ECONOMIC RESEARCH FORUM
منتدى البحوث الاقتصادية
2010

working paper series

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Working Paper No. 555

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October 2010

We are grateful to François Bourguignon, Bernard Decaluwé, Yvan Decreux, Anne Sophie Robilliard, Lionel Fontagné and Vaqar Ahmed. Also thanks to all participants of the ERF 16th annual conference for their useful comments and suggestions. All the relevant data and computation files are available upon request from the authors. Any remaining errors are ours. This work was carried out with the aid of a grant from the Gender Economic Research and Policy Analysis (GERPA) and has benefited from a financial support from the Economic Research Forum (ERF).

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First published in 2010 by
The Economic Research Forum (ERF)
7 Boulos Hanna Street
Dokki, Cairo
Egypt
www.erf.org.eg

Abstract

This paper develops a microsimulation analysis to evaluate the impact of trade liberalization policies in Egypt on income redistribution. Our analysis aims at identifying the effects of those measures on redistribution aspects. For this, we rely on a macro - micro approach integrating results obtained from a discrete choice model of labor supply in a Computable General Equilibrium model (CGE). In the empirical work, we use the Egyptian Labor Market and Panel Survey (ELMPS) of 1998 and 2006 as well as the Social Accounting Matrix (SAM) of 2001. This assessment allows us to find out to what extent such macroeconomic policies affect, on the microeconomic level, females poverty, wages and employment opportunities.

ملخص

يطور هذا البحث تحليل أسلوب المحاكاة الجزئي لتقييم أثر سياسات تحرير التجارة علي إعادة توزيع الدخل في مصر. ويهدف تحليلنا إلي تحديد أثر هذه الإجراءات علي مظاهر إعادة التوزيع. ولذلك نعتمد علي الاتجاه الكلي والجزئي بدمج النتائج التي حصل عليها من خلال نموذج الاختيار المنفصل لوجود الموارد البشرية المناسبة للأسواق وفقا لنموذج التوازن العام المقدر. خلال العمل التجريبي نستخدم المسح التتبعي لسوق العمل في مصر لعامي 1998 و 2006، وأيضا مصفوفة الحسابات الاجتماعية لعام 2001. و يسمح لنا هذا التقييم باكتشاف مدي تأثير سياسات الاقتصاد الكلي علي مستوي الاقتصاد الجزئي ومستوي الفقر لدي الإناث، ومستوي الأجور وفرص العمل.

1. Introduction

Macroeconomic policies, poverty and gender specific aspects must be present in the overall policy dialogue. Thus, analyzing trade liberalization impacts on the labor market and wage inequality is central for policymaking reforms in developing countries. In Egypt, the 1990s have been characterized by accelerated structural adjustment and trade liberalization aiming at rectifying the macro imbalances in the Egyptian economy. Those economic policies are parts of the agreements that the Egyptian government has signed with the International Monetary Fund (IMF) and the World Bank. Theoretically, Becker (1957) argues that free trade implies a more competitive environment, and consequently, a less discriminating economy (against females). However, such effects have not been observed in most developing countries (El-Hamidi, 2008). The present study aims at identifying the complex inter-linkages between trade liberalization policies and wage inequalities through a microsimulation methodology.

The literature on trade liberalization and microsimulations is quite rich. It can be divided in three main groups. The first one assesses the effect of tariffs removal on inequality and poverty. Cockburn et al (2006) conducted an extensive literature review for the microsimulation analysis assessing the effect of trade liberalization and showed that the latter has little but positive impact on welfare and poverty. In addition, industrial sectors benefit—relative to agriculture—from trade liberalization and so do urban households relative to their rural counterparts. For a flavor of such analysis in developing countries, Colombo (2008a) assessed the effect of the Free Trade Agreement of Central America with the USA on Nicaragua. She found that this agreement induces small changes both in the main macroeconomic variables and in the distribution of income and poverty indices. Annabi et al (2005) found that, in Senegal, trade liberalization induces small increases in poverty and inequality in the short run. In the long run, it enhances capital accumulation, particularly in the service and industrial sectors, and brings substantial decreases in poverty. For Zimbabwe, Chitiga et al (2007) showed that, while the complete removal of tariffs favors exporting sectors, poverty falls in the economy but inequality hardly changes.

The second group examines the gender aspects in microsimulations. For instance, Cockburn et al (2010) examined the effect of trade liberalization in Senegal and found that while the unskilled gender wage gap increases, the skilled gender wage gap falls. In addition, male workers continue to gain owing to the presence of male labor-intensive export industries. Fofana et al (2003) conducted a microsimulation analysis for Nepal where they proved that trade reform based upon import substitution strategy, i.e. a complete elimination of tariffs on imported goods, benefits women more than men in terms of income distribution.

Finally, the third group determines the effect of trade liberalization on regional inequality. Cockburn (2002) argued that, thanks to trade liberalization in Nepal, poverty falls in urban areas and increases in rural areas since initial tariffs were highest in agricultural sectors.

The motivation of the present study is twofold. On the one hand, Egypt, witnessing both macro and microeconomic changes during the last decade, has undertaken numerous policies that affected both trade and, in turn, labor market and wages inequality.

Despite many efforts that have been deployed to combat inequality, it remains a serious issue in Egypt. According to the Human Development Report HDR (2009), the Gini index in Egypt is 32.1. More precisely, the income share held by the lowest 10 % of the population is 3.7 % and the one held by the lowest 20 % is 9 %. Those figures for the highest 20 % and 10 % are 44 % and 30 % respectively. Comparing Egypt to other countries' Gini indexes, we found out that comparator economies tend to have higher levels of inequalities . Such inequality is observed at many levels: qualification, gender and geographical levels.

Although women's situation[1] has highly improved, they still earn less than men. Between 1998 and 2006, the gender pay gap increased in the public sector in favor of men to reach levels comparable to the private sector. Concerning the gender level of inequality, Said (2007) found that—after correcting for productivity differences— there is a gap in favor of women of 3 % in government sectors and a gap in favor of men in the private sector of 21 %. Therefore, inequality at the gender level is still a debatable issue in Egypt. El-Hamidi (2008) has also found that, during trade liberalization periods, tradable sectors experienced higher levels of wage differences between men and women than non-tradable ones.

At the geographic level, such inequality is even more pronounced as urban employment represents more than 65% of total employment. Said (2007) has shown that living outside greater Cairo is associated with a wage disadvantage for all sector and gender groups.

Finally, inequality between the skilled and the unskilled is also a key aspect to understand income differences in developing countries in general, and in Egypt in particular. Wage inequality and the returns to skills rose substantially as there was a sizable increase in the wage ratio between highly skilled and less skilled workers. Yet, it has never been studied in the Egyptian case.

Egypt has known successive recent changes in protection and tariff rates since the middle of the nineties and mainly in the 2000s with the implementation of various agreements such as the Free Trade Agreement (FTA) with the European Union, the Agadir Agreement, the Greater Arab Free Trade Agreement (GAFTA) and the European Free Trade Agreement (EFTA)[2] . In Egypt, the main trade reform actions have been undertaken after the conclusion of the Euromed Partnership Agreement signed in Barcelona and the General Agreement on Tariffs and Trade (GATT) signed in Marrakech in 1994. Since then, additional actions towards opening the trade regime have been taken and implemented.

Regarding the empirical motivation, we rely on a microsimulation approach using Egyptian data. The Microsimulation approach is a good tool that allows such an evaluation and determines the effects of macro policies on wage inequalities. This framework consists of estimating, in a first stage, a wage equation at the individual level using the Egyptian Labor Market Panel Survey (ELMPS) of 1998. Then, in a second stage, a computable general equilibrium (CGE) model is estimated in order to identify the effect of liberalization policies on wages at the national level using the Social Accounting Matrix (SAM) of 2001. And finally, these two models are linked by replicating the results obtained from the CGE at the individual level.

CGE models represent a major tool to assess the impact of economic policies in a general equilibrium framework because they take into account the numerous economic interactions between different sectors, markets and agents within the same economy. Trade liberalization, must be studied in a CGE framework because it has many effects not only on a country's trade, but also on sectoral expansion or contraction, employment, investment, consumption and thus welfare. All these effects cannot be studied in a partial equilibrium framework. That is why we find it appropriate to use a CGE model to determine the trade facilitation impact on the Egyptian economy. Therefore, using the microsimulation approach, this study aims at evaluating the liberalization policies effects on wage inequality in Egypt where gender, geographical and skill dimensions are used to break down labor into eight segments.

As this paper studies inequalities within the paid or wage-earners population, we use wages as an indicator of inequality and therefore as the focus of the study. Note that the use of wages, rather than incomes, is more convenient since the latter is more sensitive to policy

1 Turkey (43.2), Jordan (37.7), Tunisia (40.8) and Morocco (40.9).

[2] EFTA States (Switzerland, Norway, Iceland, Liechtenstein).

changes, in particular trade liberalization changes (for more details see Milanovic and Squire, 2007). In contrast, incomes can be sensitive to many other factors such as government transfers, remittances and direct taxes.

In what follows, Section 2 presents some stylized facts of the main liberalization changes that took place in the Egyptian economy between 1998 and 2004. Section 3 exhibits the methodology adopted in our study. Section 4 is devoted to the data presentation. In Section 5, we present the results and Section 6 concludes and presents the policy implications of the study.

2. Some Stylized Facts

Egypt has had two remarkable waves of trade liberalization. The first one took place in the early nineties enacting reform policies in many fields through the Economic Reform and Structural Adjustment Program (ERSAP) dictated by the World Bank and the IMF. Following that, Egypt opened its economy, increased its trade and privatized many state-owned companies. As shown in figure 1, the tariff rate in Egypt decreased from 110 % at the end of the eighties to reach 40 % at the end of nineties.

In addition to these tariff cuts, in 2004 the Egyptian government launched the second wave of liberalization. Its objectives were twofold: first, to reduce tariffs and rationalize the tariff structure; and second, to reduce the number of products subject to non-tariff barriers. Figure 2 presents tariff reductions in nominal and effective terms for the manufacturing sectors. Both nominal and effective protection declined for almost all manufacturing sectors after the 2004 reform. Therefore, the second wave had many crucial implications as it reduced tariff dispersion, tariff lines and tariff averages. Tariff dispersion decreased from 27 tariff brackets to 6 thus simplifying procedures, minimizing tariff evasion, and removing possibilities of corruption. Moreover, tariff lines were reduced from 8000 to 6000 which also supported the simplification of procedures. Finally, the tariff cuts decision stated that the average tariff rate would be reduced from 14.6 % to 9 %, which is much less than the 1991 and 1995 averages of 42 and 25 % respectively.

