Global Trade Analysis Project
https://www.gtap.agecon.purdue.edu/

This paper is from the
GTAP Annual Conference on Global Economic Analysis
https://www.gtap.agecon.purdue.edu/events/conferences/default.asp

The impact of trade on female labor and girls' education in South Africa: a CGE analysis

Lulit Mitik[1] Bernard Decaluwé[2]

March 2008

(Preliminary version)

In many parts of the developing world, children are required to perform household chores as natural parts of their roles in the household. Household work is highly time-consuming and often interferes with schooling. Our objective in this paper is two-fold. First, we illustrate how trade liberalization affects women's and men's market work, household work and leisure differently. Second, this paper reveals how such economic policies can influence parents' schooling, household work and leisure decisions for their children. We build a macroeconomic framework that integrates both market and non-market activities distinguishing male and female workers on the one hand, and adult and child non-market work and leisure on the other. Our dynamic computable general equilibrium model distinguishes between girls' and boys' household work, education and leisure time. Parents' decision regarding child work and schooling is influenced by perceptions of the costs and benefits of each option. Following this approach, we analyze the gender sensitive impacts of trade liberalization in South Africa. We find that gender inequality is likely to rise between adults and between boys and girls. Given the decrease in female skill premium, parents reduce girls' education time and increase their household work. In contrast, as male skill premium increases, parents increase boys' education time and reduce their household work. Leisure time is reduced for children in most households. Furthermore, we observe a direct substitution effect of children for parents in "Colored" households as the significant increase in adult male and female market labor supply is made possible through the substitution of children for adults in household work activities. A certain substitution effect also takes place in the three other household categories though this effect is mainly driven by changes in male and female skill premium. The widening gender inequality between boys and girls sustains in the long run.

[1] Université de Nice-Sophia Antipolis, Centre d'Etudes en Macroéconomie et Finance Internationale (CEMAFI), Avenue Doyen Louis Trotabas, 06050 Nice Cedex 1, France; post doctoral researcher; medi_mitik@hotmail.com

[2] Université Laval, Department of Economics, Poverty and Economic Policy (PEP), Centre Interuniversitaire sur le Risque, les Politiques Economiques et l'Emploi (CIRPEE, Université Laval) ,Centre d'Etudes Prospectives et d'Information Internationale CEPII (Paris); bdec@ecn.ulaval.ca

Introduction

Understanding how economic policies affect women and men needs to take in consideration impacts on the market and on the non-market spheres. At the market level, policies can contribute to narrowing or widening gender inequalities in terms of wages, labor market participation and contribution to the family income. At the non-market level, policy reforms affect the gender division of labor within the household. Gender inequalities and rigidities at the household level also affect the outcomes of macroeconomic policy by constraining labor mobility between the market and the non-market spheres. Indeed, women's market labor supply is highly constrained by their non-market activities. Women have primary responsibilities and do most of the work in the unpaid economy (also called the domestic, social reproduction or reproductive economy[3]). In most developing countries, women are subject to "time poverty" as they have to combine their productive and reproductive roles. An assessment of the gendered impacts economic reforms therefore requires an evaluation of the interrelations and feedbacks between market and household economies (Elson, 1995, Çagatay, 2003, Evers, 2003, Palmer 1995, Floro, 1995, Beneria, 1995, Fontana and Wood 2000). It is important to identify the transmission patterns from changes at the sectoral level to the rest of the market economy as a whole, on the one hand, but also understand how these changes affect and are affected by constraints and rigidities at the reproductive level, on the other.

During economic shocks, and particularly in poor households, time allocation of family members may be one of the major resources available for adjustment. Indeed, policy

[3] Reproductive work consists of managing the household, cooking, cleaning, gathering fuel and water and caring for other family members. In developing countries, unpaid work also includes subsistence production such as production for home use of goods and services that can be marketable. Reproductive work also includes community work.

reforms can create a shift of costs from the market to the reproductive sector when the provisioning of marketable goods and services is met through increased unpaid labor (Elson, 1995). Economic adjustments can contribute to the pressure to put all hands at work, including that of children, even at the expense of schooling. Indeed, girls and boys may be required to take on tasks of adults who have entered the labor market (adults who have increased the hours worked in order to cope with falling wages for example). Children may also have to increase their household work to help produce goods and services that have become unavailable or unaffordable on the market (households adjust to economic reforms by changing the composition of their consumption and by purchasing basic food items on the market and producing the rest at home).

The pattern of children helping parents is common in many societies. In many parts of the developing world, children are required to perform certain chores as natural parts of their roles in the household. As all family members are economic providers, the work undertaken by children may be essential. Therefore, economic reforms not only affect (and are affected by) the division of labor within the household between men and women, but also between adults and children.

Looking at child labor issues requires a gender approach as it uncovers distinct differences in the tasks performed and constraints faced by boys and girls. The role of girls in household production is similar to that of women's work. Almost everywhere in the developing world, women work longer hours than men, and girls work longer hours than boys. Furthermore, there is a high and disproportionate participation of girls in adult women's work, as opposed to boys' participation in men's work (ILO). This is explained by the general substitutability of women's work, the clear gender divide and the expectation that girls' future work will require the skills they are learning in helping with household chores and production (Kane, 2004).

Though not all child work is harmful, household work is highly time-consuming and often interferes with schooling. Empirical findings suggest that child work is detrimental to human capital accumulation. By not enrolling children in school, a household prevents its children from benefiting from higher earnings in the future. Furthermore, in poor households, this is likely to diminish chances of escaping poverty.

The relationship between child work and education is an important and complex issue. Parents' decision regarding child labor and schooling is influenced by perceptions of the costs and benefits of each option. The expected returns of education are therefore an important factor in parents' considerations. As opposed to education, it is easy for parents to realize the value of work performed by their children, since it brings immediate benefits for the well-being of the family. This situation may cause parents not to send their child to school as education may have high opportunity costs for the family (loss of their domestic services and production).

Empirical findings suggest that changes in the labor market affect adults' and children's time allocation in the household. It is likely that, increased adult participation in the labor market, impacts on children's time allocation. Katz (1995) finds that the availability of older daughters to perform the domestic labor that is normally the responsibility of the female head enables their mother to pursue remunerated labor activities in Guatemala. Admassie (2003) finds that the immediate elimination of child labor in favor of schooling in Ethiopia is neither feasible nor desirable given the significant contribution of children's labor to family labor and household production system.

Children are also income earners. Duryea and Arends-Kuenning (2003) find that children are more likely to leave school at times when they receive better pay in urban child labor markets of Brazil. Duryea, Lam and Levison (2007) also show that loss of income due to unemployment of male household head increases the probability of children entering the

labor force and declining school performance. Kruger (2007) finds that child labor among boys increases during periods of temporary increases in local economic activity driven by positive coffee production shocks in Brazil. She also finds that parents from middle-income households tend to substitute their children's time from schooling into work activities. Shafiq (2007) shows that higher child wages thus increased indirect the costs of schooling and encourage households to combine schooling with child labor in rural Bangladesh. Amin, Quayes and Rives (2006) find that working inside or outside the household deter continuous accumulation of education in Bangladesh and that working children had less schooling than non-working ones. Edmonds (2005) finds that anticipated large cash transfers to the elderly in South Africa are associated with declines in hours worked by over an hour per day and increases in schooling. In line with the Balland and Robinson (2000) model, he shows that credit liquidity constraints play an important role in determining child time allocation. Heady (2003) finds that child labor has negative impacts on schooling not only in terms of quantity, but also in terms of quality. Learning achievements in terms of reading and mathematics are substantially lower among wage working children than non working children.

Clearly, child labor is harmful for education. However, child labor is often considered as labor for pay. Unpaid child work for family is therefore overlooked (Edmonds 2008, ILO). Although domestic work is usually considered benign by parents and society, it may be just as strong a deterrent to educational activities as work done in the labor market. Changes in labor market participation of adults are likely to affect children's time allocation especially when the production of home goods and services needs to be preserved through the increase in tasks performed by young girls and boys. Our paper fills this gap by integrating these dimensions.

Our objective in this paper is two-fold. First, we illustrate how certain economic policies such as trade liberalization, through direct, indirect and feedback effects, affect women's and men's market and household work differently. The paper also shows how

constraints and rigidities at the household level affect behavior at the market level in terms of female labor supply responses to economic incentives. Second, this paper reveals how such economic policies can influence parents' schooling and household work decisions for their children. Indeed, given that economic reforms impact on skilled and unskilled wage rates, they are likely to affect parents' expectations about future returns to children's schooling relative to its opportunity costs. The paper thus analyzes the relationship between household economic shocks and the allocation of children's and adult's time.

A variety of tools can be used to consider these dimensions. In this study, we use a computable general equilibrium (CGE) model. CGE models allow, within a comprehensive macro framework, the analysis of direct and indirect effects of macro-level shocks on production, on factor demand and income distribution. Furthermore, these models can integrate gendered aspects through the distinction between male and female labor. The non-market sphere, i.e. household production and leisure activities can also be integrated. CGE modeling is thus an excellent tool for gender-based approach to macroeconomic policy impact analysis as it can be made to reflect changes in labor market participation, in inequality in income distribution, in the division of household chores, each element distinguished by gender.

This paper is organized as follows. Section 2 outlines our general approach. Section 3 explains how the data is organized in the case of South Africa. Section 4 provides a description of our CGE model. Section 5 reports the results of the experiments. Section 6 concludes and outlines further work plans.

Outline of general approach

CGE modeling is widely used to evaluate the impact of trade policies. However, few studies adopt a gender-aware approach to such policies and incorporate home produced goods to analyze labor supply decisions. Fontana and Wood (2000) built a CGE model that treats men and women as separate factors of production on the market sphere but also regarding household production and leisure activities. Household work and leisure activities have the same characteristics as the standard market economy sectors. Their model is applied to Bangladesh. Fontana (2004) develops this approach from a comparative perspective between Bangladesh and Zambia. The full elimination of import tariffs results in an increase in female wages and labor force participation. In both countries, higher female market employment results in a decrease in reproductive and leisure activities. In Bangladesh, given the increase in the opportunity cost of female workers' time relative to male workers, this encourages some substitution of male for female labor in social reproduction.

Fofana, Cockburn and Decaluwé (2005) build a CGE model that also integrates both market and non market activities distinguished by gender for the South African economy. Tariffs elimination reveals a strong gender bias against women with a decrease in their labor market participation while men participate more in the market economy. They find that women continue to suffer from heavy time burden within the household as they observe an increase in their domestic work. In contrast, given male labor participation increases, men continue to perform less domestic work, and contribute more to household income.

Despite the innovative features in these models, few improvements can be brought to them. Even if the increase in female market labor supply (in the Fontana et al model) is positive in terms of women's income contribution and bargaining power within the household, it may adversely affect children and other household members especially when the

production of home goods and services needs to be maintained through the increase in tasks performed by other members, in particular children. The increase in market employment may not be met through the reduction of leisure time, particularly when time-saving goods and services are unaffordable or unavailable. Thus, time available for leisure may be very limited. Economic incentives in terms of increased wages and labor demand can also be met through the substitution of children for parents in home production activities. Furthermore, these models fail to account for long term impacts.

No CGE model, to our knowledge, has considered evaluating trade policy impacts on child household work and education within the household context. Most research considers child labor for pay and often overlooks children's unpaid labor for the family. Our paper seeks to fill this gap and brings new insights on this issue. The integration of children's unpaid household labor allows us to monitor whether girls and boys are likely to be deprived from school to perform household tasks that their employed parents no longer have time to do. Moreover, what sets our paper apart is its long term approach, thereby allowing us to identify whether gains or losses in terms of education, from greater trade openness would be sustained over time.

Data

The first step towards making a CGE model is to build a social accounting matrix (SAM). It is also possible to use a SAM built for other models and adapt it to the issue that interests us. Our CGE model uses the South African SAM for the year 2000 built by Fofana, Cockburn and Decaluwé.

It has 27 market production sectors producing 27 categories of goods and services using two factors of production, capital and composite labor. The SAM also integrates

gendered aspects. Composite labor is disaggregated by gender and by skill level. It has four household categories distinguished by race reflecting the historical divide inherited from the apartheid regime until 1994. Unlike many SAMs, this one integrates household production activities also called "non-economic but productive" activities by the standard international system of national accounts (SNA) classification (UN, 1993). These activities, also called reproductive work, are distinguished by gender for each household category. Reproductive work includes rearing and caring for children, caring for other household members, cooking, cleaning and fetching water and fuel. They are more likely to be performed by women (see table 2). As for men, they are more likely to be producing goods and services exchanged in the market.

Activities that produce goods and services exchanged in the market enter within the SNA production boundary, thus are included in the calculation of the GDP. Conversely, reproductive work falls outside the SNA production boundary but is recognized as productive. The SAM is built following this classification based on data from the 2000 South African Time-use survey. Information on children's work (under the age of 19) is provided by the Time-use survey and by the Survey of Activities of Young People in South Africa (1999). The SAM provides information on labor in terms of hours instead of number of persons since all household members are engaged in at least two types of activities. It uses satellite accounts for reproduction activities (leisure and household production and education).

The basic characteristics of the South African SAM are described in tables 1 and 2. Table one provides a simplified overview of the sectoral structure of market production activities. It shows that the services sectors produce over half of the total output and are more intensive in value added relative to intermediate inputs. They represent over 70 per cent of total GDP. Agricultural and mining sectors are intensive in value added and they contribute for less than 10 per cent to total output and GDP. The manufacturing sectors are intensive in

intermediate inputs and produce about 37 per cent of total output and represent about 19 per cent of GDP.

Table 1- South African SAM, 2000 (Rand, million)

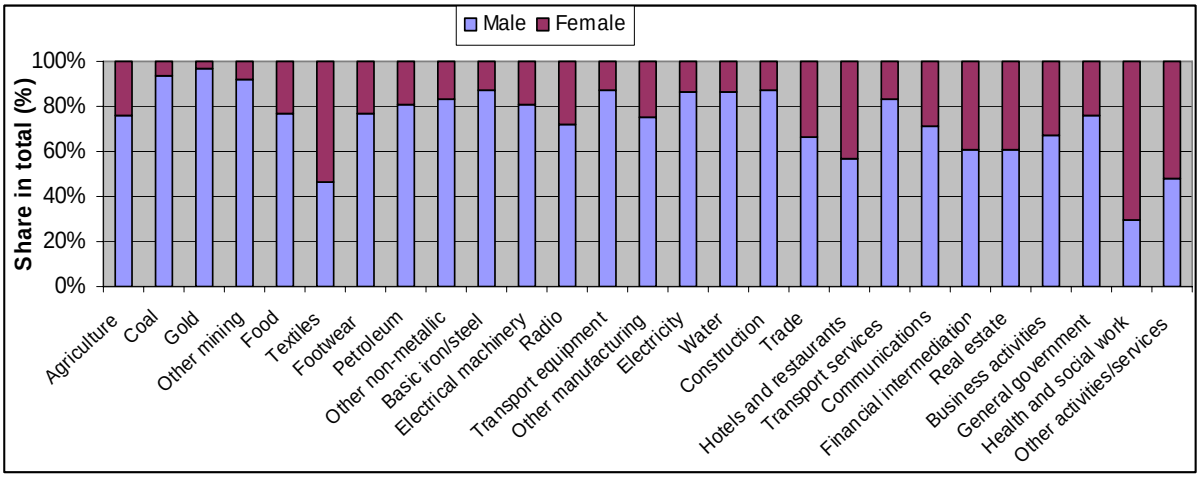
	Gross output (% of total)	Value added (% of GDP)	Share of value added in output (%)	Import penetration (%)	Export as share of total output (%)	Labor intensity (% of value added)	Labor employment (% of total)	Use of capital (% of total)	Female labor (% of total)	Male labor (% of total)
Agriculture	3,5	3,6	47,2	6,8	15,6	50,1	2,7	5,4	2,3	2,8
Mining	5,6	6,4	51,8	40,4	77,7	52,4	5,0	9,3	1,0	6,6
Manufacturing	37,5	19,1	23,2	22,2	16,5	58,6	16,8	23,9	12,9	18,2
Services	42,8	53,5	56,8	3,2	2,5	65,6	52,4	55,6	63,9	48,1
General government	10,7	17,4	74,1	0,0	0,0	88,9	23,1	5,8	19,9	24,3
Total	100,0	100,0	45,5	11,5	12,2	66,9	100,0	100,0	100,0	100,0

Foreign trade openness of the South African economy is moderate as export shares of total output is around 12,2 per cent and import shares in total domestic use is 11,5 per cent. The mining sectors are nonetheless very open to foreign trade. 77 per cent of their output is exported and 40,3 per cent of their domestic use is imported from the rest of the world. Mining sectors are also highly male-intensive (figure 1). Import penetration represents 22,2 percent in manufacturing and 16,5 per cent of output is exported.

