112.8 percent (*beverages and tobacco*). High initial tariff rates also apply to other products: *structural metal* (20.7), *garments* (17.2), *insulated wire and cable* (14.9), *footwear* (11.7), *household appliances* (10.6), and, *other electrical equipment* (10.5). We refer to these seven sectors (in **bold**) as the highly protected sectors hereon. In aggregate, *manufacturing industries* have the highest tariff rate (3.3), followed by *agriculture* (1.1). There are no tariffs on *imported mining products and services*.

The initial impact of the removal of all tariffs is a fall in the domestic price of imports that is particularly strong in the highly protected sectors. Local consumers react to the fall in import prices in the highly protected sectors by increasing their imports of these goods roughly in the same proportion. Given a fixed current account balance, the increase in imports leads to a 4.9 percent exchange rate depreciation, which partially offsets the fall in import prices in these sectors and leads to an increase in the domestic price of imports in some other sectors.

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<sup>10</sup> The “observed” tariff rates are derived from actual duty collections and may differ from official tariff rates as listed in the customs law due, for example, to tariff exemptions.



**Table 4: Trade and Output Effects**

Sectors	Tariff	Sectoral shares			IPR	EIR	Volume changes				Price changes		
		VA	Imp	Exp			Imp	Exp	Output	Dom	Imp	Dom	Output
AGRICULTURE	1.1	3.3	1.6	2.6	7.0	12.4	-5.9	2.9	-0.5	-1.0	3.7	0.3	0.6
<i>Gold and uranium</i>	0.0	2.1	0.0	9.9	0.0	85.3	-5.8	0.0	0.0	0.0	4.9	0.8	0.8
<i>Other mining</i>	0.0	4.7	13.7	24.8	73.0	87.5	-0.4	0.0	0.4	2.7	4.9	2.8	1.3
MINING*	0.0	6.8	13.7	34.7	65.8	86.8	-0.4	0.0	0.3	1.9	4.9	2.2	1.2
Meat and vegetables	4.0	0.5	1.5	1.8	11.9	16.4	-1.6	2.6	-0.8	-1.1	0.9	0.6	0.8
Dairy	7.6	0.2	0.2	0.2	6.1	6.8	3.6	2.7	-1.0	-1.1	-2.5	0.6	0.6
Grain milling	3.2	0.4	0.6	0.3	9.1	4.5	-2.8	2.6	-1.1	-1.2	1.6	0.5	0.6
Other food	5.5	0.8	0.5	1.2	6.4	16.8	-0.3	2.7	-1.0	-1.5	-0.6	0.2	0.6
<b>Beverages and tobacco</b>	<b>112.8</b>	<b>1.4</b>	<b>0.4</b>	<b>1.6</b>	<b>3.4</b>	<b>14.1</b>	<b>147.7</b>	<b>5.3</b>	<b>-4.9</b>	<b>-5.9</b>	<b>-50.7</b>	<b>-6.0</b>	<b>-5.4</b>
Textiles	6.7	0.2	1.0	0.4	28.7	17.4	0.4	2.1	-1.9	-2.5	-1.7	0.2	0.7
<b>Garments</b>	<b>17.2</b>	<b>0.7</b>	<b>1.5</b>	<b>1.1</b>	<b>18.0</b>	<b>18.5</b>	<b>14.8</b>	<b>2.0</b>	<b>-2.7</b>	<b>-2.9</b>	<b>-10.5</b>	<b>0.1</b>	<b>0.3</b>
<i>Leather</i>	1.9	0.1	0.4	0.5	40.2	47.7	-2.3	3.4	1.9	0.7	3.0	0.9	1.6
<b>Footwear</b>	<b>11.7</b>	<b>0.1</b>	<b>0.7</b>	<b>0.1</b>	<b>34.8</b>	<b>8.4</b>	<b>7.3</b>	<b>2.5</b>	<b>-2.1</b>	<b>-2.3</b>	<b>-6.1</b>	<b>0.0</b>	<b>0.1</b>
Wood	0.9	0.5	0.6	0.8	13.2	19.3	-4.1	3.7	1.4	0.9	4.0	0.5	0.9
Paper	7.7	0.9	1.3	2.4	12.6	24.3	3.8	3.2	0.2	-0.6	-2.6	0.2	0.8
Printing	1.9	0.7	1.1	0.4	17.0	7.4	-2.8	3.5	0.8	0.6	2.9	0.6	0.7
Petroleum	0.7	1.5	1.1	3.4	7.5	24.3	-5.2	2.1	-0.5	-1.0	4.2	1.3	1.6
Basic chemicals	1.2	1.0	5.2	3.7	39.2	34.6	-1.0	2.3	1.4	0.9	3.7	2.4	2.7
Other chemicals	1.4	1.2	5.4	1.8	28.8	13.8	-2.6	2.4	0.3	0.0	3.5	1.6	1.8
Rubber products	6.4	0.2	0.9	0.4	32.4	22.0	2.4	2.3	-0.6	-1.2	-1.4	1.0	1.4
Plastic products	1.4	0.6	1.0	0.3	18.9	7.9	-2.6	2.7	0.5	0.3	3.4	1.4	1.5
Glass products	1.5	0.1	0.3	0.2	24.8	16.3	-2.8	3.0	0.8	0.5	3.4	1.1	1.3
Non metallic mineral	1.5	0.6	1.1	0.4	17.8	7.7	-1.7	2.4	0.5	0.4	3.3	1.9	2.0
<i>Iron and steel</i>	0.5	2.2	3.1	10.5	17.2	46.1	-1.2	2.1	1.5	1.1	4.4	2.8	3.1
<b>Structural metal</b>	<b>20.7</b>	<b>0.4</b>	<b>0.1</b>	<b>0.4</b>	<b>2.5</b>	<b>11.7</b>	<b>25.2</b>	<b>2.2</b>	<b>-0.4</b>	<b>-0.8</b>	<b>-13.1</b>	<b>1.4</b>	<b>1.7</b>
Other fabricated metal	2.2	0.8	1.8	0.7	20.3	10.0	-0.9	2.6	0.6	0.4	2.6	1.7	1.8
<i>General purpose machinery</i>	2.2	0.4	4.3	2.6	72.2	71.4	-0.3	4.0	3.3	2.1	2.6	1.0	1.8
Special purpose machinery	2.7	0.4	5.8	1.4	60.7	32.9	-0.4	3.0	1.4	0.8	2.2	1.4	1.8
<b>Household appliances</b>	<b>10.6</b>	<b>0.1</b>	<b>0.5</b>	<b>0.1</b>	<b>35.8</b>	<b>14.1</b>	<b>5.5</b>	<b>1.8</b>	<b>-2.7</b>	<b>-3.1</b>	<b>-5.1</b>	<b>0.4</b>	<b>0.6</b>
Electric motors	7.2	0.1	0.6	0.2	42.9	25.4	2.0	2.5	-0.7	-1.7	-2.1	0.3	1.0
Electricity distribution	0.7	0.1	0.9	0.2	56.9	20.3	-1.4	3.2	2.2	1.9	4.2	1.9	2.1
<b>Insulated wire and cable</b>	<b>14.9</b>	<b>0.1</b>	<b>0.2</b>	<b>0.1</b>	<b>11.9</b>	<b>6.4</b>	<b>12.8</b>	<b>1.9</b>	<b>-2.2</b>	<b>-2.4</b>	<b>-8.7</b>	<b>0.6</b>	<b>0.8</b>
Accumulators	1.3	0.1	0.2	0.1	27.0	12.8	-2.6	2.8	0.7	0.4	3.5	1.4	1.6
Lighting equipment	1.5	0.0	0.3	0.0	39.8	11.5	-1.9	3.2	1.2	1.0	3.3	1.3	1.4
<b>Other electrical equipment</b>	<b>10.5</b>	<b>0.2</b>	<b>0.7</b>	<b>0.4</b>	<b>28.9</b>	<b>23.6</b>	<b>6.0</b>	<b>2.4</b>	<b>-1.6</b>	<b>-2.2</b>	<b>-5.0</b>	<b>0.2</b>	<b>0.6</b>
Communication equipment	2.6	0.2	6.1	0.7	77.8	33.7	-0.8	3.4	1.7	1.0	2.3	1.1	1.5
<i>Medical instruments</i>	0.5	0.1	3.0	0.4	83.5	57.9	-0.8	3.9	3.4	3.2	4.4	1.7	1.8
Motor vehicles	5.7	0.9	4.9	3.8	23.4	21.2	2.1	1.6	-0.9	-1.5	-0.8	1.6	2.1
Motor vehicle parts	0.0	0.5	8.5	1.2	64.6	23.3	-1.7	2.9	2.1	2.0	4.9	2.3	2.4
<i>Other transport equipment</i>	0.0	0.1	3.6	1.1	85.1	69.0	-0.3	3.4	3.3	3.2	4.9	2.5	2.6
Furniture	7.0	0.3	0.3	1.1	11.3	39.9	3.0	2.6	-0.7	-1.0	-2.0	0.7	0.9
<i>Other manufacturing</i>	2.4	0.2	5.4	1.8	75.1	68.5	-0.7	2.2	1.0	0.0	2.5	2.0	2.6
INDUSTRY*	3.3	18.8	74.9	47.7	29.4	24.1	0.6	2.6	-0.1	-0.7	1.5	0.8	1.3
Electricity and gas	0.0	2.4	0.0	0.4	0.0	3.6	0.0	2.9	-0.1	-0.3	0.0	0.8	0.8
Water	0.0	0.4	0.0	0.0	0.2	0.4	-6.9	3.0	-0.6	-0.6	4.9	0.4	0.4
Building	0.0	1.6	0.1	0.0	0.5	0.1	-5.0	2.6	0.0	0.0	4.9	1.4	1.4
Construction	0.0	1.3	0.2	0.0	1.9	0.2	-5.4	2.6	-0.2	-0.2	4.9	1.3	1.3
Trade services	0.0	11.1	0.1	0.2	0.1	0.3	-5.7	3.2	0.2	0.2	4.9	0.8	0.8
Hotel and restaurant	0.0	2.0	2.0	2.6	20.6	27.4	-5.6	3.0	0.9	0.1	4.9	0.9	1.4
Transport services	0.0	6.2	2.8	5.2	7.6	14.5	-4.7	2.7	0.6	0.2	4.9	1.4	1.7
Post and Telecommunications	0.0	3.9	1.6	1.1	6.6	5.1	-5.4	3.0	0.3	0.2	4.9	1.0	1.1
Financial services	0.0	10.0	0.8	2.9	1.4	5.5	-7.2	3.4	-0.2	-0.4	4.9	0.1	0.2
Real estate	0.0	6.0	0.2	0.4	0.6	1.5	-5.6	3.0	0.1	0.0	4.9	0.9	0.9
Other business	0.0	2.9	1.0	0.6	5.5	3.4	-5.5	3.2	0.4	0.3	4.9	0.8	0.9
General government	0.0	16.5	0.0	0.5	0.0	0.7	0.0	3.3	0.0	0.0	0.0	0.5	0.5
Health and social work	0.0	1.9	0.1	0.3	0.6	2.6	-6.7	2.7	-0.7	-0.8	4.9	0.7	0.8
Other services	0.0	4.8	0.9	0.8	4.0	4.0	-6.7	3.2	-0.2	-0.3	4.9	0.4	0.5
SERVICE*	0.0	71.1	9.8	15.0	3.1	4.0	-5.6	3.0	0.1	-0.1	4.9	0.7	0.8
ALL*	2.5	100.0	100.0	100.0	16.1	15.8	-0.3	1.8	0.0	-0.3	2.3	0.7	1.0