Consequently, as Egypt had considerable success in implementing its trade policy goals, its external trade significantly increased. Figure 3 shows exports and imports trends for goods and services. Exports of goods was boosted by 41.4 % between 1990 and 1999 and then by 110.6 % between 2004 and 2007. Obviously, thanks to the second wave, the exports' growth rate became higher than the first one. Taking a quick glance at the sectoral and gender distribution of trade between 1998 and 2005, the most important sectors witnessing a significant expansion were: transportation equipment (up by 950 %), food products (up by 425 %), electrical machinery (up by 268 %) and chemicals (up by 8.11 %). Employment opportunities for women also increased in these sectors by 143 %, 209 %, 268 % and 333 % respectively. Obviously, such a relationship between sectors expansion and females' work needs to be assessed within an empirical framework.

Moreover, figure 4 explores the Egyptian sectors by gender in 1998 and 2006. It shows female concentration in the education and health sector, the retail and trade sector and the textile manufacturing sector. Those sectors are then more feminized than others; which could have important implications on the analysis of the liberalization impacts on female employment. Therefore, such an evaluation is crucial to determine not only the impact of trade liberalization on income redistribution and specifically on the evolution of females' poverty but also on wages and employment opportunities of both males and females in the labor market.

Table 1 displays the distribution of the working population of our sample by segment[3] and economic working sector. Five economic sectors are considered here: the Government, the Agriculture sector, the Mining sector, Manufacture and the service sector. Statistics shown in this table are constructed using the Egyptian Labor Market Survey (ELMS) of 1998. Considering the government sector, we observe that 65 % of the workers are males and 25 % are females. However, this proportion of females seems to be high compared to the agriculture and the mining sectors where very few women are employed (6% and 0% respectively). In addition, it is quite clear that the government is characterized by a majority (80%) of skilled working population.

3. Methodology

3.1 The microsimulation model

The main role of the microsimulation model in the linked framework is to provide a detailed computation of net incomes at the household level, through a detailed description of the economy's tax-benefit system, and to estimate individual behavioral responses to policy changes (see Colombo, 2007).

The literature on microsimulation models has shown three main ways to undertake a microsimulation analysis[4] . The first one is (the integrated approach) or the micro-accounting methodology where the representative household groups are substituted by the real number of households available in the microeconomic survey. Such a method has a clear shortcoming; it does not take into account the behavioral responses. This is why we use the second method (Top-Down approach) where some micro-econometric work is done in order to take the individuals' behavior into account (Bourguignon et al, 2003). The third method (Top-Down Bottom-Up approach) was developed by Savard (2003), where there is a bidirectional link between the micro and macro levels through many iterations until they converge to the same solution. In our study, we use the Top-Down approach as it gives a relatively good compromise between simplicity and consistency while taking into account the behavior of individuals at the micro level.

The two-stage Heckman selection model is as follows,

$$log(w_{ls}) = \alpha_{l(ls)} + \beta_{l(ls)}.Z_{ls} + \theta_{l(ls)}.\lambda_{ls} + \nu_{ls} \qquad (1)$$

The wage equation computes the logarithm of labor income w_{ls} of individual l belonging to the subgroup s as a linear function of his/her personal characteristics (vector Z_{ls}) and of λ_{ls}, which represents the inverse Mills ratio estimated for the selection model. Eight subgroups are considered here. As presented above, these are: 1. High qualified men in rural regions, 2. High qualified men in urban regions, 3. High qualified women in rural regions, 4. High qualified women in rural regions, 5. Low qualified men in rural regions, 6. Low qualified men in urban regions, 7. Low qualified women in rural regions, and 8. Low qualified women in rural regions. The estimation is done separately for each s. The residual term ν_{ls} describes the effects of unobserved components on wage earnings. This equation is estimated separately for each subgroup. Vector Z of explanatory variables includes some personal characteristics of individual l of the subgroup s. The equation is defined only for individuals at working age (15-65 years old) and estimated separately for each subgroup. The

[3] Segments are: 1. High skilled males in urban areas; 2. Low skilled males in urban areas; 3. High skilled males in rural areas; 4. Low skilled males in rural areas; 5. High skilled females in urban areas; 6. Low skilled females in urban areas; 7. High skilled females in rural areas; 8. Low skilled females in rural areas.

[4] For a detailed literature review on the comparison of those methodologies and their implications, see Colombo (2008)

explanatory variables are the experience, the experience squared, membership of a trade union and dummies to control for industry fixed effects.

3.2 The macroeconomic model

CGE models are powerful tools to capture, in a general equilibrium framework, all direct and indirect effects of macroeconomic shocks (wherever the shock occurs in the economy) on sectoral production and factor demands. This is why we use the CGE model that was constructed by Decaluwé et al (2001) to assess the impact of different economic policies on developing countries. The central assumption is that the economy is a small open one which has no influence on world prices (price taker). Such assumption is consistent with the Egyptian economy. Moreover, it is a perfect competition model; therefore the profit maximization condition implies that the price of a production factor is equal to its marginal productivity. The model belongs to real models where the currency is an instrument of exchange and a unit of account only. Therefore, the currency remains neutral, meaning that price changes affect only the decisions of production and consumption. Some prices are normalized in the benchmark scenario. Regarding the factors of production, labor is perfectly mobile between production sectors, while capital is specific to each of them. They are internationally immobile. Hence, factor endowments are not affected by resources transfers with the rest of the world (RoW).

Unemployment is taken into account in our analysis through a wage curve that links the unemployment rate with real wages as follows,

$$\frac{w}{CPI} = awc.UN^{\zeta} \qquad (2)$$

where w is the average wage rate, CPI the national consumer price index, UN the unemployment rate, ζ the elasticity of unemployment with respect to real wages and, awc a scale parameter in the wage curve.

Regarding labor mobility, the number of Egyptian international migrants is estimated at 4 % of the Egyptian population and 1.5 % of world migrants (Nassar, 2005). Such proportions show to what extent the labor immobility assumption holds in our case. By contrast, international capital mobility as well as internal labor migration (from rural to urban areas) are both important issues for the Egyptian economy. Since we are trying to capture the effect of trade liberalization, such aspects are not the focus of the present paper. However, future research should extend this model in order to take these issues into full consideration.

The existence of foreign savings has no impact on the volume of productive capital. Industries use production factors and intermediate products from other activities. Households allocate their revenues between consumption and savings. Exported goods and those sold on the domestic market are not identical, which leads to an elasticity of transformation among the two commercial products. Reflecting the nature of the classical framework, competition and resource allocation are adjusted through the flexible movement of prices.

3.2.1 The model structure

This CGE model has common features with other CGE models as follows. Production factors (labor and capital) are complementary in the value added following a constant elasticity substitution (CES) function (with constant returns to scale). Similar to Leontief, technical substitution elasticity is zero and a perfect complementarity exists between intermediate inputs on the one hand and between intermediate inputs and production factors or value added on the other hand. Each market satisfies the neoclassical hypothesis of perfect competition (perfect sectoral and geographical mobility).

Modeling the labor market is an essential aspect of our model. Since we are interested in determining the impact of trade policy on the inequality based on three criteria: gender, region and qualification level, we develop a nested CES function between different segments as shown in Figure 6. Most CGE models make the standard hypothesis that different types of labor are perfect substitutes in market production. In the model presented below, we relax such an assumption by considering eight different segments that are imperfect substitutes.

Therefore, the unique labor factor is disaggregated into rural and urban labor in the first level of the nested CES. These two types of labor are imperfect substitutes in sectoral production[5]. Afterwards, in each group (rural and urban), men and women are also assumed to be imperfect substitutes. Finally, the third level is the one between skilled and unskilled workers[6]. Such a modeling allows us to take into account the imperfect substitutability between different segments. Each level of the CES yields different wages between different segments.

Households maximize their utility function represented by a linear expenditure system (LES) subject to their income constraint. Consequently, expenditure on the i^th commodity consists of expenditure on the minimum required quantity for that commodity plus the proportion of the budget which is left over after paying for all minimum requirements. This proportion is the marginal budget share that determines the allocations of supernumerary income. Different consumer price indices are considered for rural and urban households, denoted as PCI_h. Domestic production is distributed between domestic consumption and foreign exports through a constant elasticity of transformation (CET) function. Imports are differentiated by origin following an Armington function. The latter is combined with domestic production through a CES function to satisfy domestic demand. Firms have revenues coming from capital remuneration and transfers. Their expenditures are divided between investment cost and transfers to households. Households and firms pay taxes to government. Moreover, many transfers are made among economic agents, i.e. households, firms, government and the RoW.

The main closure rules are introduced in order to fit the Egyptian economy. The share of the current account to GDP is exogenously fixed[7]. International prices are assumed fixed (Egypt is modeled as a small open economy). A flexible real exchange rate clears the balance with the RoW. The producer price index is the numeraire[8]. Capital is specific to each sector. All transfers, public wages and public employment are constant. Welfare is measured through the equivalent variation that is based on household consumption. Government savings are fixed. Public consumption and government transfers are exogenous. While direct and indirect tax rates are constant, the target of government savings is accomplished through a uniform adjustment in the rate of direct tax. For each household, savings are a fixed share of its disposable income. Firms' savings are also determined by the model. Therefore, none of savings sources is free to equilibrate the aggregate savings-investment balance: the model has savings-driven determination of investment. In other words, the investment volume adjusts to

[5]We use the same elasticity of substitution for all sectors. However, substitution between male and female work may be greater in some sectors than others such as governmental jobs for women. This is why such an assumption may be unrealistic which in turn may under/overestimate the change in both wages and labor demands between men and women. Unfortunately, the lack of available data on these parameters justifies the use of uniform elasticities in different sectors.

[6]These simulations are run under the assumption that the CES parameter between urban and rural workers is 0.7. We fix the elasticity of substitution between male and female labor in market production at 0.5 for all sectors (following Fofana et al, 2003). Finally, the elasticity between skilled and unskilled is 0.3 (following Teal, 1997).

[7]Such an assumption is convenient since the share of the current account to GDP has been relatively constant (on average 0.7%) in Egypt after the ERSAP.

[8]We have also tested for the exchange rate as a numeraire and found out that results remain similar.

achieve the savings-investment equilibrium. Appendix B presents the mathematical statement of the model.

3.3 Linking the two models

The basic difficulty of the microsimulation approach is to ensure consistency between the micro and macro levels of the analysis. A growing literature highlights the linked macro-micro models (see Ahmed and Donoghue, 2004). And the main reason for such linkage is the need to conduct the micro analysis of changes in macroeconomic policies. In this conventional macro- micro literature, integration of CGE and microsimulation models has received the largest share of exposure and discussions. However, it is still a relatively new field in both developed and developing countries. We integrate a CGE and a microsimulation model so that a shock to the CGE model (such as changes in tariffs) transmits the changes in wages, prices and employment levels to the microsimulation model. In order to link the macroeconomic CGE model and the microeconometric model, some accounting equations have to be computed.