All categories of sectors are labor-intensive and relatively more in male labor (figure 1). 75,5 per cent of labor is employed in the services sectors. The general government is the second employer in South Africa as it employs 23,1 per cent of total labor. The government sector is intensive in male labor and employs over 24 per cent of total male labor. Female labor is concentrated in services sectors and 19,9 per cent is employed by the government.

The detailed SAM shows that only three sectors out of 27 are intensive in female labor (textiles, health and social work and other services sectors).

Figure 1- Composition of labor demand by sector and gender (%)



Time-use in South African households between market work, household work and leisure for adult men and women and between schooling, household tasks and leisure for girls and boys is outlined in table 2. Women spend significantly more time in home production while men are more engaged in market production activities. Adult women provide half of the labor time needed to produce home goods and services while adult men contribute up to 27%.

Table 2- Allocation of time in South African households, SAM 2000 (million hours per year, over -5 population)

	Share in time use (%)				
	African	Colored	Indian	White	Total
Men					
Market work	32,9	39,5	55,2	56,6	42,7
Domestic labor	15,5	10,8	7,9	9,5	12,6
Leisure	51,6	49,7	36,9	33,9	44,6
Total	100,0	100,0	100,0	100	100
Women					
Market work	17,4	20,0	31,5	37,0	23,9
Domestic labor	40,4	31,7	29,5	26,5	34,9
Leisure	42,3	48,3	38,9	36,5	41,2
Total	100,0	100,0	100,0	100	100
Boys					
education	32,4	22,3	32,2	21,2	28,7
Domestic labor	11,4	10,0	8,6	12,6	11,5
Leisure	56,2	67,8	59,2	66,2	59,9
Total	100,0	100,0	100,0	100	100
Girls					
education	26,9	20,5	27,0	17,9	24,1
Domestic labor	28,7	24,5	24,8	27,1	27,7
Leisure	44,4	55,0	48,2	55,1	48,2
Total	100,0	100,0	100,0	100	100
Household work					
Men	27,4	24,4	24,3	31,2	27,9
Women	53,4	56,4	56,4	49,5	52,8
Boys	6,5	5,8	5,8	7,4	6,6
Girls	12,7	13,4	13,4	11,8	12,5
Total	100,0	100,0	100,0	100,0	100

This gender division of labor is also reflected between girls and boys, as girls provide twice the household labor supplied by boys. Girls also have relatively less time for schooling and school related activities and leisure given their higher household work load. Overall, women (adults and girls) provide over 65% of the household labor. Their time allocation is therefore more constrained than that of men and boys. Men (adults and boys) benefit from higher leisure time while women and girls have a higher work load.

Table 3 – Mean minutes per day spent on domestic work including fetching water and fuel by gender and age

Age	Male	Female
10 à 19	68	131
20 à 39	87	224
40 à 59	81	232
60 et plus	91	187

Source: Time use survey: How South African men and women spend their time, Statistics South Africa, 2001

Furthermore, table 3 shows that children aged from ten to nineteen years spend more than one hour per day on domestic tasks. Children spend relatively less time on household chores than adults. The South African time-use survey also shows that women spend twice the time of men in these tasks.

The model

The study uses a computable general equilibrium model based on the neoclassical-structuralist specification presented in Decaluwé, Martens, Savard (2001). Production, consumption and prices are explained in an economy in which economic agents respond to relative prices as a result of profit or utility maximizing behavior.

The static standard model structure

The production function in the model is a three level constant elasticity of substitution (CES) function. At the lowest level, skilled and unskilled labors are aggregated into male and female labor. To reflect the rigidity on the market between different levels of qualification, skilled/unskilled substitution is limited by setting the value of the elasticity to 0,5 on the

demand side and 0,2 on the supply side. At the intermediate level, we aggregate male and female labor with a substitution elasticity of 0,5 into one large labor bundle. The production function has an upper level which combines composite labor with capital with a substitution elasticity of 1,5. Finally, value added is combines in fixed proportions with intermediate inputs to make gross output.

The treatment of trade in the model is standard. We assume that the relationship between the rest of the world and the domestic economy is determined by an imperfect substitutability between imported and domestically produced goods and services on the consumption side (Armington hypothesis). Likewise, local producers divide their output between the home and export markets; the shares vary with the ratio of domestic prices to exports process. Thus, allocation between domestic and foreign markets for demand and supply respond to relative prices of foreign goods defined by exogenous international (import and export) prices, the real exchange rate and the local tax levels.

Gender specifications and household production activities

The labor market is segmented into male labor and female labor treated as separate factors of production. This is tended to reflect gender bias against women (in South African labor market in terms of wages and employment opportunities) and also occupational differences in terms of sectoral employment. As a consequence, the same policy will affect differently women and men depending on the concentration of each in contracting and expanding sectors.

Our CGE model, unlike traditional models, is based on a gender sensitive approach on the market sphere, as demonstrated above. Another distinctive feature of our model is the integration of household production and leisure activities distinguished by gender and between adults and children. The household production structure is based on the Fofana,

Cockburn and Decaluwé approach (2005). Labor supply is endogenously determined by households. Women and men allocate their time between market labor, household work and leisure. We extend their approach by distinguishing adult and child home labor. Furthermore, we introduce parent's decision on child time allocation between education, home labor and leisure time. Finally, our model is run on a dynamic basis enabling the evaluation of long term impacts.

Non-market activities are introduced into the model with the recognition that women are more likely to perform household chores while men are more active in the labor market. Modeling market activities alongside non-market ones shows the importance of home production of goods and services as they are intensive in female labor. This reveals the constraints faced by women in terms of their ability to increase their labor market participation. Furthermore, these home produced goods and services are not sold in the market and compete with their market substitutes. They thus play an important role in households' consumption choices.

The household utility function is an extended linear expenditure system from which are derived household demand functions subject to a full income constraint. Household utility is based on the consumption of home produced goods (C^Z) and marketed goods (C^m), and leisure time for men (L^{mal}), women (L^{fem}), boys (L^{boy}) and girls (L^{girl}). Households maximize their utility under a budget constraint for consumption of marketed goods, time constraint for adults and children and non-market household production technology. Further details of optimization process are provided in the appendix.

$$U_h = f(C^m_{i,h}, C^z_h, L^{mal}_h, L^{fem}_h, L^{boy}_h, L^{girl}_h)$$

Non market household production (Z_h) is modeled by a CES function that combines male composite labor (adults and boys, $LZmal_h$) and female composite labor (women and

girls, $LZwom_h$). Male and female labor are imperfect substitutes in the production of home goods and services with a substitution elasticity of 0,5 so as to reflect rigidity in gender roles and the gender division of unpaid home labor. Household production does not require intermediate goods by assumption[4].

$$Z_{h,t} = A\_zlab_h \left[\alpha\_zlab_h . LZwom_{h,t}^{-\rho\_zlab_h} + \left(1-\alpha\_zlab_h\right) LZmen_{h,t}^{-\rho\_zlab_h} \right]^{\left(\frac{-1}{\rho\_zlab_h}\right)}$$

The relative demand for composite male and composite female labor in home production depends on their relative share (α_zlab_h) in home production, composite male and female wage rates ($wmen_h$ and $wwom_h$), and the substitution elasticity (δ_zlab_h).

$$\frac{LZwom_{h,t}}{LZmen_{h,t}} = \left(\frac{\alpha\_zlab_h}{1-\alpha\_zlab_h} \right)^{\delta\_zlab_h} \left(\frac{wmen_{h,t}}{wwom_{h,t}} \right)^{\delta\_zlab_h}$$

The value of home produced goods is equal to the value of labor devoted to their production. Unpaid household work is valued by its opportunity costs ($hwfem_h$ and $hwmal_h$) as measured by the expected wage rates on the market economy (forgone wage on the labor market). Leisure time is determined based on the household share of female and male leisure time ($ZETAfem_h$ and $ZETAmal_h$). After total disposable time ($MAXHOUR\_fem_h$ and $MAXHOUR\_mal_h$) has been allocated to market ($LSfem_h$ and $LSmal_h$) and household work ($LZfem_h$ and $LZmal_h$), leisure is residually calculated.

$$LSfem_{h,t} = MAXHOUR\_fem_{h,t} - LZfem_{h,t} - \frac{ZETAfem_h \left(CTH_{h,t} - \sum_{j=1}^{27} C\_min_{j,h,t} PC_{j,t} \right)}{hwfem_{h,t} \left(1-ZETA\_TOTAL_h\right)}$$

[4] Domestic paid labor, capital goods and intermediate goods are included in the household utility function and indirectly substitute to domestic unpaid labor which is referred here as home goods.

$$LSmal_{h,t} = MAXHOUR\_mal_{h,t} - LZmal_{h,t} - \frac{ZETAmal_h\left(CTH_{h,t} - \sum_{j=1}^{27} C\_min_{j,h,t} PC_{j,t}\right)}{hwmal_{h,t}\left(1 - ZETA\_TOTAL_h\right)}$$

Girls' and boys' time allocation

Girls replace their mother for some household chores while boys take on tasks mostly performed by their father. We suppose a perfect substitutability between adults and child household labor ($LZgirl_h$ and $LZboy_h$). This is likely to result in an increase in girls' and boys' household work in situations where women and men need to increase their labor market participation. Adults' home labor ($LZfem_h$ and $LZmal_h$) is determined as follows.

$$hwfem_{h,t}.LZfem_{h,t} = wwom_{h,t}.LZwom_{h,t} - wgirl_{h,t}.LZgirl_{h,t}$$

$$hwmal_{h,t}.LZmal_{h,t} = wmen_{h,t}.LZmen_{h,t} - wboy_{h,t}.LZboy_{h,t}$$

Nevertheless, parents can not increase children's household tasks as much as they want because girls' and boys' time is constrained by schooling, and leisure. Children's time ($MAXHOUR\_girl_h$ and $MAXHOUR\_boy_h$) is constrained by an imperfect substitution between household work ($LZgirl_h$ and $LZboy_h$) and schooling ($EDgirl_h$ and $EDboy_h$). Their time allocation function is a CET function with a substitution elasticity of 2. This value implies that parents' decision to allocate their children's time between schooling and household work will vary significantly with relative gains.

$$MAXHOUR\_girl_{h,t} = B\_g_h\left[\beta\_g_h.EDgirl_{h,t}^{\kappa\_g_h} + \left(1-\beta\_g_h\right)LZgirl_{h,t}^{\kappa\_g_h}\right]^{\left(\frac{1}{\kappa\_g_h}\right)}$$

$$MAXHOUR\_boy_{h,t} = B\_b_h\left[\beta\_b_h.EDboy_{h,t}^{\kappa\_b_h} + \left(1-\beta\_b_h\right)LZboy_{h,t}^{\kappa\_b_h}\right]^{\left(\frac{1}{\kappa\_b_h}\right)}$$

The relative education and home domestic labor time depends on their relative share (β_g_h and β_b_h) in disposable time, the gains from education ($Pedug_h$ and $Pedub_h$) and from home labor ($wgirl_h$ and $wboy_h$), and the substitution elasticity (τ_g_h and τ_b_h).

$$\frac{EDgirl_{h,t}}{LZgirl_{h,t}} = \left(\frac{Pedug_{h,t}}{wgirl_{h,t}}\right)^{\tau\_g_h} \left(\frac{1-\beta\_g_h}{\beta\_g_h}\right)^{\tau\_g_h}$$

$$\frac{EDboy_{h,t}}{LZboy_{h,t}} = \left(\frac{Pedub_{h,t}}{wboy_{h,t}}\right)^{\tau\_b_h} \left(\frac{1-\beta\_b_h}{\beta\_b_h}\right)^{\tau\_b_h}$$

This functional form is interesting because it avoids situations where children are taken out of school to perform household work when relative gains of education decrease. Time allocated to education and household chores is determined in such a way that it maximizes girls' and boys' hypothetical future income. Leisure time is determined once children's time has been allocated to education and household work. It is the difference between children's total available time (TT_girl_h and TT_boy_h) and the time devoted to education and home labor ($MAXHOUR\_girl_h$ and $MAXHOUR\_boy_h$) depending on the household share in girls and boys leisure time ($ZETAgirl_h$ and $ZETAboy_h$).

$$MAXHOUR\_girl_{h,t} = TT\_girl_{h,t} - \frac{ZETAgirl_h\left(CTH_{h,t} - \sum_{j=1}^{27} C\_min_{j,h,t} PC_{j,t}\right)}{wmaxg_{h,t}\left(1-ZETA\_TOTAL_h\right)}$$

$$MAXHOUR\_boy_{h,t} = TT\_boy_{h,t} - \frac{ZETAboy_h\left(CTH_{h,t} - \sum_{j=1}^{27} C\_min_{j,h,t} PC_{j,t}\right)}{wmaxb_{h,t}\left(1-ZETA\_TOTAL_h\right)}$$

Household decision to allocate time on child education is modeled in a relatively simple manner. It depends on the relative wages of skilled and unskilled workers distinguished by gender. Children's household work is valued by unskilled market wage rates as we assume that time not devoted to schooling is unlikely to produce skilled labor. Education is however expected to produce skilled laborers and is thus valued by skilled wage rates[5].

Children's household work level is not only affected by the need for their contribution to help and/or replace parents, providing direct utility to the household because it allows for the consumption of home produced goods. It also is determined by future prospects in terms of higher income, though schooling does not provide any utility to the household in our model.

Men and women allocate their time between market and non-market activities according to home goods production requirements, the degree of substitutability between men and women in the market and non-market spheres, market wage rates (and opportunity costs) and sectors labor demand. The contribution of children in terms of household production also plays an important role because boys and girls can be substitutes to adults in home production activities. This has a double advantage for the household. First, increased child home labor frees time for adults to work on the market sphere and thus increase the consumption of household members in market goods and services. Second, the increase in girls' and boys' household work helps maintain the level of production and consumption of home produced goods for the household. As education does not bring immediate well-being to the family, less schooling will not affect the household, but only the child in the long term.

[5] An alternative method to value education consists in using expected wages of skilled workers depending on the estimated number of schooling years necessary to become a skilled worker and the interest rate. A comparison between life time income with more education and life time income from less education can be introduced to influence parents' school/labor decision.

The need for skilled and unskilled wage rates to value girls' and boys' household work and education, but also the lack of data on household work disaggregated by skill level we suppose that adult women and men supply partly skilled and partly unskilled labor on the market. Therefore, once the level of male and female market labor supply determined, we introduce a CET distribution function for each so as to set the level of endogenous female and male labor supply distinguished by skill level; the substitution elasticity is set at a very low level (0,2). We thus preserve four labor markets for each gender by skill level. These four markets clear when the total demand from market production sectors equals the total endogenous supply by the four categories of households. We do not integrate unemployment in the market clearing system as we assume that unemployment time is devoted to home production.