Legend: VA=Value added; Imp=Imports; Exp=Exports; Dom=local sales of domestic output; IPR=Import penetration ratio; EIR=Export intensity ratio; \*: Average variation for volumes - Laspeyres index for prices.

Of course, this import surge comes at the expense of domestic competitors who experience a decline in the volume and price of their sales on the local market. Given the imperfect substitution between local and imported goods (CES), as well as the relatively small initial import intensities (imports/domestic consumption), the changes here are proportionally much smaller than the variations in import volumes. Nonetheless, the sectors with the most substantial reductions in local sales are the highly protected sectors.

The exchange rate depreciation also results in a 1.8 percent increase in overall export volume. Exports increase most in the export-intensive sectors, i.e. the sectors with the highest export intensity ratios (Exports/Output). These sectors are identified in *italics* in Table 4. Mining (*gold and uranium*, and, *other mining*) constitutes the most export-intensive activity in South Africa; however it is highly dependent on foreign investment. Consequently, we maintain the volume of mining exports constant as the volume of activity (of workers) in mining sectors is related to exogenous foreign investments. Exports do increase strongly in the other export-intensive sectors: *general purpose machinery*, *other transport equipment*, *other manufacturing*, *medical instruments*, *leather* and, finally, *iron and steel*. The export-oriented industries also witness a strong increase in their output. Export prices are assumed to be constant and determined in the international market.

Variations in exports and domestic sales determine changes in total output. Given their loss in domestic sales, the highly protected sectors also experience the strongest output declines. The biggest winners from trade liberalization export-oriented sectors: *medical instruments* (3.4 percent increase in output), *other transport equipment* (3.3), *general purpose machinery* (3.3), *leather* (1.9) and *iron and steel* (1.5). Input-intensive (low value added) sectors also benefit from the fall in import prices: among others, *electricity distribution equipment* (2.2), *motor vehicle parts equipment* (2.1), and, *communication equipment* (1.7).

Output prices are averages of export prices, which are assumed fixed, and domestic prices, weighted by the share of sales on each of these markets. Thus, it is unsurprising that they fall strongly in most of the highly protected sectors, while they increase in sectors with initially low tariff rates. Note that these are after-tax output price variations and thus include a 13.4 percent increase in the indirect tax rate required to balance the government's budget, whereas the import and domestic sales price variations are shown net of indirect taxes.

## 7.2 Factor Effects

We now examine how the trade and output effects studied above influence factor prices and unemployment rates, crucial components of the ultimate welfare and poverty effects.

To understand these results, note that factor prices are driven by value-added prices as the source of their remuneration. While value added price changes generally reflect those of output prices, their evolution is more positive (less negative) when input costs rise less (fall more) than output prices. Thus value added prices generally fall most among the highly protected sectors whereas they increase among sectors with low initial tariffs. However, export-oriented industries are among the sectors with the strongest increases in value added prices (Table 5). Indeed, beyond the modest increase in their output prices, these sectors benefit more from falling input costs, given their high share of inputs from the highly protected sectors. The contrary is true for the high value added (low input) agricultural sector, in which value added prices fall. The rest of this table shows the shares of total income that each factor derives from each of the sectors.



The relationship between the wage rate and the unemployment rate is represented by a downward-sloping relation (the "wage curve"). As a result, rising (falling) wage rates are associated with falling (rising) unemployment rates. Essentially, rising demand for certain types of labor translates into increased wages and employment, whereas falling demand has the opposite effect. Consequently, we focus our analysis here on the wage impacts with the understanding that the unemployment effects are generally the mirror image.

To explain the wage impacts, we refer throughout to the value added price variations and factor intensities in Table 5. Whereas public sector employment and wage rates are assumed fixed, private sector workers are assumed to be mobile between sectors with wage rates that equalize across all private sectors. We note substantial differences in private sector wage and unemployment rate changes according to the gender, skills and location of workers (Table 6).