First, the total household h's net income YH_h is defined by the sum of the labor income of its members YL_{hl} (with $Wdum_{hl}$ a dummy variable equals 1 if individual l is a wage-worker and 0 otherwise), any exogenous income YX_h, i.e. transfers from the government or the rest of the world to the households net of direct taxes TDH_h as follows:

$$YDH_h = \sum_{l=1}^{8} YL_{hl}.Wdum_{hl} + YX_h - TDH_h \tag{3}$$

In order to compute the real income, a household specific consumer price index has to be calculated by adding the composite price PC_i of commodity i weighted by the budgetary share, allocated to this commodity over the 16 sectors of the economy:

$$PCI_h = \sum_{i=1}^{16} \gamma_{hi}.PC_i \tag{4}$$

Dividing the nominal income by the PCI_h yields the household's real income YHR_h:

$$YDHR_h = \frac{YDH_h}{PCI_h} \tag{5}$$

Once those variables are computed, the microsimulation can be run. First, the change in average earnings in the microsimulation must be equal to the changes in the wage rate generated by the CGE model. In other terms, individuals wage is shocked by the change in the wage obtained from the CGE Δw yielding the logarithm of wage earnings:

$$\log(YL_{ls}) = \log[\overline{YL}_{ls}(1+\Delta w)] \tag{6}$$

This is done by changing the intercept of the wage equation. The rationale behind this is to guarantee neutrality of the changes by shifting proportionally the estimated wages of all individuals without causing any change in the ranking between individuals (Colombo, 2008b). In a nutshell, we impose the macroeconomic results obtained from the CGE model onto the microeconomic level in order to determine the impact of trade liberalization on the different segments of the Egyptian society.

4. Data

4.1 Micro data: ELMS 1998

Data used in this study is obtained from the 1998 ELMS. The ELMS is a nationally representative household survey covering 5,000 households. These households were selected from the Central Agency for Public Mobilizations and Statistics' (CAPMAS) master sample prepared in 1995. The questionnaire is composed of three major sections: (1) a household questionnaire administered to the head of household or the head's spouse that contains information on basic demographic characteristics of household members, movement of household members in and out of the household since 1998, ownership of durable goods and assets, and housing conditions, (2) an individual-specific questionnaire containing information on parental background, detailed education histories, activity status, job search and unemployment, detailed employment characteristics, a module on women's work, migration histories, job histories, time use, earnings and fertility. (3) a household enterprise and income module that elicits information on all agricultural and non-agricultural enterprises operated by the household as well as all income sources, including remittances and transfers.

In the present research, we consider all individuals between 15 and 65 years of age. Our working sample consists of 14,796 individuals equally divided between males and females. And, following an eight-segment division with respect to gender, region and qualification level, we observe, as shown in Table 2, that 34.46, 34.5 and 31.0 % of the masculine rural population are illiterate, low skilled and highly skilled respectively. However, females in rural areas seem to be illiterate with 57.43 %, against only 24.70 % and 17.88 % as low skilled and highly skilled respectively. In contrast, urban areas are characterized by more equality in education between males and females. For instance, 29.32 % of urban males and 28.30 % of females have a low level of education.

Table 3 represents the mean wages of the working population by segment. Generally, males, on average, have higher wages than females regardless of the level of education and the region of residence. The segment benefiting from the highest mean wage is that of highly skilled males living in urban areas. The latter has a mean wage of 262.74 against 218.29 for its female counterpart. Not surprisingly, the lowest mean wage is that of low skilled females living in rural areas.

4.2 Macro data: the SAM 2000/2001

Egypt's 2000/2001 SAM was constructed by the National Institute of Planning affiliated to the Ministry of Planning. The structure of the matrix consists of six major accounts: the production factors, the economic agents, the industries, the composite products, the capital and finally the taxes, which is an account independent from that of the government. The SAM incorporates two production factors: labor and capital, six economic agents: households (rural and urban), companies (private and public), government and the RoW. Regarding the industries, the SAM takes into account 17 branches structured as follows: two branches for agriculture (crop production and animal production), eleven branches for industry (oil and mining, tobacco, food industries, spinning and weaving, clothing (including leather), chemical industries, non-metal industries, industries of basic metals, metal industries, machinery and equipment and other industries) and finally four branches for the services sector (construction and electricity, communication and transport, other productive services and social services). The composite products account includes the same sectors mentioned above. Finally, the taxes account includes: direct taxes, indirect taxes, subsidies and tariffs on imports.

Table 4 indicates that services are the most important sector in Egypt since they contribute by 45 % and 50 % to total production and value-added respectively (thanks to Suez Canal and

tourism). This sector employs 33 % of workers and uses half of the national capital stock. The contribution of agriculture to total production and value added is 17 and 14 % respectively while industry's contribution is 35 and 25 % respectively. Oil and extraction have a small share in production and value added (6 and 8 % respectively). Most of the sectors are capital-intensive except spinning, chemicals, social services and basic metals.

At the external level, Table 5 shows that only the agricultural and industrial sectors are protected and that the tariff rates are higher for the former. Industries have the highest penetration rate (23%)[9]. The major importing sectors are machines and equipments (22% of total imports), chemicals (12.5%) and crop production (12%, particularly wheat). Services are characterized by a high export performance rate (15%) as well the highest share in total exports (72%) followed by industrial ones (24%), especially chemicals, metals, textiles and garments. On average, Egypt has a 14.1% penetration rate, a 11.4% export performance index and a 43% openness index[10].

Concerning institutions, capital income constitutes the largest source of private firms' revenue (88.6%). The government's income is mainly composed of direct taxes (57% of the total revenue) and indirect taxes (25.5%). Firms are the major contributor to aggregate savings (their share in the total savings is 55.5%), followed by urban households (37.5%), who certainly save more than rural ones (27.5%). The government being in deficit, public savings are negative, with a share of -20% to total savings.

As we need to take into account the heterogeneity of economic agents on the labor market, and specifically the gender aspects, we have disaggregated the labor in the Egyptian SAM into eight different segments according to region, qualification and gender. Such a disaggregation allows us to determine the impact of trade liberalization on the inequality between males and females, rural and urban areas and skilled and unskilled workers. Using the micro data, we computed the share of each segment in the wage bill available in the ELMS then we used these shares to determine the income of each segment in the SAM.

We follow Rutherford et al (1993) in selecting the benchmark elasticities. Labor-capital substitution varies across sectors, ranging from 0.43 to 1.99. Trade elasticities are taken from Konan and Maskus (1997). The substitution elasticity between domestic and imported goods (both intermediate and consumption) is set at 2.0. The transformation elasticity between domestic and exported output is also set to 5.0. As for the labor market, substitution elasticity between rural and urban workers is set to a value of 0.7. To stress the rigidity of gender substitution, we follow Fofana et al (2003) by assuming that the elasticity of substitution between men and women is slightly lower and fixed at 0.5. Finally, according to Teal (1997), skilled and unskilled workers are less substitutable with an elasticity equal to 0.3. For the sake of robustness, sensitivity analyses are run . The elasticity of unemployment with respect to real wages (-0.10) has been estimated using the ELMPS following the methodology of Aixála and Pelet (2010).

5. Results

5.1 Econometric results

Tables 6 and 7 display the results of the Heckman selection model for the eight different segments. Table 6 shows the results only for men. Generally, we observe that the probability of being active, for skilled workers, significantly increases with the level of education. But, for unskilled workers, being a member in a trade union is the only factor that significantly

[9]Penetration rate is the defined as the ratio of imports to domestic absorption (output - exports + imports), while exports performance is the ratio of exports to output.

[10]Rate of openness is measured by exports plus imports divided by GDP.

affects their selection into activity. This result is valid for all men living in both rural and urban regions . In the selection equation, we have also controlled for the parental level of education as well as for industry dummies.

We now turn our analysis to the results of the wage equation where the dependent variable is the logarithm of the individual's hourly wage.

For men living in urban areas, it is quite clear that their labor earnings significantly increase with the years of professional experience. This result is valid for both skilled and unskilled men. In addition, being highly educated increases the hourly wage by 0.636 and 0.445 respectively for skilled and unskilled men living in urban areas. Interestingly, being a member of a trade union increases urban skilled men's labor earnings by 16 %. This also holds true for working in the public sector increases wages, yet it is only valid for unskilled men.

Similarly, Table 6 shows the results for men living in rural regions. The only factor that significantly matters for unskilled men is working in the public sector. For skilled men, wages significantly increase with years of experience as well as the educational level.

In Table 7, the results of the Heckman selection model for women are shown. Again, the model is run separately for each segment. Similar to men, women with higher levels of education have higher probabilities to be active. The second and fourth columns of Table 7 show the results of the wage equation for skilled and unskilled urban women respectively. It is quite clear that wages significantly increase with years of experience. Contrary to unskilled urban women, skilled ones having a high level of education tend to earn higher wages. Also, working in the public sector significantly affects skilled women's wages. Note that, being a public sector employee only affects unskilled men's wages as already shown in Table 6.

When looking to the results obtained for the rural women population, we observe that skilled women's wages increase with years of experience. However, unskilled women living in rural areas are negatively affected by the number of years of experience and positively affected by this variable's square. One possible explanation of these results is that rural women start working at earlier ages compared to urban women.

Note that the constants obtained in the wage regressions are then shocked by the changes in wages that result from the CGE model in order to determine the liberalization effects on wages of the active population. Results of the CGE are analyzed in the next section.

5.2 Simulation results

In order to assess the effects of trade liberalization, we run two scenarios. The first one (PLALL) simulates the effect of a partial liberalization of all the sectors. This is done by assuming that Egypt extends a 50% tariff reduction to all countries. [11] The second simulation (PLAGR) examines the effect of a partial liberalization of agriculture. Since the latter is one of the most protected sectors in Egypt, we try to determine the effect of its liberalization, especially that Egypt is a net importer of agriculture products.

Table 8 displays the macroeconomic effects of the two simulations. The results show that the economy reacts weakly to the tariff change. This is due to the fact that tariff levels were already relatively low even before their reduction. This is why all the changes are modest. First, by observing the results of PLALL, reducing tariffs by 50% makes imports more competitive and they increase by 1.92%. Our macroeconomic closure (constant share of current account in GDP) implies that an increase in imports is associated with an increase in

[11] We have run two other simulations. While the first one assesses a complete removal of tariffs, the second one applies a Swiss formula on non-agricultural sectors. Clearly, the more ambitious the simulation, the stronger the effect of trade liberalization.

exports as well. The latter is boosted by 4.76% thanks to a significant depreciation by 2.60%. Removing agriculture tariffs (PLAGR) yields more modest figures since imports increase by some 0.47% and exports by 1.24%. Therefore, the more Egypt liberalizes its external trade, the higher the gains that are generated. In addition, as import prices decrease, the consumer price index declines by 0.79% raising real revenues of different households. That is why consumption rises by 0.62% and 0.92% for urban and rural households respectively and their welfare by 0.54% and 0.79%. Agriculture liberalization yields lower welfare gains (0.1% and 0.25% respectively). Finally, the reduction of the tariff rates on imports does not generate significant losses for the government, as tax revenues do not decrease.

On the one hand, trade liberalization of all sectors has different sectoral implications. First, when all tariffs are removed, Egypt experiences an increase of the most protected sectors such as tobacco imports (by 25%), clothes (by 11.75%), food (by 8.2%) and agricultural products (by 6%). On the export side, sectors where Egypt has a comparative advantage expand. For instance, garments exports increase by 4.08%, chemicals by 4.56%, non-metals by 5.37%, textiles by 5.52% and processed food by 6.74%.