Dynamic model specifications

We use a sequential dynamic model to evaluate long term impacts[6]. In each period, the stock of capital is accumulated using the following equation.

$$KD_{i,t+1} = KD_{i,t}.(1-\xi) + IND_{i,t}$$

ζ is the depreciation rate and IND_i is investment demand by sector of destination. Investment demand is defined following the specification of Bourguignon et al (1989). It is given by the equation below.

$$\frac{IND_{i,t}}{KD_{i,t}} = g1_i\left(\frac{r_{i,t}}{U_t}\right)^2 + g2_i\left(\frac{r_{i,t}}{U_t}\right)$$

Capital accumulation rate (the ratio of investment demand, IND, to capital demand, KD) increases with the ratio of the rate of return, $r_{i,t}$, and its user cost, U_t. the user cost of capital is

[6] Standard dynamic model specifications are based on the approach by Annabi (2004)

as follows: $U_t = PK_t.(ir_t + \xi)$ PK_t being the investment price and, ir, the real interest rate. Other exogenous variables increase yearly with population growth rate (see detailed equations in Appendix)

Model closure

The model is run for 20 periods of time. Capital is sector-specific and exogenously set at the base year level for the first period of time. Labor is fully mobile within all market production sectors. Labor supply is endogenously determined by each household category after taking in consideration constraints related to the supply of unpaid labor needed for home production and leisure time. All commodity markets follow the neoclassical market-clearing system in which each market is cleared when the total endogenous demand equals the total demand through price adjustment. Our numeraire is the nominal exchange rate. World import and export prices are set fixed following the small price-taking economy hypothesis. Current account balance is set in fixed proportions of the GDP so as to prevent increase in foreign debt when the overall economy is contracting. Transfers within institutions, minimum consumption levels and stock are set fixed at the first period and increase yearly at the demographic level in order to maintain distribution per head. Investment is saving driven. Savings are generated in fixed proportions of households' income. Firms' and government's savings are residual. Government current expenditure is set exogenously and increases yearly in order to maintain expenditure per head. Public saving is set at the base year level (domestic debt is thus preserved). To maintain government's budget constraint, we assume that loss of revenue from import taxes is fully recovered by the introduction of a uniform indirect tax rate. This is done through an increase in indirect tax rates by a uniform number of percentage points for all sectors, thus spreading the burden uniformly across sectors. A detailed version of the model equations is provided in the appendix.

Simulations and results

Our CGE model is used in this section to analyze the effects of trade liberalization, simulated as abolition of all import tariffs. South Africa has a moderate level of protection, partly as a result of liberalization programs implemented since 1994 by the Growth, Employment and Redistribution policy (GEAR). The average tariffs rate is 3,36 %. The degree of tariff dispersion is high. Tariffs range from zero in all services sectors to 26 % in the footwear manufacturing sector. Agriculture and mining sectors are protected by import taxes of less than one per cent. The manufacturing sectors are the ones highly protected (9,01 %). Tariffs constitute approximately 3,36 % of total government revenue, while direct and other indirect taxes contribute up to 82,86 % of total government revenue. We first present the short term impacts before outlining the long term trend.

The removal of tariffs in South Africa modifies the relative prices of all goods and services. The impact on households depends on their initial factor endowments and their consumption patterns. Trade liberalization also affects women and men differently. This will depend on the expansion or contraction of sectors with different intensity and concentration levels in female and male labor.

We note that trade liberalization in South Africa seems to increase gender bias (see table A4 in appendix). We observe a reduction in female labor market participation while male labor market participation increases (-0,03% for women and +0,19% for men). It also appears to generate greater gender bias against women with a real wage reduction higher than their male counterparts (-1,86% for women and -1,56% for men). Our results thus indicate that gender inequality in the labor market is likely to increase. This is due to the fact that female workers are concentrated in contracting sectors where value added prices and output

fall resulting in a fall in female labor demand (see tables A1 and A4 in appendix). Given that male workers are highly concentrated in export-intensive sectors that benefit relatively more from fall in input prices, male labor demand increases.

At the household level, we note an increase in gender disparities in "African", "Indian" and "White" households in terms of labor market participation (table 5). Changes in market labor supply come through an adjustment of home labor and leisure time. Men primarily adjust their time by reducing their leisure time and then their household work. In contrast, women adjust their time through changes in domestic work and then by adjusting their leisure time except in "Colored" households. In consequence, trade liberalization seems to reduce gender bias towards women in terms of gender division of domestic work within the household except for the "Colored".

We note that women were able to preserve their leisure time due to the increase in girls' home labor. Indeed, following the higher decrease in gains from education[7] relative to those from home labor[8], parents tend to reduce girls' education time and increase their household work in "African", "Indian" and "White" households. This creates a substitution effect of girls for their mother in home production activities though this effect is enhanced through variation in relative gains from education and home labor. Conversely, given the increase in male skill premium, parents increase boys' education time while reducing their households work load. Gender bias is therefore likely to rise between children in terms of education time in these three population groups. This may cause an intergenerational perpetuation of gender inequalities. In contrast, gender inequalities between children are less likely to increase in "Colored" households. Unlike girls in the three other household categories, girls in "Colored", households benefit from an increase in education even if their

[7] Gains from education are valued by skilled wage rates.

[8] Gains from home labor are valued by unskilled wage rates.

education time increases less that that of boys. We observe a clear substitution of children for parents in "Colored" households. Indeed, given the high labor market participation of adults, they tend to increase significantly girls' and boys' home labor. This substitution effect does not negatively affect girls' and boys' education in "Colored" households but rather their leisure time.

The following sections explain in details the impacts of trade liberalization as it channels through the overall economy following changes in import prices. We then present results from our sensitivity analysis. We finish by presenting the long term trends.

Trade and output effects

When all tariffs are removed, the total volume of imports increases by 1,63 %. Imports increase the most in manufacturing and in particular in previously highly protected sectors. Resulting from the real exchange rate depreciation, exports rise (1,96 %) mainly in male-intensive mining sectors. Variations in exports and domestic sales determine the changes in output. Domestic demand is only marginally offset by increases in exports. Greater exposure to international competition causes domestic market output and prices to fall (-0,15 %). The sectors with the most substantial reduction in local sales are initially highly protected sectors: footwear (-4,24%), other non-metallic mineral products (-2,73%) and electric machinery (-2,57%). The sectors which expand the most are export-intensive sectors like mining sectors (+1,05% for coal, +3,59% for gold and +1,86% for other mining sectors) , the basic iron and steel manufacturing (+0,25%), followed by some services sectors. These sectors benefit from their strong positive export response, the large initial export shares and the large input cost reduction.

Factor effects

We note that factor prices are tied primarily to value added price that drive factor demand. The strong output price reduction caries through to the value added price in highly protected sectors. The other sectors with strong decline in output price have moderate reductions in value added prices as their inputs costs fall even more than output price. Value added price increases only in the mining sector.

Since the assumption is that labor is a mobile factor while capital is sector-specific in the first period, contracting sectors reduce their labor demand while expanding sectors increase their demand. Given that most sectors use large inputs of labor relative to capital, expanding sectors are able to significantly increase their output in response to price changes while contracting sectors reduce their labor demand by a higher rate than that of their output. Total labor demand increases because expanding sectors are able to absorb all the additional labor coming from contracting sectors.

Female employments falls slightly in aggregate while male labor demand increases (-0,03% and +0,19%). This is due to the fact that male workers are intensively used in expanding sectors. In contrast, female workers are more concentrated in textiles and certain services sectors (trade, health and social work and other services sectors) where value added price and production fall.

We observe that skilled female labor increases along with skilled and unskilled male labor demand while demand for unskilled female labor falls due to differences in sectoral labor intensity by skill and gender. We note that unskilled female wages (-1,63%) decrease less than skilled female wages (-1,97%). This is going to influence parents' perception of gains from education and those from home labor in their time allocation decision for girls in the household as we will see in the following paragraphs, parents will tend to reduce girls' education time given the relative decrease in education gains. In contrast, skilled male wages

(-1,27%) declines less that unskilled male wages (-2,08%). Parents' will tend to allocate more time for boys' education.

The reallocation of labor from manufacturing to the other sectors comes through the decrease in wages. In aggregate, female wages decline more then male wages (-1,86 % and -1,51%). Skilled male wages fall more that skilled female wages, while unskilled female wage rates decline less that unskilled male wage rates.

Capital is assumed to be sector-specific in the first period. As a result, changes in rates of return to capital closely follow changes in value added price. These rates fall significantly more in the three highly protected sectors. Conversely, rates of return to capital rise in all expanding mining sectors. Aggregate rates of return to capital fall (-1,89 %) affecting mainly firms as it generates over 80 percent of their total income.

Income and consumption effects

Factor price changes affect households' income depending on their endowments in each type of factor. Following the reduction in wage rates, all households see their gross income decrease, the reduction being higher for "Colored" and "Indian" households followed by "White" then "Black" ones (Table 4).

Table 4- Income, consumer price and welfare effects

	African	Colored	Indian	White
Household income	-1,11	-1,31	-1,26	-1,23
Household savings	-1,12	-1,90	-1,36	-1,27
Consummer price index	-0,94	-0,88	-1,02	-1,05
Consumption or market G&S	-0,18	-1,05	-0,33	-0,21
Consumption of home produced G&S	0,19	-1,24	-0,07	0,11
Changes in welfare (EV)	1,29	-2,31	-0,57	-1,73

Trade liberalization resulted in a decrease in domestic and import prices but average decrease of market prices does not allow an increase in households' real income. Households are thus constrained to reduce their consumption of market goods and services. The decrease in consumption is higher in "Colored" households, followed by "Indian", "White" and

"Black". Consumption in home produced goods also declines for "Colored" and "Indian" households while it increases for the "African" and "White". We note an improvement in welfare for "African" households while tariff reduction results in a welfare loss for the three other households, in particular for the "Colored".

Time allocation effects

Households respond to changes in real wage rates for female and male workers by adjusting their market and home labor supplies and leisure time differently depending on their labor endowments by skill and gender and their consumption pattern. Table 5 illustrates how households adjusted their time allocation following trade liberalization.

Table 5- Time allocation effects

Households	Girls' home labor	Girls' education	Female domestic Labor supply	Female market labor supply	Skilled female labor supply	Unskilled female labor supply	Aggregate female domestic labor
African	0,05	-0,65	0,27	-1,50	-1,53	-1,46	0,20
Colored	2,49	1,77	-2,10	7,36	7,34	7,41	-1,22
Indian	0,42	-0,28	-0,15	0,14	0,12	0,18	-0,05
White	0,09	-0,61	0,16	-0,40	-0,42	-0,35	0,15
Households	Boys' home labor	Boys' education	Male domestic Labor supply	Male market labor supply	Skilled male labor supply	Unskilled male labor supply	Aggregate male domestic labor
African	-1,26	0,38	0,47	-0,38	-0,32	-0,49	0,17
Colored	3,10	4,81	-2,37	3,17	3,23	3,06	-1,29
Indian	-0,67	0,98	-0,04	0,24	0,29	0,13	-0,13
White	-0,95	0,70	0,25	0,03	0,08	-0,09	0,03

At each period, market labor supply is endogenously determined by each household category depending on market wages, the need for home produced goods and services, labor demand from market production sectors (the overall economic performance) and finally the need for leisure (to maximize household utility).

"African" and "White" households reduce their labor market participation for women (-1,50% and -0,40%) following the fall in real wages. "Colored" and "Indian" households, on the other hand, increase their labor market participation for women (+7,36% and +0,14%) and

men (+3,17% and +0,24%) due to a greater fall in their real income. Increase in labor market participation is higher for women in "Colored" households while men increase relatively more their market labor supply in 'Indian" households. While male labor market participation slightly increases in "White" households (+0,03%), female market labor supply falls (-0,40%). "African" households reduce their male labor supply but in a lower proportion compared to the reduction in female labor supply (-1,50% for women and -0,38% for men).

Gender bias is therefore believed to increase in "African", "Indian" and "white" households while it decreases in Colored households in terms of labor market participation. Moreover, given the higher reduction in female wages, this is likely to diminish women's contribution to the household income and thus reduce their bargaining power within the household[9] even if female labor market participation increased in "Colored" and "Indian" households.

Given rigidities in home production activities[10], the adjustment to changes in labor market participation is achieved primarily through changes in leisure time. Following the increase in their market labor supply, male workers in "Colored" and "Indian" households adjust their time by reducing their leisure time and then non-market work (-2,37% and -0,04% for non-market work). Men in "White" households reduce their leisure time and increase their household work (+0,25%) even if they have a greater participation in the labor market (+0,03%). "Black" households, having reduced their market labor supply (-0,36%), men increase proportionately more their domestic work (+0,47%) at the expense of their leisure time.

In contrast, women in "African", "Indian" and "White" households tend to adjust their non-market time by reducing proportionately more (or increasing less) their home labor to

[9] Though this is not modeled in this paper

[10] Low substitution elasticity between male and female home labor

benefit more from leisure time (Table 5). Women in "Colored" households however, tend to lose leisure time given that the reduction in their home labor (-2,10%) is proportionately less than the increase in their market labor supply (+7,36%).

We note that men increase their household work (+0,47%) more than women (+0,27%) in "African" households even if women's labor market participation declined relatively more (-1,50% for women and -0,38% for men). In "Colored" households, the increase in labor market participation results in a reduction of domestic work and leisure both for men and women, though women's leisure time decreases more. In "Indian" households, women increase their labor market participation through an equivalent reduction in their home labor while men adjust their non market time by reducing relatively more their leisure (Table 5). Finally, in "White" households, women increase their domestic labor proportionately less than the reduction in their market labor supply, thus increasing their leisure time. In contrast, men increase their labor market participation but also increase their domestic work through the reduction of their leisure time. Trade liberalization seems to reduce gender bias towards women in terms of gender division of domestic work except for the "Colored". Trade liberalization seems to increase men's work load while diminishing women's in "African", "Indian" and "White" households. As we will show in the next paragraph, this is due to the substitution of girls for women in terms of home labor.

Child time allocation

Following the greater decline in skilled female wages (-1,97%) relative to unskilled ones (-1,63%), parents tend to reduce girls' education time and increase their household work in "African", "Indian" and "White" households (Table 5 and Table A5). Conversely, given that skilled male wage rates fall less (-1,27%) than unskilled male wages (-2,08%), parents increase boys' education time while reducing their households work load (Table 5 and Table A5). Gender bias is therefore likely to rise between children in terms of education time in

these three population groups. In contrast, gender inequalities between children are less likely to increase in "Colored" households. Unlike girls in the three other household categories, girls in "Colored" households benefit from an increase in education (+1,77%) even if their education time increases less that that of boys (+4,81%). However, both girls and boys increase significantly their domestic work (+2,49% for girls and +3,10% for boys) resulting in a reduction in leisure time. On the one hand, given that adults' market labor increases considerably in "Colored" households, they adjust their non market time through a reduction in their own leisure and then in their domestic work. On the other hand, they also substitute children for parents in household production activities in order to preserve a certain level of welfare for the family.

We clearly observe a substitution effect of children for parents in "Colored" households. Given the significant increase in adult male and female market labor supply (+3,17% and +7,36%), some of the household production activity is maintained through the increase in girls' and boy's home labor. Even if relative gains from education and home labor vary in the same proportions for all household categories, parent's school/home labor decision is different in "Colored" households. Girls' home labor increases significantly more in "Colored" households (+2,49%) than in the three other (+0,05% for African, +0,42% for Indian and +0,09% for Whites). Boys' home labor increases in "Colored" households (+3,10%) while home labor diminishes for boys' in "African" (-1,26%), "Indian" (-0,67%) and "White" (-0,95%) households following changes in relative gains from education and home labor. Nonetheless, this direct substitution effect does not negatively affect children's education in "Colored" households (+1,77% for girls and +4,48% for boys). Instead, parents' tend to adjust children's time through a reduction in pure leisure time.

A certain substitution effect also takes place in "African", "Indian" and "White" households. However, it is important to note that this effect is mainly related to changes in

relative gains from education and home labor for children. Indeed, the increase in girls' home labor frees some time for adult women in "African", "Indian" and "White". In contrast, the reduction in boys' home labor explains why men are forced to adjust their non market time through a greater reduction in their pure leisure time.