**Table 6: Wage and unemployment rate variations**

	Urban				Urban All	Rural				Rural All	All
	High skill	Medium skill	Low skill	Child		High skill	Medium skill	Low skill	Child		
<b>Change in wage rates</b>											
Males	-0.01	0.05	0.02	-0.09	<b>0.02</b>	-0.01	0.02	-0.12	-0.24	<b>-0.01</b>	<b>0.02</b>
Females	0.01	0.01	-0.01	-0.09	<b>0.01</b>	-0.04	-0.06	-0.09	-0.64	<b>-0.06</b>	<b>0.00</b>
ALL	-0.01	0.04	0.01	-0.09	<b>0.02</b>	-0.02	0.00	-0.11	-0.31	<b>-0.03</b>	<b>0.01</b>
<b>Change in unemployment rates</b>											
Males	0.14	-0.53	-0.24	0.83	<b>-0.31</b>	0.13	-0.09	1.17	1.85	<b>0.09</b>	<b>-0.27</b>
Females	-0.10	-0.10	0.07	0.37	<b>-0.08</b>	0.40	0.58	0.88	6.59	<b>0.56</b>	<b>-0.03</b>
ALL	0.05	-0.38	-0.10	0.52	<b>-0.23</b>	0.25	0.04	1.05	2.77	<b>0.23</b>	<b>-0.18</b>

Male wage rates generally evolve more favorably than female wage rates, with the exception of high-skilled urban and low-skilled rural workers. Female workers are penalized by their greater participation in garments, as well as health and social work, for which value added prices fall (Table 5). On the other hand, male workers benefit from their strong participation in mining activities, which offsets their dependency on agricultural wages, especially in rural areas. Among child workers, in both rural and urban South Africa, the decline in wage rates for girls can be traced primarily to their greater participation in agriculture, whereas boys diversify into a number of services sectors where prices generally rise modestly.

There is also a slight tendency for wage rates to evolve less favorably in rural areas (-0.03 percent), where workers are employed intensively in agriculture, than in urban areas (+0.02 percent) (Table 5). This anti-rural bias of trade liberalization's wage effects is observed within all skill categories and regardless of sex.

By skill category, we note that wage rates evolve more favorably among medium-skilled workers. This is especially true for male medium-skilled workers due to their high employment in the mining industry and their low participation in health and social work, and, other services. High-skilled worker wages are generally affected little, as they derive most of their wages from services, where there are only moderate price effects which tend to balance out. Rural low-skilled and, especially, child workers are the biggest losers, given their strong participation in agriculture. In urban areas, male low-skilled workers are primarily employed in manufacturing, notably the export-oriented *iron and steel* sector, and thus experience a slight increase in their wage rate. In contrast, female low-skilled workers are engaged intensively in the service sectors, which explains the slight decline in their wage rates.

Capital is assumed to be sector-specific because of the short-term prospective of our analysis. As a result, variations in the rates of returns to capital closely follow changes in the value-added prices of their respective sectors. These rates fall most in the highly protected sectors and increase in the expanding export-oriented sectors (Table 5).

### 7.3 Time Allocation Analysis

We have already noted that men are more active in the labor market than women, whereas women are more heavily involved in domestic work (Figure 4). We also noted that men and women tend to work in different sectors (Figure 5). Most sectors are male intensive with the notable exceptions of *textiles and garments* and a number of service sectors (*finance, education, health and social work, and other services*).

Figure 8 to Figure 10 show that females do more domestic work than men regardless of their skills, region and population group. Men, meanwhile, participate more in market activities. However, interestingly, women do more domestic and market work in female-headed households, to the strong detriment of their leisure time. Children are only very marginally involved in market work, but girls are still more involved in domestic work activities and have less time for leisure (including education) than boys.

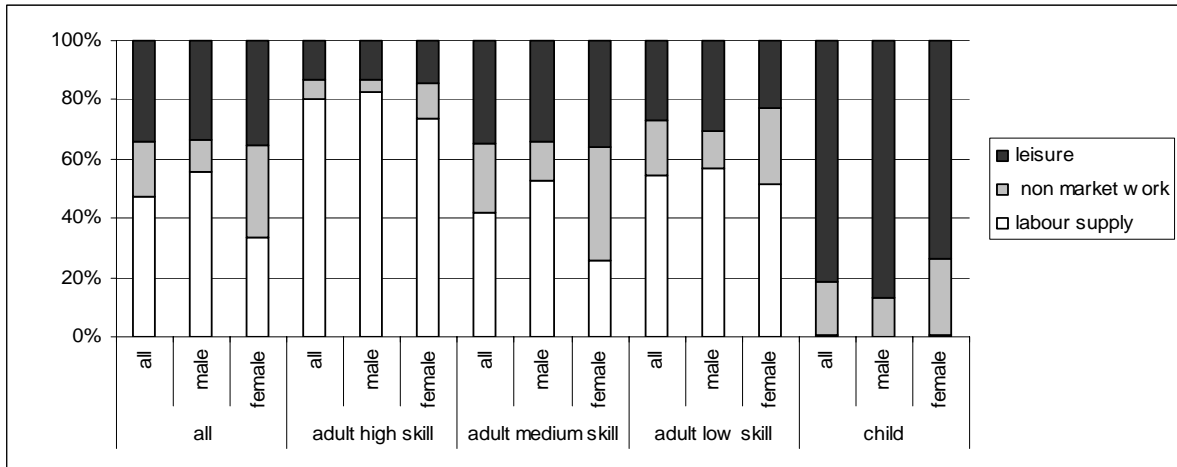
High skilled individuals spend more time performing market activities and less time in domestic and leisure activities than their low- and medium-skilled counterparts. Urban households devote more time to market work and less time to domestic work than rural households. Finally, Asian and White households are more active in the labor market and spend a smaller share of their time on domestic work than Blacks and Coloreds.

Households respond to the changes in real wage rates for male and female workers by changing their allocation of time between market and non market activities. Labor market participation decision is a joint labor and non-labor income effects which are taken at individual household-level. As a consequence, higher real wage rates will not necessary induces an increase in the labor market participation of workers as, labor income from other members, non-labor income, and, non-market activities effects may play an important role in market participation decision of men and women.

Therefore, women, especially in urban areas, increase their market participation while male market participation is stagnating (Table 7). Male and female market participations in rural areas fall as their real wage rates decrease. Female market participation increases within black population category, because of their low endowment of high and medium skilled-workers that win from tariff elimination in South Africa, and decrease within other household categories.

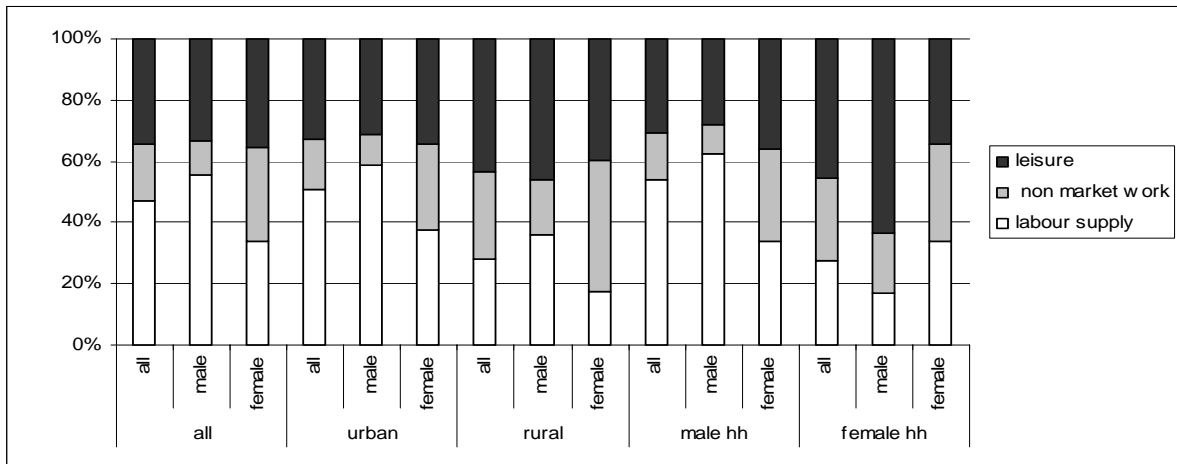
Men and women work more at home as they substitute home produced goods by costly market goods induce by price increases. Although females already do more domestic work than men they continue to carry out most of the domestic task especially in urban areas. Their market and non market work increase is roughly double than of men at the expense of their pure leisure time. As a large proportion of their time spent outside market work is devoted to leisure activities rather than domestic work, men will perform least domestic work with trade liberalization, especially in urban areas and within female headed-household categories.