Removing tariffs imposed on agriculture boosts its imports, on average by 10%, to the detriment of all other sectors. On the exports side, processed food exports witness a significant expansion (by 3.5%) since imported inputs coming from agriculture are cheaper. Recall that even in this case, clothes and textiles exports where Egypt has an advantage also increase by 1.11% and 1.76%.

Turning to the labor market, Tables 10 and 11 show that workers hired in textiles, clothes, chemicals, oil and extraction and services are positively affected by trade liberalization. Since these sectors expand, unemployment rate decreases by 0.7%. This conclusion holds for both men and women. Table 12 shows that when trade is fully liberalized, skilled workers in urban and rural areas are positively affected. In urban and rural areas, skilled females witness a higher wage variation (1% and 1.4%) than skilled males (0.3% and 0.5%) thanks to higher labor demand especially in chemicals, clothes and social services. This last sector is one of the most intensive in skilled females after manufacturing. Clearly, females are concentrated in the textile sector since it is intensive in unskilled labor which is more frequent among females as they are less educated than males. On the other hand, services is an important employer of females as it allows for a better reconciliation between work and family lives (maternity leaves, flexible working hours and stability). While unskilled men experience a decrease in their wages, unskilled women's wage in rural areas is boosted by 0.3%.

As Egypt does not have a comparative advantage in agriculture, when the sector is liberalized, production shrinks along with labor demand. This is why unemployment rate increases by 0.5% and unskilled urban workers experience a decrease in their wages. In rural areas, while unskilled men's wages decrease by 0.5%, female wages increase by 1.1% and 0.2% for skilled and unskilled respectively. Such a result may be surprising as one can perceive agriculture as an unskilled, female-intensive sector. In reality, unskilled females working in agriculture, and particularly in rural areas, usually belong to the informal sector or the subsistence work. Such a sector is not taken into account in our analysis as we only focus on the formal sector. However, studying the impact of liberalization on the informal sector is on our research agenda as it represents a significant part of female employment in general, and of the agriculture sector in particular.

After replicating the CGE results at the microeconomic level using the Top-Down approach, we can simply determine the effect of trade liberalization on the individual’s income. Such an analysis is allowed by the microsimulation as we can undertake a poverty and inequality analysis using the Gini coefficient and the Theil index (displayed in Tables 13, 14 and 15) for the eight segments we take into account.

In general, we cannot observe large changes in both the Gini coefficient and the Theil index. This may be explained by the fact that the tariff levels before their reduction were already relatively low. This is why inequality and Theil indices are not significantly altered. Yet, inequality decreases for urban and rural skilled men as well as skilled and unskilled women working in urban areas. By contrast, inequality increases among unskilled men and skilled women in rural areas.

On average, inequality increases among men, unskilled and rural workers. Nonetheless, it decreases among females, skilled and urban workers. This is in line with the literature since trade liberalization makes the labor market more competitive and reduces the gender gap. By contrast, it increases the gap between skilled and unskilled workers due to the skill-bias technological change induced by trade liberalization.

Finally, regarding Theil index, it decreases the most among skilled men and women working in urban areas. By contrast, it increases among skilled and unskilled men working in urban areas.

6. Conclusion

This paper aims at evaluating the liberalization policies' effects on wage inequality in Egypt. Gender, geographical and skill dimensions are used to break down labor into eight segments. The microsimulation approach is a good tool that allows for such an evaluation and determines the effects of macro policies on wage inequalities between the different segments at the individual level. This paper simulates the effect of a partial liberalization in Egypt which implies a reduction of tariffs by 50 %. Results show that the effect of trade liberalization policies depends on the characteristics of the individual and the working sector. Thanks to the expansion of textiles, garments, chemicals and services, inequality decreases for urban and rural skilled men as well as skilled and unskilled women working in urban areas. By contrast, inequality increases among unskilled men and skilled women in rural areas.

Our research agenda includes some methodological and technical aspects in order to better assess the effects of trade liberalization. It would be more interesting to take into account not only the tariff imposed by Egypt but also the one imposed by its trade partners. Such a point should allow us to assess the effect of multilateral trade liberalization which is more beneficial than a unilateral one. This conclusion is in line with the literature on trade liberalization: a country gains more when its main partners liberalize their trade simultaneously. Furthermore, we also need to disaggregate the RoW into many agents, namely by introducing Egypt's main trade partners: USA, EU and Arab countries. In addition, and most importantly, we have to introduce imperfect competition into the model. This assumption is a more realistic one and is quite crucial for trade liberalization issues. Finally, our simulations have been run in a static framework without taking into account long-run benefits. Our analysis should be extended to assess the effect of liberalization in a dynamic framework.

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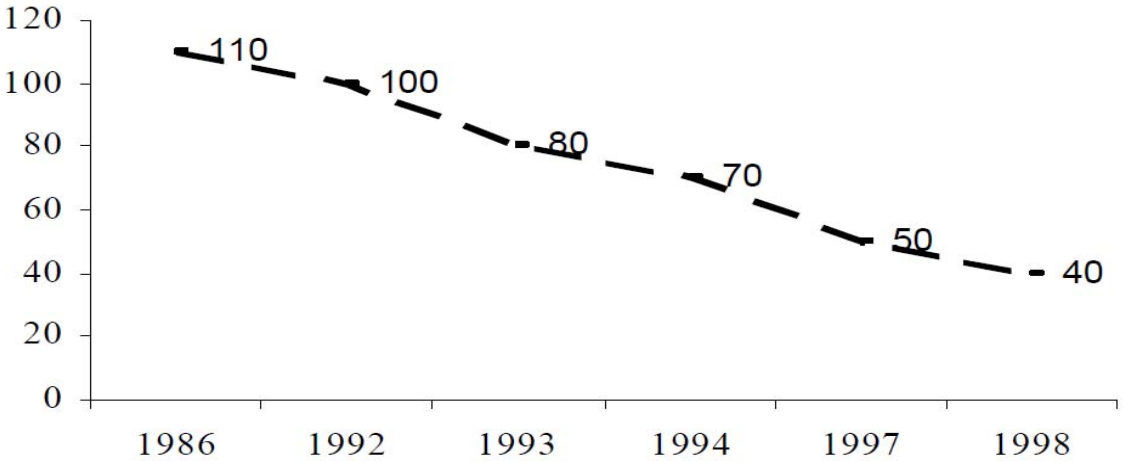
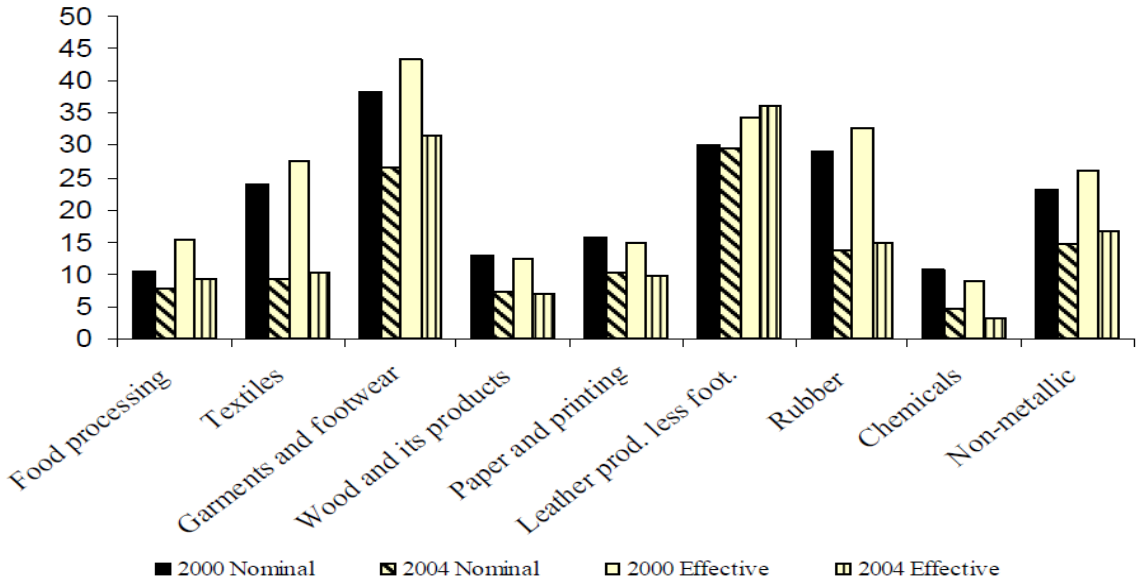
Figure 1: Tariff Rate



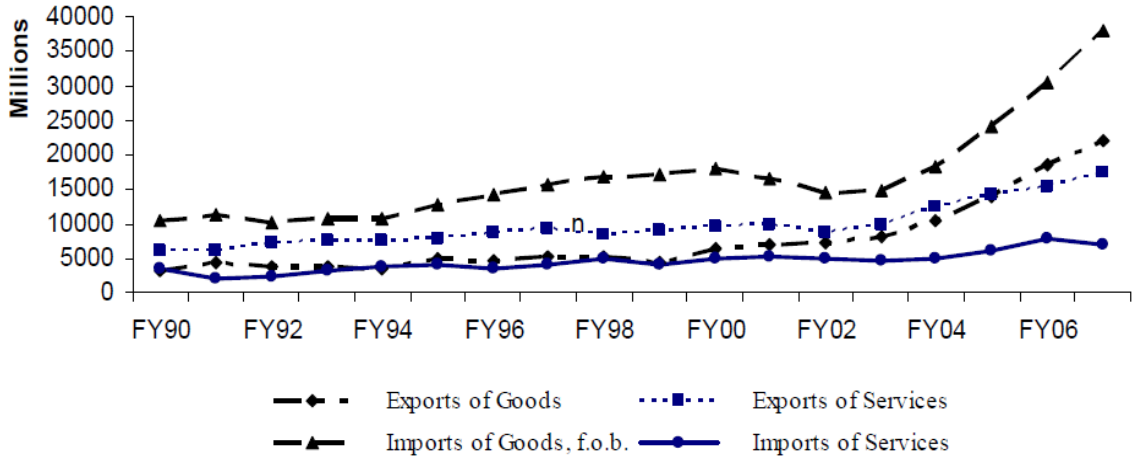
Source: CAPMAS, 2008.