Seemingly, the substitution of children for parents is a result of changes in relative gains from education and home labor. However, when adults' labor market participation is high, as it is the case of "Colored" households, there is a pure substitution effect of children for parents in home production activities.

At the household level, we note that trade liberalization results in a reduction in real income and consumption of marketed goods and services in all households[11] though more for the "Colored" followed by the 'Indians", the "White" and finally the "African" households. Consumption in home produced goods and services increases however for "African" and "White" households except colored ones[12]. In "Colored" households, even if parents reduce less their home production and increase girls' and boys' domestic work significantly, it is not sufficient to maintain their initial level of non market goods consumption. In "Indian" households, the increase in girls' domestic work is not high enough to compensate the loss of domestic work of adults and boys.

Overall, we note that the trade liberalization shock resulted in a reallocation of all household members' time illustrating that changes at the market level are likely to affect the household economy. Overall intra-household gender inequalities rise not only between adults but also between children. Boys benefit from an increase in education time while parents substitute girls' education time for home labor. As male labor market participation increases, men continue to perform relatively less domestic work and, contribute more to household

[11] This is partly related to the introduction of compensatory indirect tax which result in a slight increase in prices.

[12] This is also due to the increase in girls' home labor following the fall in returns to their schooling.

income. This is likely to reduce women's bargaining power in the household. Women are still affected by heavy time burden given that when it is not adult women who increase their home labor, the gap is filled through the increase in girls' participation in home production activities. The biggest winners in terms of increased labor market participation are men in "Colored", "Indian" and "White" households and women in "Colored", "Indian" ones. However, they only represent a minority given that the "Africans" represent over 80 percent of South African population. In consequence, inter-household (inter racial) inequalities are likely to rise.

Long term impacts of trade liberalization

Over a period of twenty years, the negative impacts of trade on the overall economy seem to diminish. Sectors demand for female labor increases slightly while aggregate male labor demand increases relatively more than in the short term (Tables A6 in appendix). Households' real income and consumption decrease more in the long term (Table A7 in appendix).

Time allocation for adults follows the same trend as in the short term (Table 6 below). Female and male market labor supply diminishes less in "African" and "White" households in the long terms. Female and male market participation increases relatively more in "Indian" households in the long run and increases for female workers are higher for women. In "Colored" households, market labor supply increases less for both male and female workers in the long run. Overall, gender disparities are believed to narrow within "Colored" households given that female labor supply increases more than male labor. In contrast, gender disparities are likely to widen in the other three households as market labor supply decreases more for women relative to men in the long run.

Table 6- Long term impacts on adult time allocation (%)

	Period 1	Period 5	Period 10	Period 15	Period 20
Female market labor supply					
African	-1,50	-1,44	-1,40	-1,38	-1,39
Colored	7,36	6,89	6,42	6,05	5,74
Indian	0,14	0,16	0,19	0,22	0,24
White	-0,40	-0,32	-0,25	-0,21	-0,18
Male market labor supply					
African	-0,38	-0,30	-0,23	-0,17	-0,12
Colored	3,17	3,10	3,02	2,95	2,90
Indian	0,24	0,27	0,29	0,31	0,33
White	0,03	0,09	0,14	0,17	0,20
Female domestic labor					
African	0,27	0,25	0,24	0,23	0,22
Colored	-2,10	-2,15	-2,25	-2,38	-2,55
Indian	-0,15	-0,17	-0,19	-0,21	-0,23
White	0,16	0,10	0,05	0,02	-0,01
Male domestic labor					
African	0,47	0,42	0,37	0,34	0,31
Colored	-2,37	-2,43	-2,52	-2,63	-2,77
Indian	-0,04	-0,08	-0,12	-0,15	-0,18
White	0,25	0,15	0,06	0,01	-0,03

Adults adjust their non market time following changes in wages, but also based on their time constraint and according to changes in children's home labor. Increase in market labor supply both for men and women is achieved though the reduction in leisure time and then domestic labor. Reduced labor market participation for women in "African" and "White" households is not followed by a proportionate increase in their home labor just like in the short run. Indeed, girls' participation in home production activities is even higher in the long run (Figures 2, 3 4 and 5 and Table A8 in appendix). In contrast, boys' household work diminishes less in the long run. This allows men in "Colored", "Indian" and "White" households to reduce slightly more their household work and gain a certain level of leisure time in the long run.

The substitution of children for parents in "Colored" households enables parents to increase less their market labor supply in the long turn while they reduce their household work relatively more than in the short term (Table 6).

The division of home labor between men and women is more equitable in "African", "Indian" and "White" households in the long term but only through the increase in the contribution of young girls. Moreover, boys' domestic labor diminished less in the long run. Nevertheless, consumption in home produced goods declines in all households except for the

Africans in the long run. Consumption in marketed goods and services also declines more for all household categories. In the long run, all households see their well being reduced (Table A7 in appendix).

Figure 2, 3, 4 and 5 show the long term trend in girls' and boys' education and home labor time. We note that education time (EDboy and EDgirl) varies in an opposite trend compared to absolute variations in home labor time (LZboy and LZgirl) except for "Colored" households.

In figure 1, we can see that boys' education time increases more in the long run while their home labor diminishes more over time in "African" households. In contrast, Girls' education time diminishes significantly in the long run while their home labor time increases slightly. Increase in home labor time is lower than the reduction in education time for girls indicating that girls in "African" households may benefit from more leisure time. In contrast, boys' education time increases more than the reduction in their home labor, resulting in a loss of leisure time in the long run.

Figure 2- Girls' and boys' time allocation in "African" households (variation in absolute value over 20 years)

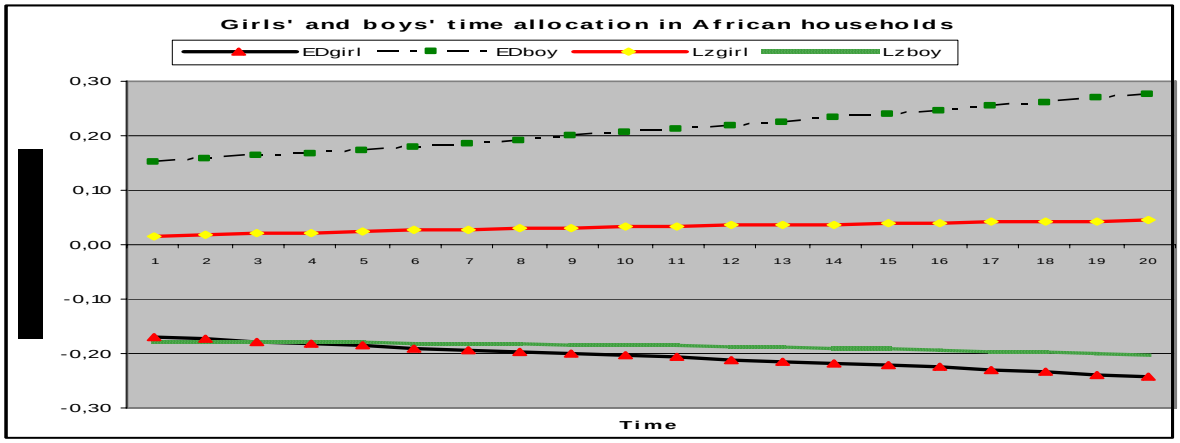
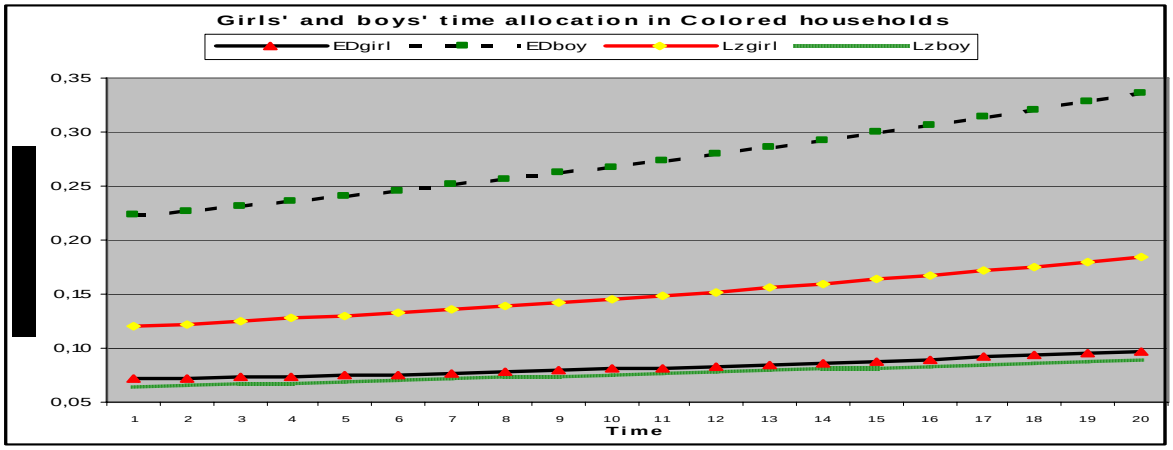


Figure 3 show the evolution of girls' and boys' education and home labor time in "Colored" households. Unlike other households, children's education and home labor time increase significantly in the long run in "Colored" households. Boys' education increases more than that of girls. Both girls and boys increase their home labor in the long run but the

absolute variation is greater for girls. Given the higher increase in home labor and education, children in "Colored" households their leisure time is more reduced.

Figure 3- Girls' and boys' time allocation in "Colored" households (variation in absolute value over 20 years)



In "Indian" households, figure 4 shows the same trend as in "African" households. Boys' education time increases more and more over a period of twenty years but their home labor diminishes relatively less. Girls' education time diminishes but in lower proportions than the increase in their home labor. This indicates a loss in leisure time both for girls and boys.

Figure 4- Girls' and boys' time allocation in "Indian" households (variation in absolute value over 20 years)

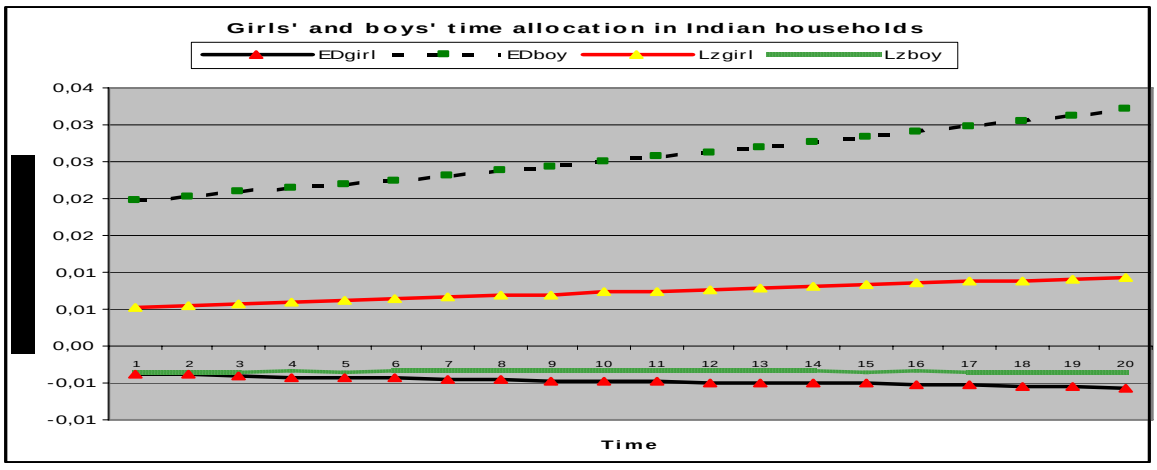
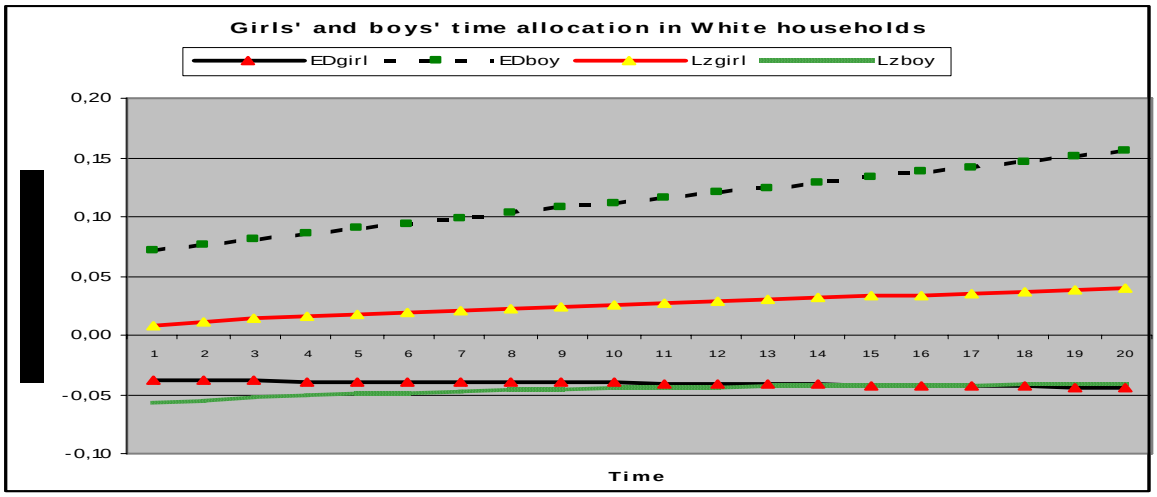


Figure 5 shows that while girls' home labor increases over time, their education time falls relatively less resulting in a slight increase in leisure time. As for boys in "White"

households, their education time increases significantly more in the long run while their home labor diminishes less resulting in a loss in leisure time.

Figure 5- Girls' and boys' time allocation in "White" households (variation in absolute value over 20 years)



The increase in girls' home labor and boys' education results in a reduction in their leisure time in most households over a period of twenty years. Girls' education time diminishes in the long run except for those in "Colored" households while boys' education increases relatively more in the long run. Girls, deprived of more education, hence less human capital accumulation, may have relatively less employment opportunities compared to boys. The widening gender inequality between boys and girls is maintained in the long run confirming an intergenerational perpetuation of gender bias against women.

Alternative substitution elasticity values

We now run the same model by increasing the substitution elasticity between education and household labor time for children. We increase it from 2 to 6 in order to increase the impact of changes in relative gains from schooling and home labor on child time allocation between education and household work. This will allow us to check if the substitution of girls for adult women is significant in our model. Given the increase in the substitution elasticity, changes in gains from schooling and home labor result in a higher

reduction of education time for girls while boys' education time increases more. As a consequence, adult women can benefit a little bit more from girls' increased domestic labor either to increase even more their labor market participation in "Colored" and "Indian" households or to increase their leisure time in "African" and "White" households. In contrast, given the relatively high reduction in boys' contribution to aggregate male home labor, adult men are forced to reduce even more their leisure time. This alternative scenario confirms the existence and importance of the substitution effect in the changes in women's and men's market labor supply, household work load and leisure time.

We also test the model sensitivity by running it with a substitution elasticity of 0,9 on the market and 0,7 at the household level between female and male labor instead of the initial value of 0,5. The overall trend remains unchanged but we note that market production sectors tend to substitute more easily female for male workers. As a consequence, labor demand for women increases while it was declining in the original scenario and male labor demand increases less. Time allocation process remains unchanged. Parents' decision in terms of decision between education and household work for children remains the same. Boys benefit from more education time while girls increase their household work at the expense of their schooling. This shows that that initial shares are the most important and that changes in substitution elasticity values do not affect significantly simulation results. It also demonstrates the robustness of our model.

Conclusion

Our policy simulation evaluated the impacts of fiscal policy through the elimination of all import tariffs along with a compensatory increase in indirect taxes. We first observe that trade liberalization penalizes the initially highly protected sectors and favors export-intensive

and input-intensive sectors. Wage rates and returns to capital decrease. Though the general level of prices decreases with depreciation of trade balance, the reduction is not significant enough to raise real wages and average return to capital. Households reduce their consumption in marketed goods and services. “Colored” households emerge as the most negatively affected.