**Figure 8: Time allocation by gender, skill category and age.**



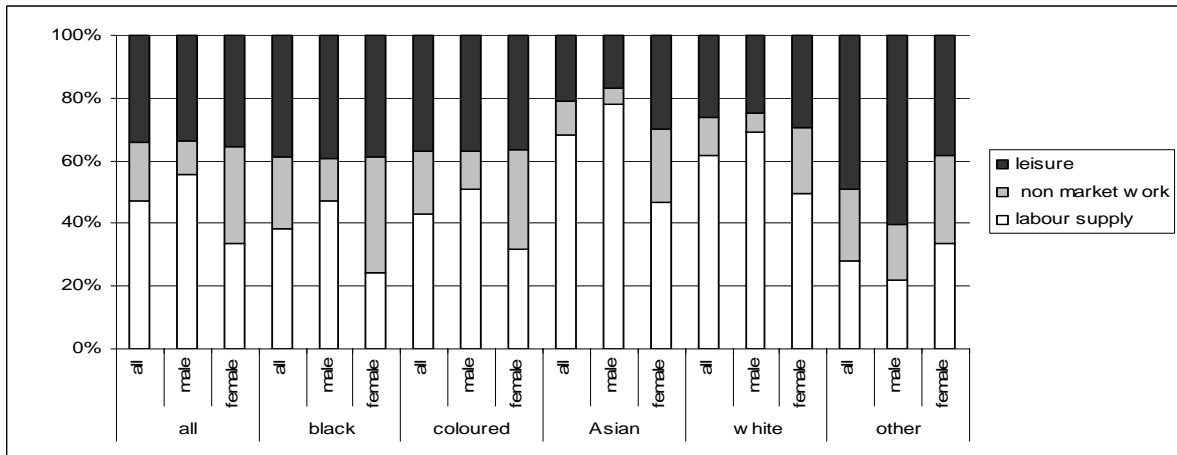
Note: Leisure does not include minimum time for survival. Source: Calculation from 2000 Time Use Survey

**Figure 9: Time allocation by area and gender-head of household**



Legend: male hh = Male headed household; female hh = Female headed household; Leisure does not include minimum time for survival. Source: Calculation from 2000 Time Use Survey

**Figure 10: Time allocation by population group**



Source: Calculation from 2000 Time Use Survey. Leisure does not include minimum time for survival

**Table 7: Change in hours worked (per cent variation)**

	Market work											Domestic work										
	Urban High skill	Urban Medium skill	Urban Low skill	Urban Child	All urban	Rural High skill	Rural Medium skill	Rural Low skill	Rural Child	All rural	All	Urban High skill	Urban Medium skill	Urban Low skill	Urban Child	All urban	Rural High skill	Rural Medium skill	Rural Low skill	Rural Child	All rural	All
<b>South Africa</b>																						
Male	-0.01	-0.01	0.01	0.01	0.00	0.00	-0.04	-0.04	-0.55	-0.02	0.00	-0.01	0.01	-0.09	-0.03	-0.04	0.03	0.01	0.89	0.87	0.56	0.07
Female	0.00	-0.02	0.07	0.03	0.04	-0.03	-0.04	-0.54	0.00	-0.03	0.03	0.08	0.00	-0.01	0.05	0.03	0.23	-0.05	0.47	1.11	0.54	0.14
<b>Head of Household</b>																						
<b>Male head</b>																						
Male	-0.01	-0.01	0.01	-0.01	0.00	-0.01	-0.06	-8.04	0.00	-0.02	0.00	-0.01	0.01	-0.06	0.00	-0.02	0.04	0.03	1.02	0.90	0.61	0.09
Female	0.00	-0.01	0.07	-0.16	0.04	-0.02	-0.02	-0.07	0.00	-0.02	0.03	0.08	-0.02	-0.05	-0.01	-0.02	0.21	-0.10	0.52	1.01	0.47	0.08
<b>Female head</b>																						
Male	-0.01	0.00	0.09	0.04	0.03	0.04	-0.03	0.00	-2.85	-0.03	0.02	0.04	0.01	-0.17	-0.08	-0.10	-0.06	0.00	0.69	0.83	0.47	0.04
Female	-0.01	-0.02	0.04	0.09	0.04	-0.11	-0.05	-4.66	0.00	-0.07	0.02	0.09	0.01	0.05	0.10	0.08	0.30	-0.02	0.42	1.19	0.60	0.20
<b>Population group</b>																						
<b>Black</b>																						
Male	-0.01	0.00	0.00	0.01	0.00	0.00	-0.04	-0.04	0.00	-0.02	0.00	0.03	-0.02	-0.10	-0.04	-0.05	0.04	0.01	0.90	0.86	0.53	0.08
Female	0.00	-0.01	0.09	0.03	0.06	-0.03	-0.04	-0.79	0.00	-0.03	0.04	0.06	-0.02	-0.01	0.05	0.03	0.25	-0.05	0.47	1.11	0.55	0.14
<b>Colored</b>																						
Male	-0.01	0.00	0.02	-0.02	0.00	0.00	-0.04	0.00	-5.76	-0.04	0.00	0.04	-0.02	-0.08	-0.02	-0.04	-0.01	0.01	0.91	0.87	0.57	0.10
Female	0.00	0.00	0.04	-0.13	0.02	-0.08	-0.01	-0.14	0.00	-0.06	-0.02	0.00	-0.11	0.03	0.06	0.05	0.15	-0.04	0.35	1.01	0.26	0.13
<b>Asian</b>																						
Male	0.00	-0.02	0.01	-0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.08	0.02	-0.07	-0.03	-0.03	0.00	-0.05	1.03	0.84	0.68	0.09
Female	0.00	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.00	-0.02	-0.02	0.00	0.00	0.00	-0.02	-0.02	0.10	0.00	0.00	1.15	0.54	0.07
<b>White</b>																						
Male	0.00	-0.01	0.02	0.02	0.00	0.00	-0.08	0.00	0.00	-0.02	0.00	-0.03	0.01	-0.09	-0.02	-0.03	0.04	0.11	0.86	0.94	0.68	0.04
Female	0.00	-0.13	0.00	0.01	0.00	0.03	0.03	0.00	0.00	0.03	0.00	0.11	0.10	0.05	0.04	0.05	0.23	-0.24	0.45	1.20	0.73	0.10
<b>Unspecified</b>																						
Male	-0.04	-0.62	-0.44	0.00	-0.13	0.03	-0.10	0.00	0.00	-0.02	-0.13	0.04	0.44	-0.06	-0.04	-0.01	0.02	-0.01	0.51	0.87	0.42	0.04
Female	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

#### 7.4 Income, consumption and welfare effects

Factor price changes affect the incomes of each of the households in our model differently according to their endowments in each of the 16 categories of labor and in each of the 55 sector-specific capital stocks. We have seen that wage rates increase for female high skilled, medium skilled (men and women) and male low-skilled workers in urban areas, as well as medium skilled rural workers, while they decline for other workers. Although the average overall returns to capital stagnate, the effect varies across individual households as capital endowments are sector-specific and returns to capital in specific sectors range from -15.8 percent (*beverages and tobacco*) up to 4.8 percent (*electricity distribution equipment*).

With the CGE microsimulation approach, we obtain income variations for each individual household, which we can then group in a variety of ways. In **Error! Not a valid bookmark self-reference.**, we present results grouped according to residential area, population group and the gender of the household head. We first note that wages are the principal source of income in South Africa, followed by various forms of in-transfers (from other households, government, etc.), although there are substantial differences between household groups.

Overall, incomes do not change significantly. Income evolve more favorably in urban than rural areas as a consequent of wage rates and market participation, and the capital remuneration effects. Male headed households benefit from trade reform policy in term of income at the expense of women headed households which observed a significant drop of the return to their capital. All population groups, except “White” which shows a stagnating change in income, would benefit from free trade in term of income. “Asian” population group is the big winner as they benefit from a significant increase of the return to their capital.

In addition to its income effects, trade liberalization influences household welfare by changing consumer prices. While pre-tax prices fall both for imports and, in the face of increased import competition, domestic goods, consumer prices increase by 0.9 percent due to exchange rate depreciation and the increase in the sales tax required to offset lost tariff revenues (Table 9). With a fixed current account balance (fixed foreign savings), increased imports leads to currency devaluation. The required increase in the initial indirect tax rate (surtax) is quite small (13.4 percent) due to the relative small share of tariff in government revenue and the average sale tax of 4.5 percent (Table 10). Trade liberalization leads to an increase of over all consumption prices. However, consumption prices for agriculture goods increase less than services and manufacturing goods as they present the smallest average tax rate.