Figure 2: Nominal and Effective Rates of Protection in the Egyptian Manufacturing Activities



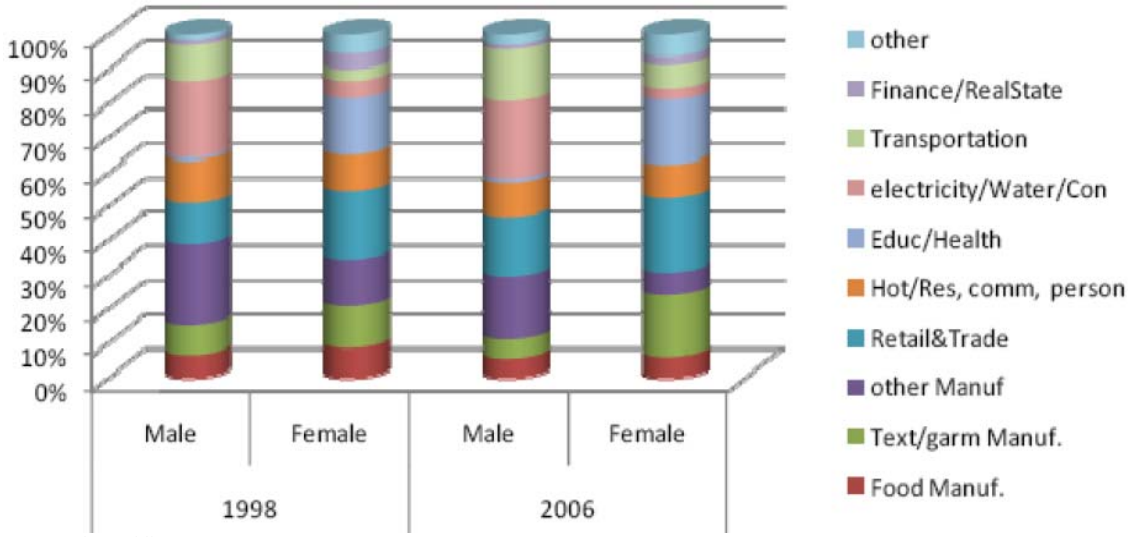
Source: CAPMAS, 2008.

Figure 3: Egypt's Trade: Exports and Imports



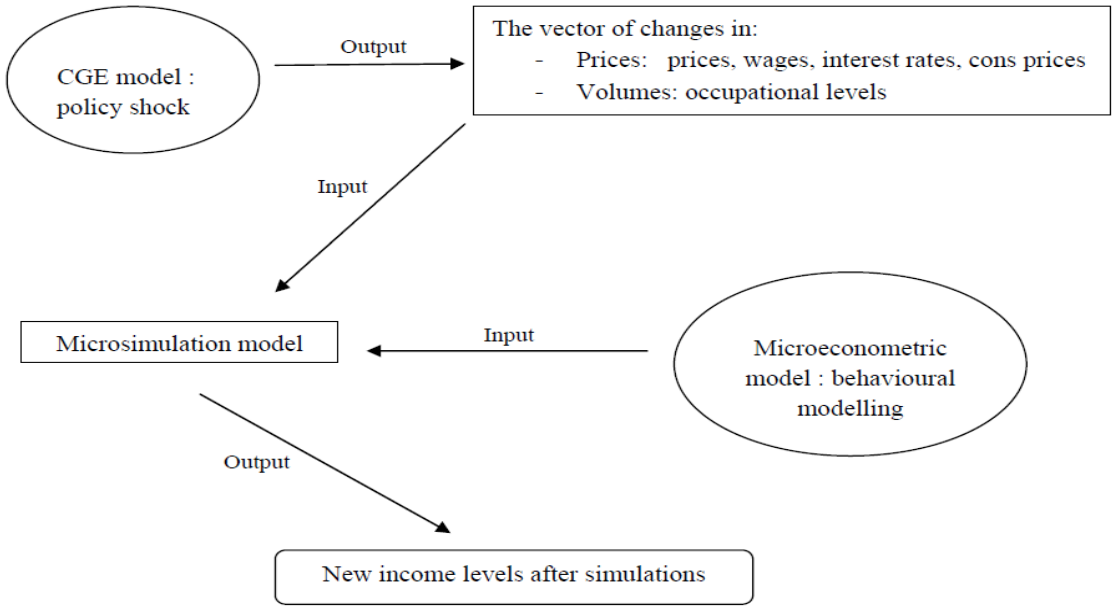
Source: CAPMAS, 2008.

Figure 4: Sectors and Gender



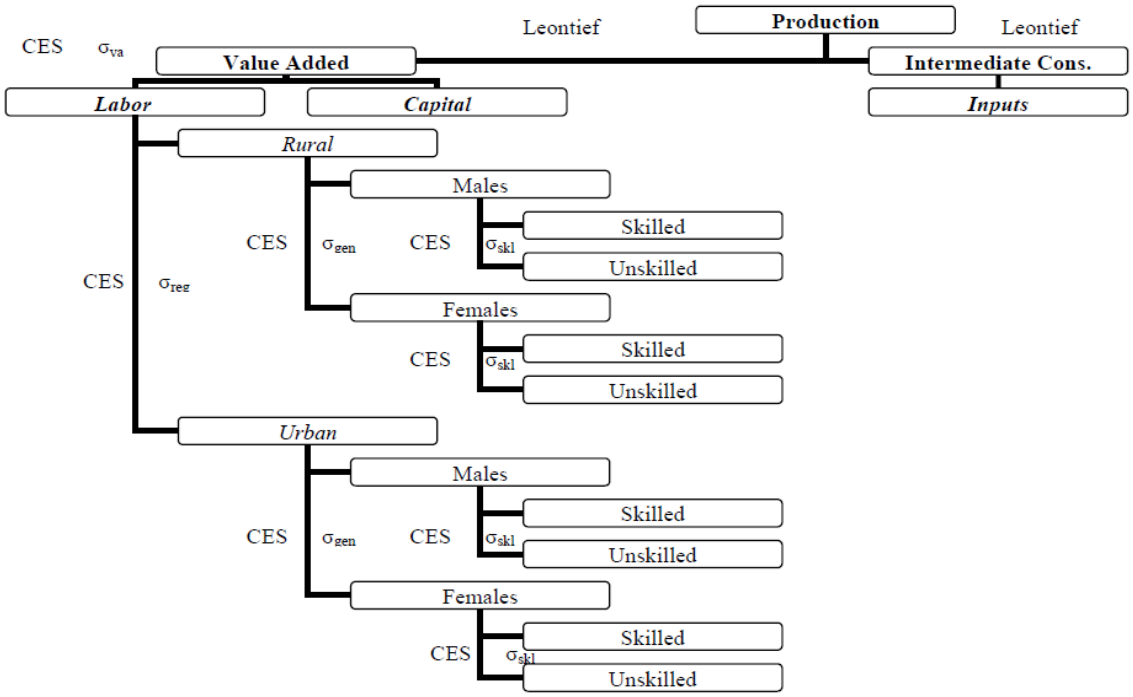
Source: El-Hamidi, 2008.

Figure 5: Microsimulation Mechanisms: The Top-Down Approach



Source: Adapted from Colombo (2008).

Figure 6: Production Structure



Source: Constructed by the authors.

Table 1: Labor by Working Sector and Segment

	Males				Females				Total
	Rural		Urban		Rural		Urban		
	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled	
Government	276	183	754	218	112	7	607	35	2192.00
	13%	8%	34%	10%	5%	0%	28%	2%	100%
Agriculture	61.00	383.00	37.00	116.00	1.00	23.00	1.00	10.00	632.00
	10%	61%	6%	18%	0%	4%	0%	2%	100%
Mining	2.00	4.00	7.00	8.00	0.00	0.00	0.00	0.00	21.00
	10%	19%	33%	38%	0%	0%	0%	0%	100%
Manufacture	70.00	167.00	292.00	325.00	4.00	20.00	43.00	40.00	961.00
	7%	17%	30%	34%	0%	2%	4%	4%	100%
Services	130.00	330.00	579.00	752.00	15.00	52.00	114.00	79.00	2051.00
	6%	16%	28%	37%	1%	3%	6%	4%	100%
Total	539.39	1068.05	1670.04	1420.00	132.06	102.06	765.32	164.07	5862.00
	9%	18%	28%	24%	2%	2%	13%	3%	100%

Notes: Constructed using the ELMS 1998.

Table 2: Labor by Gender, Region and Skills Level

		Men		Women		Total	
Rural Areas							
	Skilled	662	37.40%	199	14.81%	861	27.65%
	Unskilled	1,108	62.60%	1,145	85.19%	2,253	72.35%
	Total	1,770	100.00%	1,344	100.00%	3,114	100.00%
Urban Areas							
	Skilled	1,945	60.18%	884	59.09%	2,829	59.84%
	Unskilled	1,287	39.82%	612	40.91%	1,899	40.16%
	Total	3,232	100.00%	1,496	100.00%	4,728	100.00%

Notes: i. Constructed using the ELMS 1998. ii. Skilled workers correspond to White Collar workers; e.g. working in technical & scientific, managerial, clerical, sales and services occupations. iii. Unskilled workers represents Blue Collar workers; e.g. working in agriculture and production occupations.

Table 3: Mean Wages of the Working Population

		Mean Wages
Males		
	Skilled in Rural	173.24
	Unskilled in Rural	129.84
	Skilled in Urban	262.74
	Unskilled in Urban	146.78
Females		
	Skilled in Rural	132.91
	Unskilled in Rural	89.55
	Skilled in Urban	218.29
	Unskilled in Urban	139.32

Notes: Constructed using the ELMS 1998.

Table 4: Descriptive Statistics from the SAM (1): Production

	Share in Tot. Labor	Share in Tot. Capital	Labor Intensity	Capital Intensity	Share in Prod.	Share in V.A.
AGR-VG	15.2%	10.9%	44.8%	55.2%	9.2%	13.5%
AGR-ANM	4.6%	3.3%	44.8%	55.2%	4.5%	4.1%
OIL/EXTR	0.4%	11.6%	1.8%	98.2%	6.0%	8.1%
FOOD-IND	3.8%	2.3%	49.4%	50.6%	7.3%	3.1%
TOBC	0.5%	2.4%	10.9%	89.1%	1.5%	1.8%
SPIN/WEAV	3.7%	1.4%	60.0%	40.0%	4.0%	2.4%
CLOTH	1.7%	5.9%	14.5%	85.5%	5.5%	4.7%
CHEM	5.5%	2.4%	57.3%	42.7%	6.0%	3.8%
NMET	1.9%	1.5%	42.1%	57.9%	2.4%	1.8%
BAS- MET	2.3%	0.9%	59.0%	41.0%	2.4%	1.6%
MET-IND	0.8%	0.3%	61.7%	38.3%	0.6%	0.5%
ENG/MACH	2.6%	1.5%	51.1%	48.9%	2.4%	2.1%
OTR-IND	2.7%	2.7%	36.8%	63.2%	3.0%	2.9%
TRSP/COM	5.9%	12.4%	21.6%	78.4%	8.4%	10.9%
OTR PROD SER	14.1%	33.9%	19.4%	80.6%	27.5%	28.9%
SOC-SER	13.1%	6.7%	53.1%	46.9%	9.3%	9.8%
	79%*	100%*	31.4% **	68.6%**	100%*	100%*

Notes: (i.) Labor and capital intensity are the share of labor and capital respectively in value-added. (ii.) * means the total of the column and ** means its average.
Source: Authors' calculations from the SAM.