We note that trade liberalization in South Africa seems to increase gender bias. We observe a slight reduction in female labor market participation while male labor market participation increases. It also appears to generate greater gender bias against women with a real wage reduction higher than their male counterparts. Our results thus indicate that gender inequality in the labor market is likely to increase.

At the household level, we note an increase in gender disparities in “African”, “Indian” and “White” households in terms of labor market participation. In contrast, female labor market participation increases significantly more than that of men in “Colored” households. Changes in market labor supply come through an adjustment of home labor and leisure time. Men primarily adjust their time by reducing their leisure time and then their household work. In contrast, women adjust their time through changes in domestic work and then by adjusting their leisure time except in “Colored” households.

Gender bias is likely to rise between children in terms of education time in “African”, “Indian” and “White” households. This may cause an intergenerational perpetuation of gender inequalities. In contrast, gender inequalities between children are less likely to increase in “Colored” households even if girls’ education time increases less that that of boys. Child time allocation results in a reduction of children’s leisure time. Girls, deprived from education, are likely to become less skilled workers while boys, benefiting from more education time, have a better chance of becoming skilled workers. The existing gender inequality in terms of wages is likely to be maintained to the next generation.

We note that women were able to benefit from greater leisure time due to the increase in girls' home labor. In contrast, following the decrease in boys' home labor, adult men increase their market labor supply by first reducing their leisure time and then their household work. Our results show that trade liberalization affects not only adults' time allocation but also children's. Parents' decision concerning schooling, home labor and leisure is directly affected through changes in future gains from education relative to home labor. Furthermore, changes in children's home labor affect parents' time allocation through direct substitution effects of children for adults in household production activities. The substitution of children for parents is mainly a result of changes in relative gains from education and home labor. However, when adults' labor market participation is high, there is a pure substitution effect of children for parents in home production activities.

In conclusion, trade liberalization results in a reduction of gender inequality within a minority of households. Intra household gender based inequalities rise. Inter household inequalities also increase. Furthermore, there is an intergenerational perpetuation of gender inequalities in terms of education time.

Domestic work is rarely measured and often invisible to researchers and policy makers. Furthermore, it is universally accepted by society that children perform household work. Nevertheless, our findings reveal that the burden of domestic work is carried-out disproportionately by girls at the expense of their schooling, thus their human capital accumulation. Policy makers should therefore take interrelations and feedbacks between market and household economies into consideration because they are not only likely to affect and be affected by the division of labor within the household between men and women, but also between adults and children. Investment in time-saving goods and services may be one way to fight against gender disparities in terms of education. A gender-aware and time-use

based approach to policy making is therefore necessary in order to consider the diverse implications of gender relations and reduce child poverty.

References

Admassie, A. (2003), « Child labour and schooling in the context of subsistence rural economy: can they be compatible? », *International Journal of Educational Development*, 23 (2003) 167-185

Amin, S., Quayes, S., Rives, J.M. (2006), "Market work and household work as deterrents to schooling in Bangladesh", *World Development*, Vol. 34, No. 7, pp. 1271-1286.

Annabi, N., Cockburn, J. and Decaluwé, B. (2004), A dynamic sequential CGE model for poverty analysis, paper prepared for MPIA training workshop in Dakar, PEP Network

Baland, J-M, Robinson, J.A. (2000), "Is child labour inefficient?" *Journal of Political Economy,* vol. 108, no. 4

Beneria, L. (1995), "Toward a greater integration of gender in economics", *World Development*, Vol. 23, No. 11, pp. 1839-1850

Çagatay, N. (2003), « Engendering macro-economics », in Martha Gutiérrez (ed.), *Macro-economics: Making gender matter – Concepts, policies and institutional change in developing countries*, London/New York, pp. 22-41

Decaluwé, B., Martens, A., Savard, L. (2001), *La politique économique du développement et les modèles d'équilibre général calculable*, AUF, Les Presses de l'Université de Montréal

Edmonds, E.V. (2005), "Child labor and schooling responses to anticipated income in South Africa", *Journal of development economics*, 81 (2006) 386– 414

Edmonds, E.V. (2008), Child labor, *Handbook of Development Economics*, Volume 4, Chapter 57

Elson, D. (1995), « Gender Awareness in Modeling Structural Adjustment », *World Development,* Vol. 23, No. 1 I, pp. 1851-1868

Elson, D. (1999), « Labor Markets as Gendered Institutions: Equality, Efficiency and Empowerment Issues », *World Development*, Vol. 27, No. 3, pp. 611-627

Evers, B. (2003), « Broadening the foundations of macro-economic models through a gender approach : new developments », in Martha Gutiérrez (ed.), *Macro-economics: Making gender matter – Concepts, policies and institutional change in developing countries*, London/New York, pp. 3-21

Floro, M.S. (1995), « Economic restructuring, gender and the allocation of time », *World Development,* Vol. 23, No. 11, pp. 1913-1929

Fofana, I., Cockburn, J., Decaluwe, B. (2005), *Developing country superwomen: impacts of trade liberalisation on female market and domestic work*, Cahier de Recherche/Working Paper 05-19, Centre Interuniversitaire sur le Risque, les Ploitiques Economiques et l'Emploi (CIRPEE)

Fontana, M. (2004), "Modelling the effects of trade on women, at work and at home: comparative perspectives", *Economie Internationale*, 99 (2004), P. 49-80

Fontana, M., Wood, A. (2000), "Modelling the effects of trade on women, at work and at home", *World Development*, Vol 28, No. 7, pp. 1173-1190

Heady, C. (2003), "The effect of child labor on learning achievement", *World Development*, Vol. 31, No. 2, pp. 385-398

International Labour Organisation (2004), *Child Labour*, A textbook for university students, International Programme on the Elimination of Child Labour

Kane, E. (2004), *Girl's education in Africa - What do we know about strategies that work?*, African Region Human Development Working Paper Series, World Bank: African Region

Kruger, D.I. (2006), "Coffee production effects on child labor and schooling in rural Brazil", *Journal of Development Economics*, DEVEC – 01222

Palmer I. (1995), « Public Finance from A Gender Perspective » *World Development,* Vol. 23, No. 11, pp. 1981-1986

Statistics South Africa (1999), *Survey of activities of young people in South Africa*, Country report on children's work-related activities, Department of Labour

Statistics South Africa (2000), *Child labour in South Africa, Tables*, Survey of activities of young people, 1999, Department of Labour

Statistics South Africa (2001), *How South African women and men spend their time, A Survey of time use,* by Budlender, D., Chobokoane, N. and Y., Mpetsheni

Duryea, S., Arends-Kuenning, M. (2003), "School Attendance, Child Labor and Local Labor Market Fluctuations in Urban Brazil", *World Development* Vol. 31, No. 7, pp. 1165–1178

Duryea, S., Lam, D., Levison, D. (2007), "Effects of economic shocks on children's employment

and schooling in Brazil", *Journal of Development Economics* 84 (2007) 188–214

Shafiq, M.N. (2007), "Household schooling and child labor decisions in rural Bangladesh", *Journal of Asian Economics* 18 (2007) 946–966

Katz, E.G. (1995), "Gender and Trade within the Household: Observations from Rural Guatemala" *World Development,* Vol. 23, No. 2, pp. 321-342

Appendix

SETS

$i = j$ sectors and/or commodities, $m \in i$ import commodities and sectors, $nm \in i$ non import commodities and sectors

$x \in i$ export commodities and sectors, $nx \in i$ non export commodities and sectors, $h = hh$ households: african, colored, indian white

$ins = inst$ institutions: firms, government, rest of the world, $pub \in i$ government sector, $npub \in i$ non government sectors

$t = time$

Optimization process

The household utility function is an extended linear expenditure system from which are derived household demand functions subject to a full income constraint. Household utility is based on the consumption of home produced goods (C^Z), marketed goods (C^m), and leisure time for men (L^{mal}), women (L^{fem}), boys (L^{boy}) and girls (L^{girl}).

$$U_h = \prod_i \left(C_{i,h} - C\_min_{i,h} \right)^{\gamma_{i,h}} \bullet \left(CZ_h - CZ\_min_h \right)^{ZETAhom_h} \bullet \left(Lmal_h - Lmal\_min_h \right)^{ZETAmal_h}$$
$$\bullet \left(Lfem_h - Lfem\_min_h \right)^{ZETAfem_h} \bullet \left(Lgirl_h - Lgirl\_min_h \right)^{ZETAgirl_h} \bullet \left(Lboy_h - Lboy\_min_h \right)^{ZETAboy_h}$$

With

$$\sum_i \gamma_{i,h} + ZETAhom_h + ZETAfem_h + ZETAmal_h + ZETAgirl_h + ZETAboy_h = 1$$

L and Lmin represent the total and minimal levels of leisure consumed by household members. C and Cmin are the total and minimal levels of consumption of market goods and services and γ and ZETA are the marginal budget shares that determine the allocation of households' supernumerary income between market goods, non market home produced goods and leisure. Adult male and female and girls' and boys' leisure, market goods and non market goods are imperfect substitutes. Households maximize their utility under the following constraints.

Budget constraint

$$\sum_{i=1}^{27} PC_i . C_{i,h} = CTH_h = R_h + hwmal_h . LSmal_h + hwfem_h . LSfem_h$$

CTH is the net income (used for consumption of market goods), R is non-labor income, hwmal and hwfem are the wage rates (differentiated by household depending on the shares in sectoral return to labor), LS are market work time for women and men and PC is market commodity price.

Adult time constraint

$$MAXHOUR\_mal_h = LSmal_h + LZmal_h + Lmal_h$$

$$MAXHOUR\_fem_h = LSfem_h + LZfem_h + Lfem_h$$

MAXHOUR is the total time endowment of adult women and men in household h. LZmal and LZfem are adult male and female labor used in non market home production.

Child time constraint

$$TT\_girl_h = Lgirl_h + MAXHOUR\_girl_h$$
$$MAXHOUR\_girl_h = EDgirl_h + LZgirl_h$$

$$TT\_boy_h = Lboy_h + MAXHOUR\_boy_h$$
$$MAXHOUR\_boy_h = EDboy_h + LZboy_h$$

TT is the total time endowment of girls and boys in household h. MAXHOUR is the time devoted to education and household work for girls and boys. ED is education time and LZ is household work time.

Non-market household production technology

$$Z_h = A\_zlab_h\left[\alpha\_zlab_h.LZwom_h^{-\rho\_zlab_h} + (1-\alpha\_zlab_h)LZmen_h^{-\rho\_zlab_h}\right]^{\left(\frac{-1}{\rho\_zlab_h}\right)}$$

Z is a CES function where LZwom and LZmen are composite (adult and child) male and female labor used in home production.

Households' constraint expressed in terms of full income (FY)

$$\sum_{i=1}^{27} PC_i.C_{i,h} + P\_hom_h.CZ_h + hwfem_h.Lfem_h + hwmal_h.Lmal_h$$
$$+ wmaxg_h.Lgirl_h + wmaxb_h.Lboy_h = FY_h$$

With

$$P\_\mathrm{hom}_h.CZ_h = wwom_h.LZwom_h + wmen_h.LZmen_h$$

$$CZ_h = Z_h$$

$$FY_h = R_h + hwmal_h.MAXHOUR\_mal_h + hwfem_h.MAXHOUR\_fem_h$$
$$+ wboy_h.LZboy_h + wmaxb_h.[TT\_boy_h\text{-}MAXHOUR\_boy_h]$$
$$+ wgirl_h.LZgirl_h + wmaxg_h.[TT\_girl_h\text{-}MAXHOUR\_girl_h]$$

P_hom and CZ are the price and volume of home produced goods and services. Wwom and wmen are composite male and female home wage rates. Wboy and wgirl are the values of boys' and girls' home labor. Wmax is the average value of girls' and boys' time.

The following demand function can be derived from utility maximization under the full income constraint

Consumption demand of market goods and services

$$C_{i,h,t} = C\_min_{i,h,t} + \frac{\gamma_{i,h}\left(CTH_{h,t} - \sum_{j=1}^{27} C\_min_{j,h,t} PC_{j,t}\right)}{PC_{i,t}\underbrace{\left(1 - ZETAfem_h - ZETAmal_h - ZETAhom_h - ZETAgirl_h - ZETAboy_h\right)}_{1 - ZETA\_TOTAL_h}}$$

With

$$C\_min_{i,h} = C_{i,h} - \frac{\gamma_{i,h}}{PC_i\left(1 - ZETA\_TOTAL_h\right)}\left(\frac{CTH_h}{FRISCH_h}\right)$$

And

$$\gamma_{i,h} = \frac{PC_i C_{i,h}\left(1 - ZETA - TOTAL_h\right)YELAS_{i,h}}{CTH_h}$$

Consumption demand of non-market home produced goods and services

$$CZ_{h,t} = CZ\_min_{h,t} + \frac{ZETA\_hom_h\left(CTH_{h,t} - \sum_{j=1}^{27} C\_min_{j,h,t} PC_{j,t}\right)}{P\_hom_{h,t}\left(1 - ZETA\_TOTAL_h\right)}$$

With

$$CZ\_\min_h = \left(1 - \psi\_\hom_h\right)CZ_h$$

Male and female market labor supply

$$LSfem_{h,t} = MAXHOUR\_fem_{h,t} - LZfem_{h,t} - \frac{ZETAfem_h\left(CTH_{h,t} - \sum_{j=1}^{27} C\_min_{j,h,t} PC_{j,t}\right)}{hwfem_{h,t}\left(1 - ZETA\_TOTAL_h\right)}$$

$$LSmal_{h,t} = MAXHOUR\_mal_{h,t} - LZmal_{h,t} - \frac{ZETAmal_h\left(CTH_{h,t} - \sum_{j=1}^{27} C\_min_{j,h,t} PC_{j,t}\right)}{hwmal_{h,t}\left(1 - ZETA\_TOTAL_h\right)}$$

The household non market production function (CES function)

$$Z_{h,t} = A\_zlab_h\left[\alpha\_zlab_h . LZwom_{h,t}^{-\rho\_zlab_h} + \left(1 - \alpha\_zlab_h\right)LZmen_{h,t}^{-\rho\_zlab_h}\right]^{\left(\frac{-1}{\rho\_zlab_h}\right)}$$

$$\frac{LZwom_{h,t}}{LZmen_{h,t}} = \left(\frac{\alpha\_zlab_h}{1 - \alpha\_zlab_h}\right)^{\delta\_zlab_h}\left(\frac{wmen_{h,t}}{wwom_{h,t}}\right)^{\delta\_zlab_h}$$

Value of home produced goods

$$P\_hom_{h,t} = \frac{wwom_{h,t} . LZwom_{h,t} + wmen_{h,t} . LZmen_{h,t}}{CZ_{h,t}}$$

The household entirely consumes the non market goods and services it produces

$$CZ_h = Z_h$$

Adult female and male household work supply

$$hwfem_{h,t}.LZfem_{h,t} = wwom_{h,t}.LZwom_{h,t} - wgirl_{h,t}.LZgirl_{h,t}$$
$$hwmal_{h,t}.LZmal_{h,t} = wmen_{h,t}.LZmen_{h,t} - wboy_{h,t}.LZboy_{h,t}$$

Girls' and boys' education, household work and leisure derived based on their time constraint (CET function)

$$MAXHOUR\_girl_{h,t} = B\_g_h\left[\beta\_g_h.EDgirl_{h,t}^{\kappa\_g_h} + \left(1-\beta\_g_h\right)LZgirl_{h,t}^{\kappa\_g_h}\right]^{\left(\frac{1}{\kappa\_g_h}\right)}$$
$$\frac{EDgirl_{h,t}}{LZgirl_{h,t}} = \left(\frac{Pedug_{h,t}}{wgirl_{h,t}}\right)^{\tau\_g_h}\left(\frac{1-\beta\_g_h}{\beta\_g_h}\right)^{\tau\_g_h}$$

$$MAXHOUR\_boy_{h,t} = B\_b_h\left[\beta\_b_h.EDboy_{h,t}^{\kappa\_b_h} + \left(1-\beta\_b_h\right)LZboy_{h,t}^{\kappa\_b_h}\right]^{\left(\frac{1}{\kappa\_b_h}\right)}$$
$$\frac{EDboy_{h,t}}{LZboy_{h,t}} = \left(\frac{Pedub_{h,t}}{wboy_{h,t}}\right)^{\tau\_b_h}\left(\frac{1-\beta\_b_h}{\beta\_b_h}\right)^{\tau\_b_h}$$