**Table 8: Household income and expenditure effects (in percent)**

	Residential area		Head of household		Population group					
	South Africa	Urban	Rural	Male head	Female head	Black	Colored	Asian	White	Unspecified
<b>Initial Share :</b>										
Urban High skilled Male	14.13	16.52	0.00	17.03	2.26	4.68	13.89	18.29	25.58	1.18
Urban Medium skilled Male	4.92	5.76	0.00	4.17	8.01	3.27	7.06	6.05	6.64	0.93
Urban Low skilled Male	16.11	18.83	0.00	19.35	2.85	20.98	31.58	19.40	8.53	0.92
Urban Boy	5.80	6.78	0.00	4.27	12.06	3.05	11.59	3.70	8.30	3.96
Urban High skilled Female	2.27	2.65	0.00	2.47	1.43	3.64	4.95	0.76	0.52	0.30
Urban Medium skilled Female	1.41	1.65	0.00	0.88	3.59	2.28	3.51	1.00	0.18	0.18
Urban Low skilled Female	0.01	0.01	0.00	0.00	0.04	0.02	0.00	0.00	0.00	0.00
Urban Girl	0.02	0.03	0.00	0.02	0.02	0.04	0.03	0.00	0.00	0.00
Rural High skilled Male	0.59	0.00	4.10	0.72	0.08	0.54	0.00	0.00	0.87	0.00
Rural Medium skilled Male	0.35	0.00	2.42	0.19	1.00	0.67	0.13	0.00	0.08	0.00
Rural Low skilled Male	2.09	0.00	14.44	2.35	1.02	3.27	1.23	0.00	1.27	0.00
Rural Boy	0.42	0.00	2.90	0.13	1.62	0.79	0.11	0.00	0.12	0.00
Rural High skilled Female	0.54	0.00	3.72	0.64	0.12	0.92	1.00	0.11	0.10	0.00
Rural Medium skilled Female	0.41	0.00	2.85	0.26	1.03	0.82	0.45	0.00	0.01	0.00
Rural Low skilled Female	0.00	0.00	0.03	0.00	0.00	0.01	0.02	0.00	0.00	0.00
Rural Girl	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capital	15.08	14.05	21.17	16.18	10.57	20.55	5.48	17.82	6.23	67.63
Transfers in	35.85	33.73	48.36	31.34	54.28	34.47	18.97	32.87	41.56	24.89
<b>All incomes</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
Income taxes	10.2	11.5	3.0	11.6	4.6	3.4	6.7	4.6	20.0	1.4
Transfers out	17.9	18.3	15.3	19.1	12.9	20.3	12.7	10.3	17.7	5.4
Savings	15.7	15.9	14.5	12.2	30.0	22.6	28.9	51.0	0.8	25.1
Consumption	56.2	54.3	67.5	57.1	52.5	53.6	51.5	33.9	61.5	67.6
<b>All expenses</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>Change in :</b>										
Urban High skilled Male	-0.05	-0.05		-0.05	-0.06	-0.06	-0.05	-0.05	-0.05	-0.09
Urban Medium skilled Male	0.03	0.03		0.03	0.04	0.04	0.04	0.02	0.03	-0.58
Urban Low skilled Male	0.27	0.27		0.27	0.36	0.27	0.28	0.27	0.28	-0.18
Urban Boy	0.09	0.09		0.06	0.12	0.08	0.06	0.07	0.10	0.08
Urban High skilled Female	0.11	0.11		0.10	0.15	0.11	0.11	0.13	0.11	0.14
Urban Medium skilled Female	-0.10	-0.10		-0.12	-0.09	-0.11	-0.10	-0.07	-0.14	-0.17
Urban Low skilled Female	-1.10	-1.10		-9.04	-1.07	-1.10				
Urban Girl	-1.45	-1.45		-0.91	-3.73	-0.91	-6.61			
Rural High skilled Male	-0.07		-0.07	-0.07	-0.07	-0.07			-0.07	
Rural Medium skilled Male	-0.31		-0.31	-0.30	-0.31	-0.30	-0.29		-0.42	
Rural Low skilled Male	0.15		0.15	0.15	0.12	0.18	0.12		0.08	
Rural Boy	-0.30		-0.30	-0.49	-0.24	-0.30	-0.46		-0.32	
Rural High skilled Female	-0.43		-0.43	-0.43	-0.51	-0.43	-0.48	-0.42	-0.37	
Rural Medium skilled Female	-0.35		-0.35	-0.33	-0.36	-0.35	-0.32		-0.28	
Rural Low skilled Female	-1.05		-1.05	-0.58	-5.15	-1.30	-0.65			
Rural Girl	-1.48		-1.48	-1.48		-1.48				
Capital	-0.01	0.29	-1.17	0.08	-0.52	-0.08	-0.69	0.65	-0.37	0.69
Transfers in	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>All incomes</b>	<b>0.04</b>	<b>0.09</b>	<b>-0.27</b>	<b>0.06</b>	<b>-0.04</b>	<b>0.04</b>	<b>0.05</b>	<b>0.16</b>	<b>0.00</b>	<b>0.46</b>