Table 5: Descriptive Statistics from the SAM (2): Trade Policy

	Export Share	Import Share	Tariff	Exports Perf.	Penetration Rate	Openness
AGR-VG	0.9%	12.2%	13.8%	1.1%	16.3%	22.8%
AGR-ANM	0.0%	3.9%	18.1%	0.1%	11.3%	23.3%
OIL/EXTR	3.0%	5.5%	5.7%	5.6%	12.4%	23.2%
FOOD-IND	1.5%	8.6%	17.7%	2.4%	15.0%	77.0%
TOBC	0.0%	2.1%	58.4%	0.1%	17.0%	27.6%
SPIN/WEAV	3.5%	3.5%	11.0%	10.0%	12.3%	61.6%
CLOTH	3.9%	0.5%	17.6%	8.1%	1.5%	18.4%
CHEM	7.0%	12.5%	4.8%	13.3%	25.9%	114.3%
NMET	0.9%	3.0%	10.8%	4.2%	16.1%	49.5%
BAS- MET	3.1%	7.6%	7.1%	14.5%	34.7%	153.5%
MET-IND	0.2%	1.4%	11.7%	4.0%	25.7%	75.6%
ENG/MACH	0.5%	21.8%	6.4%	2.4%	57.2%	259.2%
OTR-IND	3.0%	7.5%	12.5%	11.5%	29.1%	81.8%
TRSP/COM	15.3%	0.8%	9.2%	20.6%	1.8%	28.4%
OTR PROD SER	54.2%	6.4%	0.0%	22.4%	4.2%	40.8%
SOC-SER	2.9%	2.6%	0.0%	3.5%	4.1%	12.0%
	100%*	100% *	15%**	11.4%**	14.1%**	42.9%**

Notes: (i.) Exports performance is the ratio of exports to total output. (ii.) Penetration rate is the ratio of imports to domestic absorption (output + imports - exports). (iii.) Rate of openness is measured by exports plus imports divided by GDP. (iv.) Tariffs are taken from the World Tariffs Profile. (v.) * means the total of the column and ** means its average.
Source: Authors' calculations from the SAM.

Empirical Results

Microeconomic Results

Table 6: Results of the Heckman Model: Men

	Urban				Rural			
	Skilled		Unskilled		Skilled		Unskilled	
	Ln(Wage)	Selection	Ln(Wage)	Selection	Ln(Wage)	Selection	Ln(Wage)	Selection
Experience	0.0378***		0.0255**		0.0270*		0.0167	
	(0.00559)		(0.0119)		(0.0160)		(0.0161)	
Exp. Squared	-0.000358***		-7.86e-05		-0.000268		-0.000196	
	(0.000127)		(0.000248)		(0.000335)		(0.000337)	
High Educ.	0.636***	0.416***	0.445***	-0.0689	0.305*	0.410*	0.292	0.150
	(0.0726)	(0.0992)	(0.120)	(0.0946)	(0.166)	(0.209)	(0.202)	(0.129)
Public sector	-0.0436		0.990***		0.116		1.054***	
	(0.0647)		(0.113)		(0.223)		(0.203)	
Trade Union	0.161***	0.191	-0.0143	0.408***	0.120	0.518	-0.0720	0.695***
	(0.0464)	(0.122)	(0.245)	(0.125)	(0.135)	(0.342)	(0.345)	(0.208)
Lambda		-0.507		-0.432		-1.281*		-1.401
		(0.369)		(1.303)		(0.719)		(0.961)
				-0.808***				-1.304***
Constant	4.292***	0.897**	3.339*		4.615***	1.099**	5.544***	
	(0.208)	(0.382)	(1.773)	(0.131)	(0.432)	(0.552)	(1.703)	(0.0849)
Parents educ.		YES		YES		YES		YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1879		1209		641		965	

Notes: i. Standard errors in parentheses. ii. ***, ** and * represent respectively statistical significance at the 1%, 5% and 10% levels.

Table 7: Results of the Heckman Model: Women

	Urban				Rural			
	Skilled		Unskilled		Skilled		Unskilled	
	Ln(Wage)	Selection	Ln(Wage)	Selection	Ln(Wage)	Selection	Ln(Wage)	Selection
Experience	0.0341***		0.0978***		0.0290***		-1.574***	
	(0.00520)		(0.0299)		(0.00925)		(0.268)	
			-					
Exp. Squared	-4.05e-05		0.00311***		0.000161		0.199***	
	(0.000138)		(0.000788)		(0.000314)		(0.0343)	
High Educ.	0.325***	2.286***	0.529	0.357	0.0896	2.296***	-2.564***	1.988***
	(0.0800)	(0.325)	(0.331)	(0.476)	(0.163)	(0.540)	(0.779)	(0.626)
	-0.262***							
Public sector			-0.439		-0.0701		5.251***	
	(0.0649)		(0.376)		(0.171)		(0.823)	
Trade Union	0.128***	0.265	0.414	5.605	0.102	11.73		
	(0.0360)	(0.389)	(0.519)	(0)	(0.0683)	(5,016)		
Lambda		0.101		-0.139		-0.109		-0.309
		(0.168)		(1.225)		(0.203)		(0.302)
Constant	4.797***	5.110***	5.388***	-6.036***	3.729***	3.765	4.726***	-1.669***
	(0.203)	(0.824)	(0.934)	(0.886)	(0.395)	(1.047e+07)	(0.713)	(0.421)
Parents educ.		YES		YES		YES		YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
Observations	859		70		182		52	

Notes: i. Standard errors in parentheses. ii. ***, ** and * represent respectively statistical significance at the 1%, 5% and 10% levels.

Macroeconomic Results

Table 8: Key Macroeconomic Variables

	PLALL	PLAGR
Total exports	4.76%	1.24%
Total imports	1.92%	0.47%
Total inv.	-5.08%	-1.32%
Firms revenues	0.03%	0.04%
Gov. revenues	-0.09%	-0.01%
Unemployment rate	-0.70%	0.50%
CPI	-0.79%	-0.20%
Exchange rate	2.60%	0.80%
Rural CPI	-0.99%	-0.30%
Urban CPI	-0.59%	-0.10%
Rural welfare	0.79%	0.25%
Urban welfare	0.54%	0.09%
Rural total cons.	0.92%	0.29%
Urban total cons.	0.62%	0.11%
Rural HH real revenue	0.98%	0.27%
Urban HH real revenue	0.58%	0.07%

Notes: i. Source: Authors calculations. ii. Those figures are calculated with respect to the base year scenario.

Table 9: Exports and Imports Variations by Economic Sector

	PLALL		PLAGR	
	Exports	**Imports**	**Exports**	**Imports**
AGRANM	6.70%	8.86%	3.64%	11.94%
AGRVEG	6.44%	5.08%	3.57%	7.93%
INDBAS	5.27%	-0.33%	1.05%	-0.78%
INDCHM	4.56%	-0.15%	1.00%	-0.72%
INDCLO	4.08%	11.75%	1.11%	-1.21%
INDENG	5.87%	-1.78%	1.15%	-1.10%
INDFOOD	6.74%	8.20%	3.50%	-2.46%
INDMET	5.46%	2.59%	1.13%	-0.92%
INDNMET	5.37%	3.55%	1.04%	-0.94%
INDOIL	2.99%	2.06%	0.25%	-0.28%
INDOTH	6.17%	2.86%	1.13%	-1.04%
INDSPIN	5.52%	4.23%	1.76%	-1.34%
INDTOB	17.48%	25.03%	0.82%	-0.81%
SEROTH	4.96%	-6.78%	1.26%	-1.71%
SERTRA	3.61%	4.58%	1.06%	-1.21%
SOCSER	5.17%	-4.79%	1.45%	-1.41%

Notes: i. Source: Authors calculations. ii. Those figures are calculated with respect to the base year scenario.

Table 10: Labor Demand Variations for Men

	PLALL				PLAGR			
	Rural		Urban		Rural		Urban	
	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled
AGRANM	-1.06%	-0.82%	-0.99%	-0.74%	-1.67%	-1.31%	-1.56%	-1.15%
AGRVEG	-1.47%	-1.23%	-1.40%	-1.15%	-2.03%	-1.66%	-1.92%	-1.51%
INDBAS	-0.49%	-0.25%	-0.45%	-0.20%	0.40%	0.77%	0.45%	0.87%
INDCHM	0.94%	1.19%	0.98%	1.24%	0.39%	0.77%	0.45%	0.86%
INDCLO	1.33%	1.57%	1.37%	1.62%	0.21%	0.58%	0.27%	0.68%
INDENG	-2.28%	-2.04%	-2.24%	-2.00%	0.02%	0.39%	0.07%	0.49%
INDFOOD	-0.91%	-0.66%	-0.87%	-0.62%	1.65%	2.02%	1.70%	2.12%
INDMET	-2.49%	-2.26%	-2.46%	-2.21%	0.19%	0.56%	0.24%	0.65%
INDNMET	-1.05%	-0.81%	-1.01%	-0.76%	0.18%	0.55%	0.23%	0.64%
INDOIL	0.40%	0.65%	0.46%	0.71%	0.11%	0.48%	0.19%	0.61%
INDOTH	-1.96%	-1.72%	-1.92%	-1.67%	0.41%	0.79%	0.47%	0.88%
INDSPIN	0.46%	0.70%	0.50%	0.75%	0.63%	1.01%	0.69%	1.10%
INDTOB	-7.67%	-7.45%	-7.64%	-7.40%	0.23%	0.60%	0.28%	0.70%
SEROTH	0.36%	0.60%	0.41%	0.66%	0.15%	0.52%	0.21%	0.63%
SERTRA	2.41%	2.66%	2.46%	2.72%	0.56%	0.93%	0.62%	1.04%
SOCSER	0.83%	1.08%	0.88%	1.14%	0.04%	0.41%	0.11%	0.52%

Notes: i. Source: Authors calculations. ii. Those figures are calculated with respect to the base year scenario.

Table 11: Labor Demand Variations for Women

	PLALL				PLAGR			
	Rural		Urban		Rural		Urban	
	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled
AGRANM	-1.4%	-1.1%	-1.2%	-0.7%	-1.9%	-1.6%	-1.7%	-1.2%
AGRVEG	-1.9%	-1.5%	-1.6%	-1.1%	-2.2%	-2.0%	-2.1%	-1.6%
INDBAS	-0.9%	-0.6%	-0.8%	-0.3%	0.2%	0.5%	0.2%	0.7%
INDCHM	0.5%	0.9%	0.7%	1.2%	0.2%	0.5%	0.2%	0.7%
INDCLO	0.9%	1.3%	1.0%	1.5%	0.0%	0.3%	0.0%	0.5%
INDENG	-2.7%	-2.4%	-2.6%	-2.1%	-0.2%	0.1%	-0.2%	0.3%
INDFOOD	-1.3%	-1.0%	-1.2%	-0.7%	1.4%	1.7%	1.4%	2.0%
INDMET	-2.9%	-2.6%	-2.8%	-2.3%	0.0%	0.2%	-0.1%	0.5%
INDNMET	-1.4%	-1.1%	-1.3%	-0.8%	0.0%	0.2%	-0.1%	0.5%
INDOTH	-2.4%	-2.0%	-2.2%	-1.7%	0.2%	0.5%	0.2%	0.7%
INDSPIN	0.0%	0.4%	0.2%	0.7%	0.4%	0.7%	0.4%	0.9%
INDTOB	-8.1%	-7.7%	-7.9%	-7.5%	0.0%	0.3%	0.0%	0.5%
SEROTH	-0.1%	0.3%	0.1%	0.6%	-0.1%	0.2%	-0.1%	0.4%
SERTRA	2.0%	2.3%	2.1%	2.6%	0.3%	0.6%	0.3%	0.8%
SOCSER	0.4%	0.7%	0.5%	1.0%	-0.2%	0.1%	-0.2%	0.3%

Notes: i. Source: Authors calculations. ii. Those figures are calculated with respect to the base year scenario.