Time for education and household work for girls and boys

$$MAXHOUR\_girl_{h,t} = TT\_girl_{h,t} - \frac{ZETAgirl_h\left(CTH_{h,t} - \sum_{j=1}^{27} C\_min_{j,h,t}PC_{j,t}\right)}{wmaxg_{h,t}\left(1-ZETA\_TOTAL_h\right)}$$

$$MAXHOUR\_boy_{h,t} = TT\_boy_{h,t} - \frac{ZETAboy_h\left(CTH_{h,t} - \sum_{j=1}^{27} C\_min_{j,h,t}PC_{j,t}\right)}{wmaxb_{h,t}\left(1-ZETA\_TOTAL_h\right)}$$

Model equations

SETS

i = j sectors and/or commodities, $m \in i$ import commodities and sectors, $nm \in i$ non import commodities and sectors

$x \in i$ export commodities and sectors, $nx \in i$ non export commodities and sectors, h = hh households: african, colored, indian white

ins = inst institutions: firms, government, rest of the world, $pub \in i$ government sector, $npub \in i$ non government sectors

t = time

Production

$XS_{j,t} = \frac{VA_{j,t}}{V_j}; \frac{CI_{i,t}}{io_i}$	$CI_{i,t} = io_i VA_{i,t} / v_i$
$DI_{i,j,t} = aij_{i,j} CI_{j,t}$	$VA_{i,t} = A\_kl_i \left[\alpha\_kl_i . LD_{i,t}^{-\rho\_kl_i} + \left(1-\alpha\_kl_i\right) KD_{i,t}^{-\rho\_kl_i} \right]^{\left(\frac{-1}{\rho\_kl_i}\right)}$
$LD_{i,t} = \left(\frac{\alpha\_kl_i}{1-\alpha\_kl_i}\right)^{\delta\_kl_i} \left(\frac{r_{i,t}}{w_{i,t}}\right)^{\delta\_kl_i} KD_{i,t}$	$LD_{i,t} = A\_g_i \left[\alpha\_g_i . LDfem_{i,t}^{-\rho\_g_i} + \left(1-\alpha\_g_i\right) LDmal_{i,t}^{-\rho\_g_i} \right]^{\left(\frac{-1}{\rho\_g_i}\right)}$
$LDfem_{i,t} = \left(\frac{\alpha\_g_i}{1-\alpha\_g_i}\right)^{\delta\_g_i} \left(\frac{wmal_{i,t}}{wfem_{i,t}}\right)^{\delta\_g_i} LDmal_{i,t}$	$LDfem_{i,t} = A\_fq_i \left[\alpha\_fq_i . LDfemq_{i,t}^{-\rho\_fq_i} + \left(1-\alpha\_fq_i\right) LDfemnq_{i,t}^{-\rho\_fq_i} \right]^{\left(\frac{-1}{\rho\_fq_i}\right)}$
$LDfemq_{i,t} = \left(\frac{\alpha\_fq_i}{1-\alpha\_fq_i}\right)^{\delta\_fq_i} \left(\frac{wfemnq_t}{wfemq_t}\right)^{\delta\_fq_i} LDfemnq_{i,t}$	$LDmal_{i,t} = A\_mq_i \left[\alpha\_mq_i . LDmalq_{i,t}^{-\rho\_mq_i} + \left(1-\alpha\_mq_i\right) LDmalnq_{i,t}^{-\rho\_mq_i} \right]^{\left(\frac{-1}{\rho\_mq_i}\right)}$
$LDmalq_{i,t} = \left(\frac{\alpha\_mq_i}{1-\alpha\_mq_i}\right)^{\delta\_mq_i} \left(\frac{wmalnq_t}{wmalq_t}\right)^{\delta\_mq_i} LDmalnq_{i,t}$	$PIB_t = \sum_{j=1}^{27} PV_{i,t} VA_{i,t}$

Income and savings

$YH_{h,t} = \lambda\_wfemq_h . wfemq_t \sum_{i=1}^{27} LDfemq_{i,t} + \lambda\_wfemnq_h . wfemnq_t \sum_{i=1}^{27} LDfemnq_{i,t} + \lambda\_wmalq_h . wmalq_t \sum_{i=1}^{27} LDmalq_{i,t} + \lambda\_wmalnq_h . wmalnq_t . \sum_{i=1}^{27} LDmalnq_{i,t} + \sum_{h=1}^{4} TRHHS_{h,hh,t} + \sum_{ins=1}^{4} TRHINS_{h,ins,t}$	$YDH_{h,t} = (1-tyh_h) YH_{h,t} - \sum_{hh=1}^{4} TRHHS_{hh,h,t} - \sum_{ins=1}^{4} TRINSH_{ins,h,t}$ $SH_{h,t} = \psi_h YDH_{h,t}$
$YF_t = \lambda\_fir \sum_{i=1}^{27} r_{i,t} . KD_{i,t} + \sum_{ins=1}^{3} TRA_{fir,ins,t} + \sum_{h=1}^{4} TRINSH_{fir,h,t}$	$SF_t = (1-tyf) YF_t - \sum_{ins=1}^{3} TRA_{ins,fir,t} - \sum_{h=1}^{4} TRHINS_{h,fir,t}$
$YG_t = \lambda\_gov \sum_{i=1}^{27} r_{i,t} . KD_{i,t} + \sum_{ins=1}^{3} TRA_{gov,ins,t} + \sum_{h=1}^{4} TRINSH_{gov,h,t} + \sum_{h=1}^{4} TDH_{h,t} + TDF + \sum_{i=1}^{27} TI_{i,t} + \sum_{m=1}^{24} TIM_{m,t} + \sum_{x=1}^{25} TIE_{x,t}$	$SG_t = YG_t - G_t - \sum_{ins=1}^{3} TRA_{ins,gov,t} + \sum_{h=1}^{4} TRHINS_{h,gov,t}$

Taxes

$TI_{m,t} = adj_{m,t} . tx_m \left(PL_{m,t} . DD_{m,t} \right) + adj_{m,t} . \left(\frac{tx_m}{1-tx_m}\right) PM_{m,t} . IM_{m,t}$	$TI_{nm,t} = adj_{nm,t} . tx_{nm} (PL_{nm,t} . DD_{nm,t})$
$TIM_{m,t} = tm_m . e_t . PWM_{m,t} . IM_{m,t}$	$TIE_{x,t} = te_x (PE_{x,t} . EXS_{x,t})$
$TDH_{h,t} = tyh_h YH_{h,t}$	$TDF_t = tyf . YF_t$

Demand

$C_{i,h,t} = C\_min_{i,h,t} + \frac{\gamma_{i,h} \left(CTH_{h,t} - \sum_{j=1}^{27} C\_min_{j,h,t} PC_{j,t} \right)}{PC_{i,t} \underbrace{\left(1-ZETAfem_h-ZETAmal_h-ZETAhom_h-ZETAgirl_h-ZETAboy_h\right)}_{1-ZETA\_TOTAL(h)}}$	$CTH_{h,t} = YDH_{h,t} - SH_{h,t}$
$DIT_{i,t} = \sum_{j=1}^{27} aij_{i,j} CI_{j,t}$	$G_t = \sum_{pub=1}^{1} CG_{pub,t} PC_{pub,t}$

$FBCF_{i,t}=\mu_i.ITSV_t/PC_{i,t}$	$ITSV_t=IT_t-\sum_{j=1}^{27}PC_{i,t}STK_{i,t}$

Market prices

$w_{i,t}=\frac{wmal_{i,t}.LDmal_{i,t}+wfem_{i,t}.LDfem_{i,t}}{LD_{i,t}}$	$wfem_{i,t}=\frac{wfemq_t.LDfemq_{i,t}+wfemnq_t.LDfemnq_{i,t}}{LDfem_{i,t}}$
$wmal_{i,t}=\frac{wmalq_t.LDmalq_{i,t}+wmalnq_t.LDmalnq_{i,t}}{LDmal_{i,t}}$	$PV_{i,t}=\frac{P_{i,t}XS_{i,t}-\sum_{j=1}^{27}PC_{j,t}.DI_{j,i,t}}{VA_{i,t}}$
$r_{i,t}=\frac{PV_{i,t}.VA_{i,t}-w_{i,t}.LD_{i,t}}{KD_{i,t}}$	$PD_{i,t}=\left(1+tx_i.adj_{i,t}\right)PL_{i,t}$
$PM_{m,t}=\left(1+tx_m.adj_{m,t}\right)\left(1+tm_m\right).e_t.PWM_{m,t}$	$PE_{x,t}=\frac{e_t.PFOB_{x,t}}{\left(1+te_x\right)}$
$PC_{m,t}=\frac{PD_{m,t}.DD_{m,t}+PM_{m,t}.IM_{m,t}}{Q_{m,t}}$	$PC_{nm,t}=\frac{PD_{nm,t}.DD_{nm,t}}{Q_{nm,t}}$
$P_{x,t}=\frac{PL_{x,t}.DD_{x,t}+PE_{x,t}.EXS_{x,t}}{XS_{x,t}}$	$P_{nx,t}=\frac{PL_{nx,t}.DD_{nx,t}}{XS_{nx,t}}$
$PINDEX_t=\sum_{i=1}^{27}\eta_iPV_{i,t}$	

International trade

$XS_{x,t}=B\_e_x\left[\beta\_e_x.EXS_{x,t}^{\kappa\_e_x}+\left(1-\beta\_e_x\right)DD_{x,t}^{\kappa\_e_x}\right]^{\left(\frac{1}{\kappa\_e_x}\right)}$	$XS_{nx,t}=DD_{nx,t}$
$EXD_{x,t}=EXR_{x,t}\left(\frac{PWE_{x,t}}{PFOB_{x,t}}\right)^{\delta\_x_x}$	$EXS_{x,t}=\left(\frac{PE_{x,t}}{PL_{x,t}}\right)^{\tau\_e_x}\left(\frac{1-\beta\_e_x}{\beta\_e_x}\right)^{\tau\_e_x}DD_{x,t}$
$Q_{m,t}=A\_m_m\left[\alpha\_m_m.IM_{m,t}^{-\rho\_m_m}+\left(1-\alpha\_m_m\right)DD_{m,t}^{-\rho\_m_m}\right]^{\left(\frac{-1}{\rho\_m_m}\right)}$	$Q_{nm,t}=DD_{nm,t}$
$IM_{m,t}=\left(\frac{\alpha\_m_m}{1-\alpha\_m_m}\right)^{\delta\_m_m}\left(\frac{PD_{m,t}}{PM_{m,t}}\right)^{\delta\_m_m}DD_{m,t}$	$SR_t=\sum_{ins=1}^{3}TRA_{row,ins,t}+\sum_{h=1}^{4}TRINSH_{row,h,t}+e_t\sum_{m=1}^{24}PWM_{m,t}IM_{m,t}-\sum_{ins=1}^{3}TRA_{ins,row,t}-e_t\sum_{x=1}^{25}PFOB_{x,t}.EXS_{x,t}-\sum_{h=1}^{4}TRHINS_{h,row,t}$
$SR_t=\phi.PIB_t$	

Endogenous market labor supply

$LSfem_{h,t}=MAXHOUR\_fem_{h,t}-LZfem_{h,t}-\frac{ZETAfem_h\left(CTH_{h,t}-\sum_{j=1}^{27}C\_min_{j,h,t}PC_{j,t}\right)}{hwfem_{h,t}\left(1-ZETA\_TOTAL_h\right)}$
$LSmal_{h,t}=MAXHOUR\_mal_{h,t}-LZmal_{h,t}-\frac{ZETAmal_h\left(CTH_{h,t}-\sum_{j=1}^{27}C\_min_{j,h,t}PC_{j,t}\right)}{hwmal_{h,t}\left(1-ZETA\_TOTAL_h\right)}$
$LSfem_{h,t}=B\_f_h\left[\beta\_f_h.LSfemq_{h,t}^{\kappa\_f_h}+\left(1-\beta\_f_h\right)LSfemnq_{h,t}^{\kappa\_f_h}\right]^{\left(\frac{1}{\kappa\_f_h}\right)}$
$LSfemq_{h,t}=\left(\frac{wfemq_t}{wfemnq_t}\right)^{\tau\_f_h}\left(\frac{1-\beta\_f_h}{\beta\_f_h}\right)^{\tau\_e_h}LSfemnq_{h,t}$
$LSmal_{h,t}=B\_m_h\left[\beta\_m_h.LSmalq_{h,t}^{\kappa\_m_h}+\left(1-\beta\_m_h\right)LSmalnq_{h,t}^{\kappa\_m_h}\right]^{\left(\frac{1}{\kappa\_m_h}\right)}$
$LSmalq_{h,t}=\left(\frac{wmalq_t}{wmalnq_t}\right)^{\tau\_m_h}\left(\frac{1-\beta\_m_h}{\beta\_m_h}\right)^{\tau\_e_h}LSmalnq_{h,t}$

Non market production

$$Z_{h,t}=A\_zlab_h\left[\alpha\_zlab_h.LZwom_{h,t}^{-\rho\_zlab_h}+\left(1-\alpha\_zlab_h\right)LZmen_{h,t}^{-\rho\_zlab_h}\right]^{\left(\frac{-1}{\rho\_zlab_h}\right)}$$

$$LZwom_{h,t}=\left(\frac{\alpha\_zlab_h}{1-\alpha\_zlab_h}\right)^{\delta\_zlab_h}\left(\frac{wmen_{h,t}}{wwom_{h,t}}\right)^{\delta\_zlab_h}LZmen_{h,t}$$

$$hwfem_{h,t}.LZfem_{h,t}=wwom_{h,t}.LZwom_{h,t}-wgirl_{h,t}.LZgirl_{h,t}$$

$$hwmal_{h,t}.LZmal_{h,t}=wmen_{h,t}.LZmen_{h,t}-wboy_{h,t}.LZboy_{h,t}$$

$$CZ_{h,t}=CZ\_min_{h,t}+\frac{ZETA\_hom_h\left(CTH_{h,t}-\sum_{j=1}^{27}C\_min_{j,h,t}PC_{j,t}\right)}{P\_hom_{h,t}\left(1-ZETA\_TOTAL(h)\right)}$$

Girls' and boys' time allocation

$$MAXHOUR\_girl_{h,t}=B\_g_h\left[\beta\_g_h.EDgirl_{h,t}^{\kappa\_g_h}+\left(1-\beta\_g_h\right)LZgirl_{h,t}^{\kappa\_g_h}\right]^{\left(\frac{1}{\kappa\_g_h}\right)}$$

$$MAXHOUR\_boy_{h,t}=B\_b_h\left[\beta\_b_h.EDboy_{h,t}^{\kappa\_b_h}+\left(1-\beta\_b_h\right)LZboy_{h,t}^{\kappa\_b_h}\right]^{\left(\frac{1}{\kappa\_b_h}\right)}$$

$$EDgirl_{h,t}=\left(\frac{Pedug_{h,t}}{wgirl_{h,t}}\right)^{\tau\_g_h}\left(\frac{1-\beta\_g_h}{\beta\_g_h}\right)^{\tau\_g_h}LZgirl_{h,t}$$

$$EDboy_{h,t}=\left(\frac{Pedub_{h,t}}{wboy_{h,t}}\right)^{\tau\_b_h}\left(\frac{1-\beta\_b_h}{\beta\_b_h}\right)^{\tau\_b_h}LZboy_{h,t}$$

$$MAXHOUR\_girl_{h,t}=TT\_girl_{h,t}-\frac{ZETAgirl_h\left(CTH_{h,t}-\sum_{j=1}^{27}C\_min_{j,h,t}PC_{j,t}\right)}{wmaxg_{h,t}\left(1-ZETA\_TOTAL_h\right)}$$

$$MAXHOUR\_boy_{h,t}=TT\_boy_{h,t}-\frac{ZETAboy_h\left(CTH_{h,t}-\sum_{j=1}^{27}C\_min_{j,h,t}PC_{j,t}\right)}{wmaxb_{h,t}\left(1-ZETA\_TOTAL_h\right)}$$