**Table 9: Consumer Price Effects**

Sectors	Import Intensity	Indirect tax rate		Change in domestic prices			Consumption shares All households
		Initial	Change in	Imports	Local output	Consumer	
<b>AGRICULTURE</b>	<b>7.0</b>	<b>1.7</b>	<b>13.4</b>	<b>3.7</b>	<b>0.3</b>	<b>0.7</b>	<b>5.4</b>
Gold and uranium	0.0	0.0	13.4	4.9	0.8	0.8	0.0
Other mining	73.0	0.1	13.4	4.9	2.8	4.3	0.1
<b>MINING*</b>	<b>65.8</b>	<b>0.1</b>	<b>13.4</b>	<b>4.9</b>	<b>2.2</b>	<b>4.0</b>	<b>0.1</b>
Meat and vegetables	11.9	10.4	13.4	0.9	0.6	1.6	4.4
Dairy	6.1	10.0	13.4	-2.5	0.6	1.2	0.9
Grain milling	9.1	6.4	13.4	1.6	0.5	1.3	2.4
Other food	6.4	7.6	13.4	-0.6	0.2	0.9	3.4
Beverages and tobacco	3.4	32.3	13.4	-50.7	-6.0	-8.7	1.5
Textiles	28.7	3.6	13.4	-1.7	0.2	0.0	0.0
Garments	18.0	8.4	13.4	-10.5	0.1	-1.7	1.7
Leather	40.2	3.4	13.4	3.0	0.9	2.1	0.1
Footwear	34.8	8.9	13.4	-6.1	0.0	-1.8	0.7
Wood	13.2	0.5	13.4	4.0	0.5	1.1	0.0
Paper	12.6	0.7	13.4	-2.6	0.2	-0.1	0.4
Printing	17.0	5.0	13.4	2.9	0.6	1.6	0.2
Petroleum	7.5	53.2	13.4	4.2	1.3	5.6	1.9
Basic chemicals	39.2	1.1	13.4	3.7	2.4	3.0	0.0
Other chemicals	28.8	4.5	13.4	3.5	1.6	2.6	2.6
Rubber products	32.4	7.2	13.4	-1.4	1.0	0.9	0.0
Plastic products	18.9	2.5	13.4	3.4	1.4	2.1	0.2
Glass products	24.8	2.8	13.4	3.4	1.1	2.0	0.0
Non metallic mineral	17.8	1.1	13.4	3.3	1.9	2.3	0.0
Iron and steel	17.2	0.1	13.4	4.4	2.8	3.1	0.0
Structural metal	2.5	2.5	13.4	-13.1	1.4	1.3	0.0
Other fabricated metal	20.3	2.2	13.4	2.6	1.7	2.2	0.1
General purpose machinery	72.2	5.0	13.4	2.6	1.0	2.8	0.1
Special purpose machinery	60.7	5.0	13.4	2.2	1.4	2.4	0.1
Household appliances	35.8	11.9	13.4	-5.1	0.4	-0.9	0.3
Electric motors	42.9	9.7	13.4	-2.1	0.3	0.2	0.0
Electricity distribution	56.9	1.2	13.4	4.2	1.9	3.4	0.0
Insulated wire and cable	11.9	5.5	13.4	-8.7	0.6	-0.1	0.0
Accumulators	27.0	1.1	13.4	3.5	1.4	2.1	0.1
Lighting equipment	39.8	1.9	13.4	3.3	1.3	2.3	0.0
Other electrical equipment	28.9	9.5	13.4	-5.0	0.2	-0.7	0.0
Communication equipment	77.8	9.4	13.4	2.3	1.1	3.1	0.7
Medical instruments	83.5	11.3	13.4	4.4	1.7	4.9	0.1
Motor vehicles	23.4	6.6	13.4	-0.8	1.6	1.8	3.0
Motor vehicle parts	64.6	2.2	13.4	4.9	2.3	4.2	0.4
Other transport equipment	85.1	7.5	13.4	4.9	2.5	5.4	0.1
Furniture	11.3	9.6	13.4	-2.0	0.7	1.1	0.7
Other manufacturing	75.1	9.7	13.4	2.5	2.0	3.3	0.6
<b>INDUSTRY*</b>	<b>29.4</b>	<b>9.0</b>	<b>13.4</b>	<b>1.5</b>	<b>0.8</b>	<b>1.6</b>	<b>26.8</b>
Electricity and gas	0.0	3.1	13.4	0.0	0.8	1.2	2.3
Water	0.2	2.2	13.4	4.9	0.4	0.7	1.0
Building	0.5	3.8	13.4	4.9	1.4	1.9	0.1
Construction	1.9	4.5	13.4	4.9	1.3	1.9	1.0
Trade services	0.1	0.5	13.4	4.9	0.8	1.9	0.0
Hotel and restaurant	20.6	4.8	13.4	4.9	0.9	2.3	2.3
Transport services	7.6	-0.1	13.4	4.9	1.4	1.7	3.9
Post and Telecommunications	6.6	2.3	13.4	4.9	1.0	1.5	2.4
Financial services	1.4	3.0	13.4	4.9	0.1	0.5	30.7
Real estate	0.6	5.1	13.4	4.9	0.9	1.6	0.6
Other business	5.5	2.9	13.4	4.9	0.8	1.4	0.2
General government	0.0	0.5	13.4	0.0	0.5	0.6	0.1
Health and social work	0.6	5.0	13.4	4.9	0.7	1.4	4.0
Other services	4.0	3.9	13.4	4.9	0.4	1.0	6.2
<b>SERVICE*</b>	<b>3.1</b>	<b>2.2</b>	<b>13.4</b>	<b>4.9</b>	<b>0.7</b>	<b>1.2</b>	<b>54.9</b>
<b>ALL*</b>	<b>16.1</b>	<b>4.5</b>	<b>13.4</b>	<b>2.3</b>	<b>0.7</b>	<b>1.4</b>	<b>100.0</b>
Overall change in household consumer prices							<b>0.9</b>

**Table 10: Government revenues and expenditures**

	Sales taxes	Production taxes	Household			Firm		Transfer income	Total Revenue	Expenses	Transfer	
			Duties	income taxes	income taxes	income taxes	payments				Savings	
Share	28.9	7.9	2.2	35.7	11.6	13.6	<b>100.0</b>	36.9	64.7	-1.6		
Change	6.9	0.5	-100.0	0.0	0.0	0.0	<b>-0.2</b>	0.5	0.0	25.8		

Each household is affected differently by consumer price reductions according to its consumption patterns. In this respect, we note that consumer prices increase for all household, consequently, tariff elimination on imports leads to a welfare loss in South Africa.

**Table 11: Household income and expenditure effects (in percent)**

	Residential area			Head of household		Population group				
	South Africa	Urban	Rural	Male head	Female head	Black	Colored	Asian	White	Unspecified
All incomes	0.04	0.09	-0.27	0.06	-0.04	0.04	0.05	0.16	0.00	0.46
Income taxes	-0.21	-0.21	-0.16	-0.23	0.00	0.04	0.08	0.05	-0.29	0.12
Transfers out	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Savings	0.22	0.44	-1.22	0.40	-0.10	0.07	0.02	0.23	2.67	1.68
Consumption	0.05	0.09	-0.13	0.07	-0.02	0.04	0.07	0.12	0.05	0.05
Consumer price index	0.92	0.89	1.05	0.90	0.99	0.86	0.79	1.19	0.99	0.72
<b>EV/Initial income</b>	<b>-0.23</b>	<b>-0.21</b>	<b>-0.35</b>	<b>-0.24</b>	<b>-0.15</b>	<b>-0.17</b>	<b>-0.11</b>	<b>-0.17</b>	<b>-0.31</b>	<b>-0.33</b>

## 7.5 Poverty and Inequality Analysis

The advantage of the integrated CGE micro-simulation approach is its capacity to capture the heterogeneity of household income sources and consumption patterns in order to perform the between- and within- group distribution, poverty, and inequality analysis. The model is used to generate the post-simulation data. Then these data and the base year data drawn from the income and expenditure survey are used to compute and compare standard consumption-based poverty and inequality indicators.

Foster-Greene-Thorbecke (FGT) poverty indicators (i.e. head count, poverty gap, and squared poverty gap) and the Theil inequality index are adopted. We define the poverty line as 3864 South African rands per year in 2000 prices, a lower bound poverty line suggested by Hoogeveen and Ozler (2004). We also present FGT curves, which map out FGT values for a wide range of possible values for the poverty line. Post-liberalization consumption data are deflated by the Laspeyres economy-wide consumer price index to account for the change in the general price-level.

Analysis of the household survey data indicates that 53 percent of the population was below the poverty line in the year 2000 (Table 12). The poverty gap and severity indices were 25 and 15 percent, respectively. Poverty in South Africa is shown to be more widespread and severe in rural areas, although inequality is greater among urban households. Significantly for this study, two-thirds of female headed households were below the poverty line, as compared to less than half of male-headed households, although inequality is greater in the latter group. Table 12 also shows that poverty is far more prevalent and severe among African households and, to a lesser degree, Colored households, in contrast with Asian, white and unspecified households.