Table 12: Macroeconomic Results: Real Wage Variations

	PLALL	PLAGR
Females rural skilled	1.40%	1.10%
Females rural unskilled	0.30%	0.20%
Males rural skilled	0.50%	0.70%
Males rural unskilled	-0.40%	-0.50%
Females urban skilled	1.00%	1.10%
Females urban unskilled	-0.60%	-0.70%
Males urban skilled	0.30%	0.50%
Males urban unskilled	-0.60%	-0.90%

Notes: i. Source: Authors calculations. ii. Those figures are calculated with respect to the base year scenario.

Microsimulation Results

Table 13: Microsimulation Results: Gini index

	Benchmark	PLALL		PLAGR	
		Level	Variation	Level	Variation
Males urban skilled	0.2769	0.2759	-0.33%	0.2762	-0.24%
Males urban unskilled	0.3451	0.3481	0.88%	0.3492	1.20%
Males rural skilled	0.2784	0.2781	-0.08%	0.2788	0.17%
Males rural unskilled	0.3581	0.3591	0.28%	0.3602	0.59%
Females urban skilled	0.2929	0.2877	-1.80%	0.2866	-2.15%
Females urban unskilled	0.4011	0.3998	-0.33%	0.4000	-0.27%
Females rural skilled	0.3347	0.3351	0.12%	0.3357	0.29%
Females rural unskilled	0.9998	0.9998	0.00%	0.9998	0.00%

Notes: i. Source: Authors calculations. ii. Those figures are calculated with respect to the base year scenario.

Table 14: Microsimulation Results: Average Gini index

	Benchmark	PLALL		PLAGR	
		Level	Variation	Level	Variation
Males	0.31	0.32	0.23%	0.32	0.48%
Females	0.51	0.51	-0.31%	0.51	-0.32%
Unskilled	0.53	0.5267	0.13%	0.53	0.24%
Skilled	0.30	0.2942	-0.51%	0.29	-0.47%
Urban	0.33	0.3279	-0.34%	0.33	-0.30%
Rural	0.49	0.4931	0.06%	0.49	0.18%

Notes: i. Source: Authors calculations. ii. Those figures are calculated with respect to the base year scenario.

Table 15: Microsimulation Results: Theil index

	Benchmark	PLALL		PLAGR	
		Level	Variation	Level	Variation
Males urban skilled	0.1306	0.1290	-1.22%	0.1290	-1.25%
Males urban unskilled	0.1910	0.1943	1.75%	0.1956	2.42%
Males rural skilled	0.1320	0.1321	0.09%	0.1328	0.66%
Males rural unskilled	0.2364	0.2394	1.25%	0.2411	1.96%
Females urban skilled	0.1423	0.1373	-3.53%	0.1362	-4.30%
Females urban unskilled	0.2695	0.2683	-0.44%	0.2687	-0.28%
Females rural skilled	0.1874	0.1877	0.19%	0.1883	0.53%
Females rural unskilled	8.7774	8.6917	-0.98%	8.6913	-0.98%

Notes: i. Source: Authors calculations. ii. Those figures are calculated with respect to the base year scenario.

Appendix A: List of sectors

The Egyptian SAM includes 17 sectors. For the sake of modeling, two service sectors have been merged in order to avoid zero values present in the SAM. Those sectors are distributed as follows: 2 agricultural sectors, 11 industrial ones and 3 services sectors as follows:

Table 16: List of sectors included in the SAM

Abbreviation	Sector
AGRVEG	Agriculture vegetal production
AGRANM	Agriculture animal production
INDOIL	Oil and extraction industry
INDFOOD	Food industry
INDTOB	Tobacco industry
INDSPIN	Spinning and weaving industry
INDCLO	Clothes(includes leather)
INDCHM	Chemical industries
INDNMET	Non-metal industries
INDBAS	Basic metal industries
INDMET	Metal industries
INDENG	Enginery and machinery industries
INDOTH	Other industries
SERTRA	Transport and communication services
SEROTH	Other services
SOCSER	Social services

Appendix B: Mathematical Statement of the CGE Model

Indices Definition

h	Household of type h
i and j	Sectors of the economy (16 sectors)
l	Individuals and type of labor
t	Time index

Parameters definition

1- Production functions

ν_j	Share of the value added in the production (Leontief) of sector j
io_j	Share of intermediary consumption in the production (Leontief) of sector j
aij_{ij}	Intermediary consumption of good i by unity of production of sector j
δ_j	Share of sector j value added of in GDP at factor cost

2- CES function between capital and labor

A_j^{va}	Scale parameter of the value added CES function of sector j
α_j^{va}	Share parameter of the value added CES function of sector j
ρ_j^{va}	Substitution parameter between labor and capital
σ_j^{va}	Substitution elasticity (value added function)

3- CES function between types of labor

First level

A_j^{reg}	Scale parameter of the labor CES function in urban/rural
ρ_j^{reg}	Substitution parameter between labor in urban/rural
σ_i^{reg}	Substitution elasticity parameter among labor in urban/rural
α_j^{reg}	Share parameter of the labor CES function in urban/rural

Second level

$A_j^{UR,gen}$	Scale parameter of the labor CES function among males/females in urban
$\rho_j^{UR,gen}$	Substitution parameter between labor among males/females in urban
$\sigma_i^{UR,gen}$	Substitution elasticity parameter among males/females in urban
$\alpha_j^{UR,gen}$	Share parameter of the labor CES function among males/females in urban
$A_j^{RU,gen}$	Scale parameter of the labor CES function among males/females in rural
$\rho_j^{RU,gen}$	Substitution parameter between labor among males/females in rural
$\sigma_i^{RU,gen}$	Substitution elasticity parameter among males/females in rural
$\alpha_j^{RU,gen}$	Share parameter of the labor CES function among males/females in rural

Third level

$A_j^{URMA,skl}$	Scale parameter of the labor CES function skilled/unskilled males in urban
$\rho_j^{URMA,skl}$	Substitution parameter between labor among skilled/unskilled males in urban
$\sigma_i^{URMA,skl}$	Substitution elasticity parameter among skilled/unskilled males in urban
$\alpha_j^{URMA,skl}$	Share parameter of the labor CES function among skilled/unskilled males in urban
$A_j^{URFE,skl}$	Scale parameter of the labor CES function skilled/unskilled females in urban
$\rho_j^{URFE,skl}$	Substitution parameter between labor among skilled/unskilled females in urban
$\sigma_i^{URFE,skl}$	Substitution elasticity parameter among skilled/unskilled females in urban
$\alpha_j^{URFE,skl}$	Share parameter of the labor CES function among skilled/unskilled females in urban
$A_j^{RUMA,skl}$	Scale parameter of the labor CES function skilled/unskilled males in rural
$\rho_j^{RUMA,skl}$	Substitution parameter between labor among skilled/unskilled males in rural
$\sigma_i^{RUMA,skl}$	Substitution elasticity parameter among skilled/unskilled males in rural
$\alpha_j^{RUMA,skl}$	Share parameter of the labor CES function among skilled/unskilled males in rural
$A_j^{RUFE,skl}$	Scale parameter of the labor CES function skilled/unskilled females in rural
$\rho_j^{RUFE,skl}$	Substitution parameter between labor among skilled/unskilled females in urban
$\sigma_i^{RUFE,skl}$	Substitution elasticity parameter among skilled/unskilled females in rural
$\alpha_j^{RUFE,skl}$	Share parameter of the labor CES function among skilled/unskilled females in rural

4- Demand functions

φ_h	Household h propensity to save
γ_{ih}	Budgetary share of good i in the income of household h
μ_i	Share of investment demand of sector i in total investment
λ_w^H	Share of household h in the wages bill
$C_{i,h}^{min}$	Minimal consumption of good i by household h

5- Tax rates

tx_j	Indirect taxes rate applied on sector j products
tm_j	Import tariff rate applied on sector j products
te_j	Export tariff rate applied on sector j products
tp_j	Production tax rate applied on sector j
tyh_h	Direct tax rate applied on household h income
tyf	Direct tax rate applied on firms income

6- CES function between imports and domestic production

A_j^m	Scale parameter of the Armington CES function
α_j^m	Share parameter of the Armington CES function

ρ_j^m	Substitution parameter
σ_j^m	Substitution elasticity (Armington function)

7- CET function between exports and domestic production

B_j^e	Scale parameter of the CET production function
β_j^e	Share parameter of the CET production function
τ_j^e	Transformation elasticity (CET production function)
ε_j^e	Price elasticity
κ_j^e	Transformation parameter
EXD_j^o	Scale parameter of exports

8- Unemployment parameters

awc	Scale parameter in the wage curve
ζ	Elasticity of unemployment with respect to real wages

Variables Definition

A- Endogenous variables

1- Production

VA_j	Value added of sector j
XS_j	Production of sector j
XXS_j	Production of sector j at basic prices
CI_j	Total intermediary consumption of sector j
$DI_{i,j}$	Intermediary demand of product i by sector j

2- Production factors

KD_j	Capital demand by sector j
LS	Labor supply
LD_j	Labor demand by sector j
W_j	Wage rate in sector I
UN	Unemployment rate

First level

$LFD_{UR,j}$	Labor demand of sector j in urban areas
$LFD_{RU,j}$	Labor demand of sector j in rural areas
$W_{UR,j}$	Wage rate of sector j in urban areas