Non market prices

$$P\_\mathrm{hom}_{h,t}=\frac{wwom_{h,t}.LZwom_{h,t}+wmen_{h,t}.LZmen_{h,t}}{CZ_{h,t}}$$

$$wwom_{h,t}=\frac{\lambda\_wfemq_h\sum_{i=1}^{27}LDfemq_{i,t}.wfemq_t+2\left(\lambda\_wfemnq_h\sum_{i=1}^{27}LDfemnq_{i,t}.wfemnq_t\right)}{\lambda\_wfemq_h\sum_{i=1}^{27}LDfemq_{i,t}+2\left(\lambda\_wfemnq_h\sum_{i=1}^{27}LDfemnq_{i,t}\right)}$$

$$wmen_{h,t}=\frac{\lambda\_wmalq_h\sum_{i=1}^{27}LDmalq_{i,t}.wmalq_t+2\left(\lambda\_wmalnq_h\sum_{i=1}^{27}LDmalnq_{i,t}.wmalnq_t\right)}{\lambda\_wmalq_h\sum_{i=1}^{27}LDmalq_{i,t}+2\left(\lambda\_wmalnq_h\sum_{i=1}^{27}LDmalnq_{i,t}\right)}$$

$$hwfem_{h,t}=\frac{\lambda\_wfemq_h\sum_{i=1}^{27}LDfemq_{i,t}.wfemq_t+\lambda\_wfemnq_h\sum_{i=1}^{27}LDfemnq_{i,t}.wfemnq_t}{\lambda\_wfemq_h\sum_{i=1}^{27}LDfemq_{i,t}+\lambda\_wfemnq_h\sum_{i=1}^{27}LDfemnq_{i,t}}$$

$$hwmal_{h,t}=\frac{\lambda\_wmalq_h\sum_{i=1}^{27}LDmalq_i.wmalq_t+\lambda\_wmalnq_h\sum_{i=1}^{27}LDmalnq_{i,t}.wmalnq_t}{\lambda\_wmalq_h\sum_{i=1}^{27}LDmalq_{i,t}+\lambda\_wmalnq_h\sum_{i=1}^{27}LDmalnq_{i,t}}$$

$wgirl_{h,t}=\frac{\lambda\_wfemnq_h \sum_{i=1}^{27} LDfemnq_{i,t}.wfemnq_t}{\lambda\_wfemnq_h \sum_{i=1}^{27} LDfemnq_{i,t}}$	$wboy_{h,t}=\frac{\lambda\_wmalnq_h \sum_{i=1}^{27} LDmalnq_{i,t}.wmalnq_t}{\lambda\_wmalnq_h \sum_{i=1}^{27} LDmalnq_{i,t}}$
$Pedug_{h,t}=\frac{\lambda\_wfemq_h.wfemq_t \sum_{i=1}^{27} LDfemq_{i,t}}{\lambda\_wfemq_h \sum_{i=1}^{27} LDfemq_{i,t}}$	$Pedub_{h,t}=\frac{\lambda\_wmalq_h.wmalq_t \sum_{i=1}^{27} LDmalq_{i,t}}{\lambda\_wmalq_h \sum_{i=1}^{27} LDmalq_{i,t}}$
$wmaxg_{h,t}=\frac{wgirl_{h,t}.LZgirl_{h,t}+Pedug_{h,t}.EDgirl_{h,t}}{MAXHOUR\_girl_{h,t}}$	$wmaxb_{h,t}=\frac{wboy_{h,t}.LZboy_{h,t}+Pedub_{h,t}.EDboy_{h,t}}{MAXHOUR\_boy_{h,t}}$

Equilibrium conditions

$Q_{i,t}=\sum_{h=1}^{4} C_{i,h,t}+DIT_{i,t}+FBCF_{i,t}+STK_{i,t}$	$EXS_x=EXD_x$	$CZ_h=Z_h$	$KS_t=\sum_{i=1}^{27} KD_{i,t}$
$IT=\sum_{h=1}^{4} SH_h+SF+SG+SR$	$LSTfemq=\sum_{i=1}^{27} LDfemq_i$	$LSTfemnq=\sum_{i=1}^{27} LDfemnq_i$	$LSTmalq=\sum_{i=1}^{27} LDmalq_i$
$LSTmalnq=\sum_{i=1}^{27} LDmalnq_i$	$LSTfemq=\sum_{h=1}^{4} LSfemq_h$	$LSTmalq=\sum_{h=1}^{4} LSmalq_h$	$LSTmalnq=\sum_{h=1}^{4} LSmalnq_h$

Dynamic

$KD_{i,t+1}=KD_{i,t}.(1-\xi)+IND_{i,t}$	$U_t=PK_t.(ir_t+\xi)$	$PK_t=\sum_{i=1}^{27} PC_{i,t}.\mu_i$
$\frac{IND_{i,t}}{KD_{i,t}}=g1_i\left(\frac{r_{i,t}}{U_t}\right)^2+g2_i\left(\frac{r_{i,t}}{U_t}\right)$	$IT_t=PK_t.\sum_{i=1}^{27} IND_{i,t}$	$TRA_{ins,inst,t+1}=TRA_{ins,inst,t}.(1+n)$
$TRHH_{h,hh,t+1}=TRHH_{h,hh,t}.(1+n)$	$TRINSH_{ins,h,t+1}=TRINSH_{ins,h,t}.(1+n)$	$TRHINS_{h,ins,t+1}=TRHINS_{h,ins,t}.(1+n)$
$C\_min_{i,h,t+1}=C\_min_{i,h,t}.(1+n)$	$CZ\_min_{h,t+1}=CZ\_min_{h,t}.(1+n)$	$G_{t+1}=G_t.(1+n)$
$SG_{t+1}=SG_t.(1+n)$	$STK_{i,t+1}=STK_{i,t}.(1+n)$	$MAXHOUR\_fem_{h,t+1}=MAXHOUR\_fem_{h,t}.(1+n)$
$MAXHOUR\_mal_{h,t+1}=MAXHOUR\_mal_{h,t}.(1+n)$	$TT\_girl_{h,t+1}=TT\_girl_{h,t}.(1+n)$	$TT\_boy_{h,t+1}=TT\_boy_{h,t}.(1+n)$

Measure of well being

$$EV_{h,t}=\left(\frac{1}{1-ZETA\_TOTAL_h}\right)\left[\prod_i\left(\frac{PC_i^0}{PC_{i,t}^1}\right)^{\gamma_{i,h}}.\left(\frac{hwmal_h^0}{hwmal_{h,t}^1}\right)^{ZETAmal_h}\left(\frac{hwfem_h^0}{hwfem_{h,t}^1}\right)^{ZETAfem_h}\left(\frac{wmaxg_h^0}{wmaxg_{h,t}^1}\right)^{ZETAgirl_h}\left(\frac{wmaxb_h^0}{wmaxb_{h,t}^1}\right)^{ZETAboy_h}\left(\frac{P\_hom_h^0}{P\_hom_{h,t}^1}\right)^{ZETAhom_h}.\left(CTH_{h,t}^1-\sum_i PC_{i,t}.\overline{C\_min_{i,h,t}^1}\right)-\left(CTH_h^0-\sum_i PC_i.\overline{C\_min_{i,h}^0}\right)\right]$$

Exogenous variables

$TT\_girl_{h,T1}$, $TT\_boy_{h,T1}$, $MAXHOUR\_fem_{h,T1}$, $MAXHOUR\_mal_{h,T1}$,

$TRHHS_{h,hh,T1}$,$TRINSH_{ins,h,T1}$,$TRHINS_{h,ins,T1}$,$TRA_{ins,inst,T1}$,

$STK_{i,T1}$,$C\_min_{i,h,T1}$,$CZ\_min_{h,T1}$,$KD_{i,T1}$,G_{T1},SG_{T1},

$PWM_{m,t}$,$PWE_{x,t}$,$EXR_{x,t}$,e_t

Variables definition

w	aggregate wage rate	PV	value added price
wfem	aggregate female wage rate	PD	Local price of domestic commodities
wmal	aggregate male wage rate	PC	composite commodity price
wfemq	skilled female wage rate	PM	Local price of imports
wfemnq	unskilled female wage rate	PE	Local price of exports
wmalq	skilled male wage rate	PWM	world import price
wmalnq	unskilled male wage rate	PWE	world export price

r	rate of return to capital	PINDEX	GDP price index
P	Producer price	E	nominal exchange rate
PL	local output price	PFOB	export fob price
PK	price of capital	U	user cost of capital
IR	rate of interest	KS	Capital supply
XS	local output	LDmalq	skilled male labor demand
VA	value added	LDmalnq	unskilled male labor demand
DI	intermediate demand	LSfem	household female labor supply
CI	intermediate consumption	LSmal	household male labor supply
KD	capital demand	LSfemq	household skilled female labor supply
LD	aggregate labor demand	LSfemnq	household unskilled female labor supply
LDfem	female labor demand	LSmalq	household skilled male labor supply
LDmal	male labor demand	LSmalnq	household unskilled male labor supply
LDfemq	skilled female labor demand	LSTfemq	total skilled female labor
LDfemnq	unskilled female labor demand	LSTfemnq	total unskilled female labor
C	household final consumption demand	CTH	total consumption
FBCF	investment demand by commodity origin	STK	level of capital stock
IND	investment demand by sectoral destination	ITSV	total investment net of stocks
C_MIN	minimum consumption	DIT	intermediate demand
IT	total investment	G	public expenditure
CG	public consumption demand	DD	demand for domestic g
Q(I)	aggregate demand	PIB	GDP
EXS	Exports supply	EXD	Exports supply
EXR	Export demand (base year)		
IM	Imports	SR	current account balance
YH	Household income	YDH	Disposable household income
YF	Firms income	SH	Household savings
SF	Firms savings	EV	Household well being (equivalent variation)
TRA	inter institutions transfers	TRHHS	Transfers within households
TRINSH	Transfers from households to institutions	TRHINS	transfers from institutions to households
YG	Government revenue	SG	Government savings
TDH	revenue form household income tax	TDF	revenue from firm's direct tax
TI	revenue form indirect product tax	TIE	revenue form export tax
TIM	revenue from import tax	adjf	Indirect compensation tax rate

LZwom	composite domestic female labor	LZmen	composite domestic female labor
LZfem	domestic adult female labor	LZmal	domestic adult male labor
LZgirl	domestic girls' labor	LZboy	domestic boys' labor
EDgirl	girls' education time	EDboy	boys' education time
Z	household non market production	CZ	household non market consumption
CZ_MIN	minimum consumption in home produced goods		
MAXHOUR_fem	female work-leisure maximum hours	MAXHOUR_mal	male work-leisure maximum hours
Tt_girl	girls' domestic work, education and leisure maximum hours	Tt_boy	boys' domestic work, education and leisure maximum hours
MAXHOUR_girl	girls' education and domestic work maximum hours	MAXHOUR_boy	boys' education and domestic work maximum hours
P_hom	value of home produced goods	Wwom	average women's non market wage
Wmen	average men's non market wage	Hwfem	household female wage rate (opportunity cost)
Hwmal	household male wage rate (opportunity cost)	wgirl	gains from girls home labor
wboy	gains from boys home labor	Pedug	gains from girls' education
Pedub	gains from boys' education	Wmaxg	average value of girls' education and home labor time
Wmaxb	average value of boys' education and home labor time		

Parameters definition

v	Coefficient (Leontief value added)	io	Coefficient (Leontief total intermediate consumption)
aij	Input Output coefficient	φ	current account balance-GDP ratio
ψ	Propensity to save for households		
λ_wmal	Share of male labor income in household	λ_wfem	Share of female labor income in household
λ_wmalq	Share of skilled male labor income in household	λ_wmalnq	Share of unskilled male labor income received by

			household
λ_wfemq	Share of skilled female labor income received by household	λ_wfemnq	Share of unskilled female labor income received by household
λ_gov	Share of capital income received by the government	λ_fir	Share of capital income received by firms
te	Tax on exports	tm	Import duties
tx	Indirect tax rate	tyh	household income tax rate
tyf	firms income tax rate		
γ	Marginal share of good I in LES consumption function	YELAS	Income elasticity of demand
V_MIN	Minimum consumption value	FRISCH	Frisch parameter (LES consumption function)
μ	Share of sectors in investment demand	η	share of sectoral value added in total
δ_x	export demand elasticity		
B_	Scale parameter (CET function)	β_	Share parameter (CET function)
κ_	Transformation parameter (CET function)	τ_	Transformation elasticity (CET function)
A_	Scale parameter (CES function)	α_	Share parameter (CES function)
ρ_	Substitution parameter (CES function)	δ_	Substitution elasticity (CES function)
ZETA_fem	household share of female leisure time	ZETA_mal	household share of male leisure time
Zeta_girl	household share of girls' leisure time	Zeta_boy	household share of boys' leisure time
ZETA_hom	household share of consumption in home produced goods	psi_hom	share of minimum consumption of home produced goods

Result tables

Table A1: Trade and output effects (short term)

Sectors	Tariffs	imports	Local sales	Composite demand	output	exports	Households consumption	Investment demand	Intermediate demand	Government consumption
Agriculture	0,63	-1,89	-0,68	-0,76	-0,34	1,45	-0,11	0,00	-0,91	_
Coal	-	-1,65	0,14	0,04	1,05	1,94	-0,06	0,00	0,05	_
Gold	-	-1,46	-0,02	-0,02	3,59	3,87	0,00	0,00	-0,47	_
Other mining	0,02	-	0,40	-0,76	1,86	2,23	0,00	0,00	-0,67	_
Food	6,95	5,14	-1,18	-0,77	-1,02	0,91	-0,63	0,00	-0,61	_
Textiles	8,76	6,95	-1,40	-0,29	-1,18	0,82	0,01	0,00	-1,03	_
Footwear	26,44	23,85	-4,24	2,04	-4,14	-1,06	2,26	0,00	-1,07	_
Petroleum	5,19	3,08	-1,26	-0,37	-0,96	0,75	-0,54	-2,15	-0,34	_
Other non-metallic mineral products	14,95	11,99	-2,73	-0,59	-2,39	0,42	0,98	1,93	-0,68	_
Basic iron/steel	2,29	-0,05	-0,50	-0,35	0,25	1,88	-0,07	-0,87	-0,02	_
Electrical machinery	10,59	6,96	-2,57	-0,08	-2,19	0,66	0,82	1,43	-0,64	_
Radio	3,38	0,42	-1,25	-0,30	-0,94	1,33	-0,05	-0,85	0,08	_
Transport equipment	4,83	2,02	-1,11	0,01	-0,67	1,67	0,24	-0,06	-0,07	_
Other manufacturing	6,73	4,53	-1,01	-0,11	-0,51	1,58	0,30	0,03	-0,30	_
Electricity	-	-	0,14	0,14	0,16	1,73	-0,33	0,00	0,35	_
Water	-	-1,82	0,00	0,00	0,00	-	-0,29	0,00	0,08	_
Construction	-	-3,02	-0,82	-0,84	-0,82	1,64	0,00	-1,24	-0,40	_
Trade	-	-2,67	-0,69	-0,70	-0,69	1,45	-0,03	0,00	-0,72	_
Hotels and restaurants	-	-1,78	-0,06	-0,25	0,18	1,70	-0,44	0,00	-0,03	_
Transport services	-	-1,55	0,13	-0,14	0,28	1,81	-0,12	0,00	-0,14	_
Communications	-	-2,07	-0,12	-0,22	-0,06	1,90	-0,14	0,00	-0,31	_
Financial intermediation	-	-2,09	-0,15	-0,19	-0,08	1,86	-0,17	0,00	-0,22	_
Real estate	-	-2,89	-0,26	-0,27	-0,26	2,46	-0,12	-1,00	-0,41	_
Business activities	-	-2,09	-0,22	-0,29	-0,18	1,72	-0,15	-1,08	-0,25	_
General government	-	-	1,29	1,29	1,29	-	-0,14	0,00	1,26	1,36
Health and social work	-	-2,14	-0,30	-0,31	-0,29	1,67	-0,45	0,00	0,65	_
Other activities/services	-	-2,33	-0,38	-0,44	-0,35	1,68	-0,33	0,00	-0,32	_
Total	3,36	1,63	-0,45	-0,20	-0,15	1,96	-0,26	-0,79	-0,35	1,36