**Table 12: Poverty and inequality indexes (in percent)**

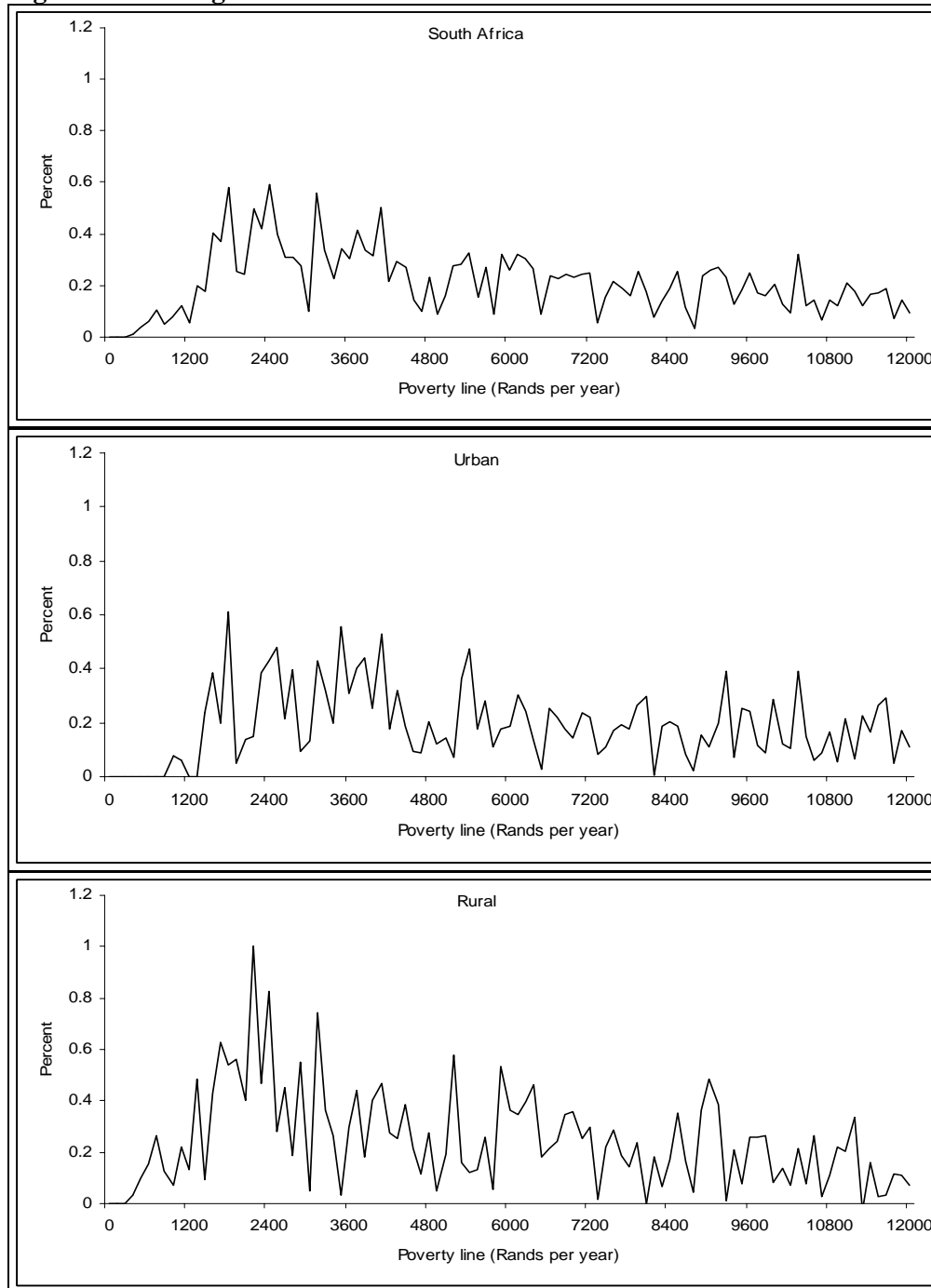
	Initial values				Variation			
	P0	P1	P2	Theil index	P0	P1	P2	Theil index
<b>South Africa</b>	53.0	25.3	15.0	1.6	0.29	0.26	0.20	0.06
<b>Residential area</b>								
Urban	42.4	18.4	10.2	1.6	0.23	0.21	0.14	-0.01
Rural	68.3	35.4	22.1	1.0	0.37	0.34	0.27	0.07
<b>Head of household</b>								
Male	43.6	19.5	11.1	1.6	0.19	0.22	0.15	0.03
Female	65.8	33.4	20.5	0.8	0.43	0.32	0.26	0.03
<b>Population group</b>								
Black household	61.0	29.5	17.6	1.1	0.31	0.30	0.23	0.07
Colored household	36.2	14.7	7.8	0.8	0.45	0.19	0.12	0.01
Asian household	6.4	2.3	0.8	0.3	0.00	0.04	0.03	0.01
White household	0.1	0.0	0.0	1.0	0.00	0.00	0.00	0.06
Unspecified household	11.4	3.1	0.8	1.7	0.00	0.08	0.04	-0.06

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

We now turn our attention to the changes in poverty and inequality resulting from our trade liberalization scenario. Results presented in Table 12 suggest that the impacts of complete tariff removal on poverty are small. Poverty and inequality increase slightly. Poverty indicators increase more in rural areas than in urban areas. This is confirmed by the increasing inequality in rural areas. Poverty increase more among female-headed and colored and black households, whereas they increase slightly or remain stable for male-headed, Asian, White and unspecified households. For a whole range of poverty lines, Figure 11 shows that the increases in headcount ratios are clearly higher among poorest and rural households for a whole range of possible poverty lines.

Our analysis until now has been at the household level. However, given our preoccupation with the gender impacts of trade liberalization, we exploit the microsimulation aspect of our analysis, including detailed information on all individuals in the sample households, to analyze poverty and inequality impacts separately for men, women and children. Note that we do not attempt to integrate issues of intra-household allocation and simply assume that income and consumption are shared evenly. Thus, men, women and children are considered to be poor if they belong to a poor household, i.e. a household for which consumption expenditure per capita is less than the poverty line.

**Figure 11 : Change in headcount ratios**



**Table 13** indicates that in South Africa 63 percent of children and 51 percent of women are poor (live in poor households), as compared to only 44 percent of men. This hierarchy is reproduced for all household categories, with the exception of female-headed households, in which the incidence of poverty is less among women than among men. Note that this does not reflect intra-household allocation as this is ignored. Instead, it indicates that there tends to be a higher ratio of men to women in poor female-headed households than in non-poor female-headed households. Note that the gender gap is robust to a whole range of poverty lines in both urban and rural South Africa (Figure 12).

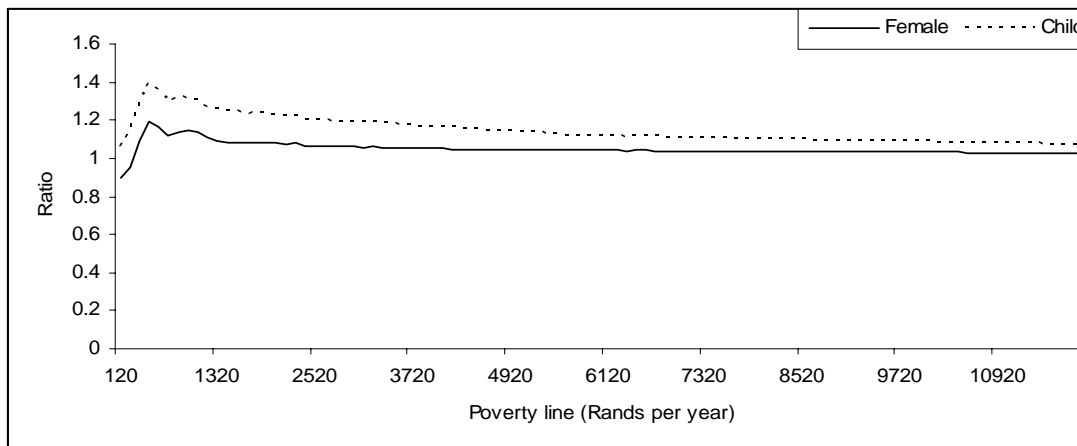
The results of our trade liberalization scenario in the bottom half of Table 13 indicate that poverty increases slightly more among women and children than among their male counterparts. In particular, the elimination of import tariffs is likely to increase more among women and children living in poverty than men. This gender and age bias in the poverty results is particularly strong for individuals in rural areas, female-headed and black households. Figure 13 indicates that the increase in gender and age gap is robust to a whole range of poverty lines.