Table A2: Price variations (short term)

Sectors	Import price	Domestic price	Composite price	Producer price	Local price	Export price
Agriculture	-0,34	-1,36	-1,29	-1,42	-1,64	-0,24
Coal	0,03	-1,46	-1,38	-0,90	-1,49	-0,32
Gold	-0,01	-3,13	-3,13	-0,81	-3,13	-0,63
Other mining	-	-1,55	-0,59	-0,60	-1,56	-0,37
Food	-4,74	0,32	-0,04	-1,43	-1,54	-0,15
Textiles	-7,29	-0,80	-1,71	-1,46	-1,61	-0,14
Footwear	-20,51	-1,50	-6,59	-1,93	-2,00	0,17
Petroleum	-3,03	0,51	-0,24	-1,26	-1,46	-0,13
Other non-metallic mineral products	-13,12	-2,30	-4,05	-1,95	-2,17	-0,07
Basic iron/steel	-1,77	-1,40	-1,52	-1,38	-1,87	-0,31
Electrical machinery	-9,06	-1,71	-3,75	-2,01	-2,26	-0,11
Radio	-2,13	-0,75	-1,54	-1,71	-1,91	-0,22
Transport equipment	-3,93	-1,40	-2,33	-1,81	-2,10	-0,28
Other manufacturing	-6,03	-1,67	-2,41	-1,63	-1,96	-0,26
Electricity	-	-0,95	-0,95	-1,32	-1,34	-0,29
Water	0,27	-1,07	-1,07	-1,33	-1,33	-
Construction	0,70	-1,17	-1,16	-1,85	-1,86	-0,26
Trade	0,06	-1,57	-1,57	-1,63	-1,63	-0,24
Hotels and restaurants	0,69	-0,76	-0,60	-1,28	-1,44	-0,28
Transport services	-0,19	-1,59	-1,38	-1,30	-1,40	-0,30
Communications	0,17	-1,47	-1,39	-1,59	-1,63	-0,31
Financial intermediation	0,32	-1,30	-1,28	-1,58	-1,62	-0,31
Real estate	0,82	-1,41	-1,40	-2,21	-2,21	-0,41
Business activities	0,19	-1,37	-1,32	-1,54	-1,56	-0,28
General government	-	-1,34	-1,34	-1,43	-1,43	-
Health and social work	0,96	-0,61	-0,60	-1,55	-1,56	-0,27
Other activities/services	0,75	-0,90	-0,86	-1,61	-1,64	-0,28
Total	-2,80	-1,25	-1,68	-1,50	-1,75	-0,25

Table A3: Effects on factors of production (short term)

	wages	Capital return	Value added price	Producer price	Labor demand	Value added
Sectors						
Agriculture	-1,76	-2,21	-1,98	-1,42	-0,68	-0,34
Coal	-1,47	0,22	-0,50	-0,90	2,55	1,05
Gold	-1,50	1,88	-0,45	-0,81	5,26	3,59
Other mining	-1,48	1,43	0,13	-0,60	4,37	1,86
Food	-1,62	-2,87	-2,26	-1,43	-1,99	-1,02
Textiles	-1,70	-2,65	-1,82	-1,46	-1,36	-1,18
Footwear	-1,53	-5,68	-2,98	-1,93	-6,24	-4,14
Petroleum	-1,54	-2,76	-2,20	-1,26	-1,96	-0,96
Other non-metallic mineral products	-1,55	-4,42	-2,85	-1,95	-4,31	-2,39
Basic iron/steel	-1,52	-1,21	-1,43	-1,38	0,39	0,25
Electrical machinery	-1,50	-4,19	-2,82	-2,01	-4,14	-2,19
Radio	-1,52	-2,21	-1,68	-1,71	-1,17	-0,93
Transport equipment	-1,51	-2,10	-1,68	-1,81	-0,93	-0,67
Other manufacturing	-1,59	-2,21	-1,85	-1,63	-0,92	-0,51
Electricity	-1,45	-1,10	-1,25	-1,32	0,47	0,16
Water	-1,57	-1,55	-1,56	-1,33	0,03	0,01
Construction	-1,54	-2,21	-1,71	-1,85	-1,07	-0,82
Trade	-1,73	-2,21	-1,77	-1,63	-0,75	-0,69
Hotels and restaurants	-1,76	-1,43	-1,61	-1,28	0,40	0,18
Transport services	-1,54	-1,21	-1,47	-1,30	0,40	0,28
Communications	-1,66	-1,66	-1,67	-1,59	-0,08	-0,06
Financial intermediation	-1,64	-1,77	-1,69	-1,58	-0,15	-0,08
Real estate	-1,84	-2,65	-2,49	-2,21	-1,25	-0,26
Business activities	-1,62	-1,76	-1,63	-1,54	-0,20	-0,18
General government	-1,51	-0,55	-1,41	-1,43	1,45	1,29
Health and social work	-1,77	-2,10	-1,96	-1,55	-0,58	-0,29
Other activities/services	-1,70	-1,88	-1,71	-1,61	-0,37	-0,35
Total	-1,60	-1,89	-1,71	-1,50	0,13	0,08

Table A4: Effects on gendered labor demand (short term)

	Aggregate wages		Aggregate demand		Female wages		Male wages		Female labor demand		Male labor demand	
Sectors	female	male	female	male	Skilled	Unskilled	Skilled	Unskilled	skilled	unskilled	skilled	unskilled
Agriculture	-1,71	-1,78	-0,71	-0,67	-1,97	-1,63	-1,27	-2,08	-0,58	-0,75	-0,93	-0,52
Coal	-1,89	-1,44	2,76	2,53	-1,97	-1,63	-1,27	-2,08	2,82	2,71	2,44	2,86
Gold	-1,88	-1,49	5,47	5,25	-1,97	-1,63	-1,27	-2,08	5,53	5,30	5,14	5,57
Other mining	-1,90	-1,45	4,59	4,35	-1,97	-1,63	-1,27	-2,08	4,62	4,48	4,26	4,69
Food	-1,81	-1,56	-1,90	-2,02	-1,97	-1,63	-1,27	-2,08	-1,82	-1,99	-2,17	-1,77
Textiles	-1,89	-1,48	-1,26	-1,47	-1,97	-1,63	-1,27	-2,08	-1,22	-1,39	-1,57	-1,17
Footwear	-1,91	-1,42	-6,07	-6,29	-1,97	-1,63	-1,27	-2,08	-6,00	-6,00	-6,36	-5,98
Petroleum	-1,89	-1,46	-1,78	-2,00	-1,97	-1,63	-1,27	-2,08	-1,74	-1,92	-2,09	-1,69
Other non-metallic mineral products	-1,88	-1,48	-4,15	-4,35	-1,97	-1,63	-1,27	-2,08	-4,10	-4,27	-4,45	-4,05
Basic iron/steel	-1,86	-1,47	0,55	0,36	-1,97	-1,63	-1,27	-2,08	0,62	0,43	0,26	0,67
Electrical machinery	-1,89	-1,41	-3,94	-4,19	-1,97	-1,63	-1,27	-2,08	-3,92	-4,13	-4,25	-3,86
Radio	-1,91	-1,38	-0,97	-1,25	-1,97	-1,63	-1,27	-2,08	-0,95	-1,17	-1,30	-0,87
Transport equipment	-1,88	-1,45	-0,74	-0,96	-1,97	-1,63	-1,27	-2,08	-0,70	-0,88	-1,05	-0,65
Other manufacturing	-1,87	-1,49	-0,78	-0,96	-1,97	-1,63	-1,27	-2,08	-0,72	-0,90	-1,07	-0,67
Electricity	-1,89	-1,38	0,70	0,43	-1,97	-1,63	-1,27	-2,08	0,74	0,58	0,38	0,79
Water	-1,87	-1,52	0,21	0,00	-1,97	-1,63	-1,27	-2,08	0,29	0,00	-0,12	0,26
Construction	-1,76	-1,51	-0,96	-1,09	-1,97	-1,63	-1,27	-2,08	-0,85	-1,03	-1,21	-0,80
Trade	-1,77	-1,71	-0,72	-0,76	-1,97	-1,63	-1,27	-2,08	-0,62	-0,80	-0,98	-0,57
Hotels and restaurants	-1,79	-1,73	0,42	0,39	-1,97	-1,63	-1,27	-2,08	0,51	0,33	0,15	0,56
Transport services	-1,82	-1,49	0,54	0,37	-1,97	-1,63	-1,27	-2,08	0,62	0,44	0,26	0,67
Communications	-1,79	-1,61	-0,01	-0,10	-1,97	-1,63	-1,27	-2,08	0,08	-0,09	-0,27	0,14
Financial intermediation	-1,89	-1,49	-0,03	-0,23	-1,97	-1,63	-1,27	-2,08	0,01	-0,16	-0,34	0,07
Real estate	-1,74	-1,89	-1,30	-1,22	-1,97	-1,63	-1,27	-2,08	-1,18	-1,36	-1,53	-1,13
Business activities	-1,86	-1,50	-0,08	-0,26	-1,97	-1,63	-1,27	-2,08	-0,02	-0,20	-0,38	0,03
General government	-1,91	-1,39	1,65	1,39	-1,97	-1,63	-1,27	-2,08	1,69	1,51	1,32	1,74
Health and social work	-1,92	-1,43	-0,50	-0,75	-1,97	-1,63	-1,27	-2,08	-0,48	-0,66	-0,83	-0,43
Other activities/services	-1,92	-1,46	-0,26	-0,49	-1,97	-1,63	-1,27	-2,08	-0,23	-0,41	-0,59	-0,18
Total	-1,86	-1,51	-0,03	0,19	-1,97	-1,63	-1,27	-2,08	0,17	-0,40	0,23	0,10

Table A5: Time allocation effects (variation in volume and value, short terms)

	Girls' home	Girls'	Female domestic	Female market	Skilled female	Unskilled female	Aggregate female
Households	labor	education	Labor supply	labor supply	labor supply	labor supply	domestic labor
African	0,05	-0,65	0,27	-1,50	-1,53	-1,46	0,20
Colored	2,49	1,77	-2,10	7,36	7,34	7,41	-1,22
Indian	0,42	-0,28	-0,15	0,14	0,12	0,18	-0,05
White	0,09	-0,61	0,16	-0,40	-0,42	-0,35	0,15
Households	wgirl(h)	Pedug(h)	hwfem(h)	wfem(I)	wfemq	wfemnq	wwom
African	-1,63	-1,97	-1,79	-1,86	-1,97	-1,63	-1,73
Colored	-1,63	-1,97	-1,88	-1,86	-1,97	-1,63	-1,82
Indian	-1,63	-1,97	-1,87	-1,86	-1,97	-1,63	-1,82
White	-1,63	-1,97	-1,90	-1,86	-1,97	-1,63	-1,85
	Boys' home	Boys'	Male domestic	Male market	Skilled male	Unskilled male	Aggregate male
Households	labor	education	Labor supply	labor supply	labor supply	labor supply	domestic labor
African	-1,26	0,38	0,47	-0,38	-0,32	-0,49	0,17
Colored	3,10	4,81	-2,37	3,17	3,23	3,06	-1,29
Indian	-0,67	0,98	-0,04	0,24	0,29	0,13	-0,13
White	-0,95	0,70	0,25	0,03	0,08	-0,09	0,03
Households	wboy(h)	Pedub(h)	hwmal(h)	wmal(I)	wmalq	wmalnq	wmen
African	-2,08	-1,27	-1,54	-1,51	-1,27	-2,08	-1,67
Colored	-2,08	-1,27	-1,55	-1,51	-1,27	-2,08	-1,68
Indian	-2,08	-1,27	-1,52	-1,51	-1,27	-2,08	-1,66
White	-2,08	-1,27	-1,49	-1,51	-1,27	-2,08	-1,61

Table A6- Long term impacts on the market economy

	T1	T5	T10	T15	T20
Output	-0,15	-0,18	-0,21	-0,24	-0,26
GDP	-1,56	-1,51	-1,46	-1,44	-1,42
Investment (total value)	-2,72	-2,66	-2,63	-2,64	-2,68
Investment demand	-1,13	-1,11	-1,14	-1,18	-1,25
Intermediate demand	-0,35	-0,39	-0,42	-0,46	-0,49
Final consumption demand	-0,26	-0,32	-0,38	-0,42	-0,45
Public consumption	1,36	1,37	1,37	1,37	1,37
DD	-0,45	-0,49	-0,53	-0,56	-0,58
Q	-0,20	-0,23	-0,26	-0,29	-0,31
Exports	1,96	2,00	2,03	2,04	2,04
Imports	1,63	1,67	1,70	1,72	1,73
Capital	0,00	-0,20	-0,39	-0,55	-0,68
Female labor demand	-0,03	0,04	0,11	0,16	0,20
Male labor demand	0,19	0,25	0,30	0,35	0,38

Table A7- Long term impacts on households

	T1	T5	T10	T15	T20
Household income					
African	-1,11	-1,06	-1,02	-0,99	-0,97
Colored	-1,31	-1,27	-1,22	-1,19	-1,16
Indian	-1,26	-1,22	-1,17	-1,14	-1,11
White	-1,23	-1,18	-1,14	-1,11	-1,08
Household consumption of market goods and services					
African	-0,18	-0,23	-0,28	-0,31	-0,34
Colored	-1,05	-1,09	-1,13	-1,17	-1,20
Indian	-0,33	-0,38	-0,43	-0,46	-0,49
White	-0,21	-0,29	-0,36	-0,40	-0,44
Household consumption of non market goods and services					
African	0,19	0,18	0,16	0,15	0,14
Colored	-1,24	-1,26	-1,29	-1,34	-1,40
Indian	-0,07	-0,08	-0,10	-0,11	-0,12
White	0,11	0,07	0,03	0,01	0,00
Household well being (Equivalent variation)					
African	1,29	1,23	0,32	0,09	-0,01
Colored	-2,31	-37,78	-18,42	-13,07	-10,70
Indian	-0,57	-6,00	-3,13	-2,29	-1,90
White	-1,73	-2,74	-1,84	-1,51	-1,33

Table A8- Long term impacts on child time allocation

	T1	T5	T10	T15	T20
Girls' domestic work					
African	0,05	0,08	0,10	0,11	0,11
Colored	2,49	2,46	2,44	2,42	2,41
Indian	0,42	0,46	0,49	0,50	0,51
White	0,09	0,17	0,23	0,26	0,29
Girls' education time					
African	-0,65	-0,67	-0,68	-0,68	-0,69
Colored	1,77	1,70	1,64	1,61	1,59
Indian	-0,28	-0,29	-0,30	-0,29	-0,29
White	-0,61	-0,58	-0,55	-0,53	-0,52
Boys' domestic labor					
African	-1,26	-1,18	-1,12	-1,08	-1,05
Colored	3,10	3,00	2,87	2,75	2,64
Indian	-0,67	-0,60	-0,54	-0,50	-0,46
White	-0,95	-0,77	-0,64	-0,56	-0,50
Boys' education					
African	0,38	0,40	0,43	0,46	0,48
Colored	4,81	4,65	4,48	4,35	4,23
Indian	0,98	1,00	1,03	1,05	1,08
White	0,70	0,82	0,92	0,99	1,05