**Table 13: Poverty indexes by gender and age**

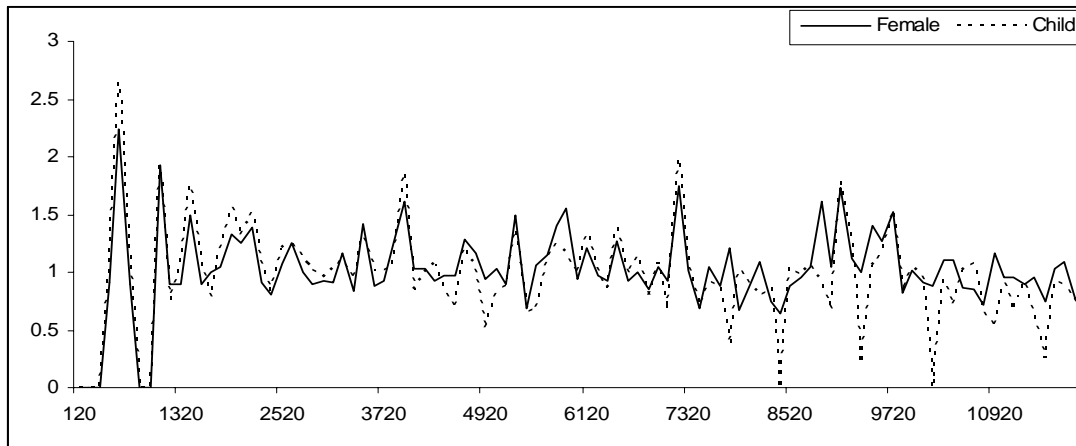
	Men			Women			Children		
	P0	P1	P2	P0	P1	P2	P0	P1	P2
<b>Base Year Values (in percent)</b>									
<b>South Africa</b>	<b>43.8</b>	<b>19.9</b>	<b>11.5</b>	<b>50.8</b>	<b>23.9</b>	<b>14.0</b>	<b>62.7</b>	<b>31.2</b>	<b>19.0</b>
Urban area	35.1	14.9	8.1	41.6	18.1	10.0	51.7	22.8	12.8
Rural area	61.5	30.2	18.5	65.9	33.4	20.5	73.7	39.7	25.4
<b>Male-headed</b>	<b>36.6</b>	<b>15.6</b>	<b>8.7</b>	<b>41.9</b>	<b>18.7</b>	<b>10.6</b>	<b>53.6</b>	<b>24.9</b>	<b>14.6</b>
<b>Female-headed</b>	<b>66.0</b>	<b>33.2</b>	<b>20.3</b>	<b>59.4</b>	<b>28.9</b>	<b>17.3</b>	<b>72.6</b>	<b>38.1</b>	<b>23.9</b>
Black	51.8	23.8	13.9	60.1	28.5	16.8	68.9	34.7	21.3
Colored	30.8	11.9	6.1	34.6	14.3	7.7	43.0	17.6	9.3
Asian	5.5	2.0	0.8	2.9	1.0	0.3	12.3	4.3	1.6
White	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.0
Unspecified	0.0	0.0	0.0	7.9	2.1	0.6	21.8	5.8	1.6
<b>Variations after simulation (in percent)</b>									
<b>South Africa</b>	<b>0.22</b>	<b>0.22</b>	<b>0.16</b>	<b>0.31</b>	<b>0.26</b>	<b>0.19</b>	<b>0.32</b>	<b>0.30</b>	<b>0.23</b>
Urban area	0.26	0.17	0.11	0.26	0.21	0.15	0.15	0.25	0.17
Rural area	0.13	0.32	0.24	0.39	0.34	0.27	0.50	0.35	0.29
<b>Male-headed</b>	<b>0.19</b>	<b>0.19</b>	<b>0.13</b>	<b>0.23</b>	<b>0.21</b>	<b>0.15</b>	<b>0.14</b>	<b>0.26</b>	<b>0.19</b>
<b>Female-headed</b>	<b>0.30</b>	<b>0.31</b>	<b>0.25</b>	<b>0.38</b>	<b>0.31</b>	<b>0.23</b>	<b>0.53</b>	<b>0.35</b>	<b>0.28</b>
Black	0.23	0.26	0.19	0.35	0.31	0.23	0.33	0.33	0.26
Colored	0.42	0.17	0.10	0.37	0.18	0.12	0.55	0.22	0.15
Asian	0.00	0.03	0.02	0.00	0.02	0.01	0.00	0.07	0.05
White	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unspecified	0.00	0.00	0.00	0.00	0.05	0.03	0.00	0.15	0.08

Notes: P0=Headcount Index; P1=Poverty Gap; P2=Squared Poverty Gap (Poverty Severity Index).

**Figure 12 : Female and child relative to male headcount ratios**



**Figure 13 : Change in female and child relative to male headcount ratios**



## CONCLUSION

South Africa is in the midst of an ambitious trade liberalization program, notably in the context of various regional and international trade agreements. These policies are likely to have wide-ranging effects on the South African economy, in particular its international trade, production, government revenues, factor markets, household incomes and consumer price structure. To analyze the poverty impacts on South African men, women and children, we construct a CGE microsimulation model including 4000 actual households from a nationally representative household survey and featuring the explicit modeling of male and female market and domestic work activities and leisure time.

South Africa has a very discriminatory tariff structure with rates varying from zero to 112.8 percent. The high protection sectors are predominantly comprised of light manufacturing activities such as garments, beverages and tobacco, structural metal, electrical equipment and household appliances. These sectors are found to suffer from a contraction in output and value added prices subsequent to trade liberalization. In contrast, export-oriented sectors such as mining, transport and communication equipment, machinery and medical instruments expand as a result of the import-driven exchange rate depreciation and the fall in input costs. As male workers tend to be more heavily involved in the export-oriented sectors, whereas women work more in the highly protected light manufacturing activities and services, male wage rates rise with respect to female wage rates. An interesting contrast emerges between urban and rural workers. While urban wage rates tend to perform better than rural wage rates, results vary substantially among skill categories. Medium- and urban low-skilled workers, especially men, are the big winners from our trade experiment. In contrast, high- and rural low-skilled, and child workers fare worse as a result of their dependency on wages from the agricultural sector in rural areas, and from social services in urban areas. Consequently, wage effects are in favor of the more skilled workers in rural areas and in favor of the less skilled urban workers. As capital is assumed to be immobile in the short run, rates of return closely mirror the evolutions in sectoral value added prices.

The upshot of all these changes is an increase in the incomes of urban and male-headed households relative to their rural and female-headed counterparts. These results compound with a greater reduction in consumer prices among urban and male-headed households to generate for them a smaller increase in poverty and a reduction in inequality.

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## Appendix 1 : Industry code

Sector	Detail
Agriculture	Agriculture, hunting, forestry, fishing and related activities
Gold and uranium	Mining of gold and uranium ore
Other mining	Mining of coal and lignite, Other mining and quarrying
Meat and vegetables	Production, processing and preserving of meat, fish, fruit, vegetable, oil products
Dairy	Dairy products
Grain milling	Grain mill products, starches and starch products, and prepared animal feeds
Other food	Other food products
Beverages and tobacco	Beverages and tobacco products
Textiles	Spinning, weaving and finishing of textiles
Garments	Garments, knitting mill products, other textile products
Leather	Tanning and dressing of leather; Luggage, handbags and the like
Footwear	Footwear
Wood	Wood products
Paper	Paper products
Printing	Published and printed products, Recorded media products
Petroleum	Petroleum products
Basic chemicals	Basic chemicals, fertilizers, primary plastics, synthetic rubber; man-made fibres
Other chemicals	Other chemical products
Rubber products	Rubber products
Plastic products	Plastic products
Glass products	Glass products
Non metallic mineral	Non metallic mineral products
Iron and steel	Iron and steel products, non-ferrous metals , and casting of metals
Structural metal	Structural metal products
Other fabricated metal	Other fabricated metal products, and related activities
General purpose machinery	General purpose machinery
Special purpose machinery	Special purpose machinery
Household appliances	Household appliances
Electric motors	Electric motors, generators and transformers
Electricity distribution	Electricity distribution and control apparatus
Insulated wire and cable	Insulated wire and cable
Accumulators	Accumulators, primary cells and primary batteries
Lighting equipment	Electric lamps and lighting equipment
Other electrical equipment	Other electrical equipment
Communication equipment	Radio-, television- and communication equipment and apparatus
Medical instruments	Medical, precision- and optical instruments, watches and clocks
Motor vehicles	Motor vehicles and bodies for motor vehicles; trailers and semi-trailers
Motor vehicle parts	Parts and accessories for motor vehicles and their engines
Other transport equipment	Other transport equipment
Furniture	Furniture
Other manufacturing	Other manufacturing and recycling
Electricity and gas	Electricity, gas, steam and hot water supply
Water	Collection, purification and distribution of water
Building	Building, installation, building completion
Construction	Site preparation; construction of structures; renting of construction equipment
Trade services	Trade services
Hotel and restaurant	Hotel and restaurant
Transport services	Transport services
Post and Telecommunications	Post, courier activities and telecommunications
Financial services	Financial intermediation, insurance and pension funding
Real estate	Real estate activities
Other business	Other business activities
General government	Other individual and collective general government
Health and social work	Human health, veterinary and social work activities
Other services	Education, other services and other activities

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