$W_{RU,j}$ Wage rate of sector j in rural areas

Second level

$LFD_{URMA,j}$ Labor demand of males working sector j in urban areas

$LFD_{RUMA,j}$ Labor demand of males working sector j in rural areas

$W_{URMA,j}$ Wage rate of males working sector j in urban areas

$W_{RUMA,j}$ Wage rate of males working sector j in rural areas

$LFD_{URFE,j}$ Labor demand of females working sector j in urban areas

$LFD_{RUFE,j}$ Labor demand of females working sector j in rural areas

$W_{URFE,j}$ Wage rate of females working sector j in urban areas

$W_{RUFE,j}$ Wage rate of females working sector j in rural areas

Third level

$LFD_{URMASK,j}$ Labor demand of skilled males working sector j in urban areas

$LFD_{RUMASK,j}$ Labor demand of skilled males working sector j in rural areas

$W_{URMASK,j}$ Wage rate of skilled males working sector j in urban areas

$W_{RUMASK,j}$ Wage rate of skilled males working sector j in rural areas

$LFD_{URFESK,j}$ Labor demand of skilled females working sector j in urban areas

$LFD_{RUFESK,j}$ Labor demand of skilled females working sector j in rural areas

$W_{URFESK,j}$ Wage rate of skilled females working sector j in urban areas

$W_{RUFESK,j}$ Wage rate of skilled females working sector j in rural areas

$LFD_{URMAUK,j}$ Labor demand of unskilled males working sector j in urban areas

$LFD_{RUMAUK,j}$ Labor demand of unskilled males working sector j in rural areas

$W_{URMAUK,j}$ Wage rate of unskilled males working sector j in urban areas

$W_{RUMAUK,j}$ Wage rate of unskilled males working sector j in rural areas

$LFD_{URFEUK,j}$ Labor demand of unskilled females working sector j in urban areas

$LFD_{RUFEUK,j}$ Labor demand of unskilled females working sector j in rural areas

$W_{URFEUK,j}$ Wage rate of unskilled females working sector j in urban areas

$W_{RUFEUK,j}$ Wage rate of unskilled females working sector j in rural areas

3- Prices

r_j Capital return in sector j

Pv_j Value added price of sector j

Pc_j Market price of the composite good belonging to sector j

P_j Production price on factor cost of sector j

Pl_j Producer price of sector j product sold on the domestic market

$Pfob_j$ Fob price of the exported good j

Pm_j Domestic price of the imported good j

Pe_j	Producer price of the exported good j
$Pinv_j$	Investment price index
PCI_h	Consumer price index for household h
e	Nominal exchange rate
CPI	National consumer price index

4- Revenues and Savings

YH_h	Household h income
YDH_h	Disposable income of household h
YF	Firms income
YG	Government income
SH_h	Household h savings
SF	Firms savings
SG	Government savings

5- Tax revenues

TDH_h	Receipts from direct taxes of household h
TDF	Receipts from direct taxes of firms
TI_j	Receipts from indirect of sector j
TIM_j	Receipts from import tariffs of goods j
TIE_j	Receipts from export tariffs of goods j
TIP_j	Receipts from production taxes

6- External Trade

EX_j	Export supply of product j
EXD_j	Export demand of product j
M_j	Import demand of product j
D_j	Domestic production of sector j sold on the domestic market
Q_j	Supply of composite product belonging to sector j

7- Final Demand

$C_{i,h}$	Consumption of good i by household h
INV_i	Investment demand of product i
DIT_i	Total intermediary demand of input i
IT	Gross fixed capital formation
$ITVOL$	Volume of total investment
EV_h	Equivalent variation of household h

8- Other variables

$savadj$	Adjustment variable for investment and savings
$Leon$	Walras law verification variable

B- Exogenous variables

w^g	Worker L wage rate in government
G_i	Public consumption of product i
LD_G	Labor demand by public sector
TG_h	Transfers made by the government to household h
DIV_h	Dividends distributed by firms to household h
Pwm_j	International import price of product j (foreign currency)
Pwe_j	International export price of product j (foreign currency)
$Pindex$	GDP deflator, numéraire
CAB	Current account balance (external savings)
$TR_{ROW,h}$	Transfers from the Rest of the World to household h
$TR_{h,f}$	Transfers from household h to the firms
$TR_{ROW,f}$	Transfers from the Rest of the World to the firms
$TR_{G,f}$	Transfers from the government to the firms
$TR_{ROW,G}$	Transfers from the Rest of the World to the government
$TR_{G,ROW}$	Transfers from the government to the Rest of the World

The Model Equations

1- Production Bloc

$$XS_j = min[(\frac{CI_j}{io_j})(\frac{VA_j}{\nu_j})] \tag{1}$$

$$XXS_j = XS_j.tp_j \tag{2}$$

$$VA_j = A_j^{va}[\alpha_j^{va} LD_j^{-\rho_j^{va}} + (1-\alpha_j^{va}) KD_j^{-\rho_j^{va}}]^{\frac{-1}{\rho_j^{va}}} \tag{3}$$

$$CI_j = io_j XS_j \tag{4}$$

$$DI_{ij} = aij_{ij} CI_j \tag{5}$$

$$LD_j = (\frac{\alpha_j^{va}}{1-\alpha_j^{va}})^{\sigma_j^{va}} (\frac{r_j}{W_j})^{\sigma_j^{va}} KD_j \tag{6}$$

First level

$$LD_j = A_j^{reg}[\alpha_j^{reg} LFD_{UR,j}^{-\rho_j^{reg}} + (1-\alpha_j^{reg}) LFD_{RU,j}^{-\rho_j^{reg}}]^{\frac{-1}{\rho_j^{reg}}} \tag{7}$$

$$LFD_{UR,j} = (\frac{\alpha_j^{reg}}{1-\alpha_j^{reg}})^{\sigma_j^{reg}} (\frac{W_{RU,j}}{W_{UR,j}})^{\sigma_j^{reg}} LFD_{RU,j} \tag{8}$$

$$W_j = (W_{UR,j} LFD_{UR,j} + W_{RU,j} LFD_{RU,j})/LD_j \tag{9}$$

Second level

$$LFD_{UR,j} = A_j^{UR,gen}[\alpha_j^{UR,gen} LFD_{URFE,j}^{-\rho_j^{UR,gen}} + (1-\alpha_j^{UR,gen}) LFD_{URMA,j}^{-\rho_j^{UR,gen}}]^{\frac{-1}{\rho_j^{UR,gen}}} \tag{10}$$

$$LFD_{URMA,j} = (\frac{\alpha_j^{UR,gen}}{1-\alpha_j^{UR,gen}})^{\sigma_j^{UR,gen}} (\frac{W_{URFE,j}}{W_{URMA,j}})^{\sigma_j^{UR,gen}} LFD_{URFE,j} \tag{11}$$

$$W_{UR,j} = (W_{URMA,j} LFD_{URMA,j} + W_{URFE,j} LFD_{URFE,j})/LFD_{UR,j} \tag{12}$$

$$LFD_{RU,j} = A_j^{RU,gen}[\alpha_j^{RU,gen} LFD_{RUFE,j}^{-\rho_j^{RU,gen}} + (1-\alpha_j^{RU,gen}) LFD_{RUMA,j}^{-\rho_j^{RU,gen}}]^{\frac{-1}{\rho_j^{RU,gen}}} \tag{13}$$

$$LFD_{RUMA,j} = (\frac{\alpha_j^{RU,gen}}{1-\alpha_j^{RU,gen}})^{\sigma_j^{RU,gen}} (\frac{W_{RUFE,j}}{W_{RUMA,j}})^{\sigma_j^{RU,gen}} LFD_{RUFE,j} \tag{14}$$

$$W_{RU,j} = (W_{RUMA,j} LFD_{RUMA,j} + W_{RUFE,j} LFD_{RUFE,j}) / LFD_{RU,j} \tag{15}$$

Third level

$$LFD_{URMA,j} = A_j^{URMA,skl} [\alpha_j^{URMA,skl} LFD_{URMASK,j}^{-\rho_j^{URMA,skl}} + (1-\alpha_j^{URMA,skl}) LFD_{URMAUK,j}^{-\rho_j^{URMA,skl}}]^{\frac{-1}{\rho_j^{URMA,skl}}} \tag{16}$$

$$LFD_{URMASK,j} = \left(\frac{\alpha_j^{URMA,skl}}{1-\alpha_j^{URMA,skl}}\right)^{\sigma_j^{URMA,skl}} \times \left(\frac{W_{URMAUK,j}}{W_{URMASK,j}}\right)^{\sigma_j^{URMA,skl}} LFD_{URMAUK,j} \tag{17}$$

$$W_{URMA,j} = (W_{URMASK,j} LFD_{URMASK,j} + W_{URMAUK,j} LFD_{URMAUK,j}) / LFD_{URMA,j} \tag{18}$$

$$LFD_{RUMA,j} = A_j^{RUMA,skl} [\alpha_j^{RUMA,skl} LFD_{RUMASK,j}^{-\rho_j^{RUMA,skl}} + (1-\alpha_j^{RUMA,skl}) LFD_{RUMAUK,j}^{-\rho_j^{RUMA,skl}}]^{\frac{-1}{\rho_j^{RUMA,skl}}} \tag{19}$$

$$LFD_{RUMASK,j} = \left(\frac{\alpha_j^{RUMA,skl}}{1-\alpha_j^{RUMA,skl}}\right)^{\sigma_j^{RUMA,skl}} \times \left(\frac{W_{RUMAUK,j}}{W_{RUMASK,j}}\right)^{\sigma_j^{RUMA,skl}} LFD_{RUMAUK,j} \tag{20}$$

$$W_{RUMA,j} = (W_{RUMASK,j} LFD_{RUMASK,j} + W_{RUMAUK,j} LFD_{RUMAUK,j}) / LFD_{RUMA,j} \tag{21}$$

$$LFD_{URFE,j} = A_j^{URFE,skl} [\alpha_j^{URFE,skl} LFD_{URFESK,j}^{-\rho_j^{URFE,skl}} + (1-\alpha_j^{URFE,skl}) LFD_{URFEUK,j}^{-\rho_j^{URFE,skl}}]^{\frac{-1}{\rho_j^{URFE,skl}}} \tag{22}$$

$$LFD_{URFESK,j} = \left(\frac{\alpha_j^{URFE,skl}}{1-\alpha_j^{URFE,skl}}\right)^{\sigma_j^{URFE,skl}} \times \left(\frac{W_{URFEUK,j}}{W_{URFESK,j}}\right)^{\sigma_j^{URFE,skl}} LFD_{URFEUK,j} \tag{23}$$

$$W_{URFE,j} = (W_{URFESK,j} LFD_{URFESK,j} + W_{URFEUK,j} LFD_{URFEUK,j}) / LFD_{URFE,j} \tag{24}$$

$$LFD_{RUFE,j} = A_j^{RU,skl}[\alpha_j^{RUFE,skl} LFD_{RUFESK,j}^{-\rho_j^{RUFE,skl}} + (1-\alpha_j^{RUFE,skl}) LFD_{RUFEUK,j}^{-\rho_j^{RUFE,skl}}]^{\frac{-1}{\rho_j^{RUFE,skl}}} \quad (25)$$

$$LFD_{RUFESK,j} = (\frac{\alpha_j^{RUFE,skl}}{1-\alpha_j^{RUFE,skl}})^{\sigma_j^{RUFE,skl}} \times (\frac{W_{RUFEUK,j}}{W_{RUFESK,j}})^{\sigma_j^{RUFE,skl}} LFD_{RUFEUK,j} \quad (26)$$

$$W_{RUFE,j} = (W_{RUFESK,j} LFD_{RUFESK,j} + W_{RUFEUK,j} LFD_{RUFEUK,j})/LFD_{RUFE,j} \quad (27)$$

2- Revenues and Savings Bloc

$$YH_h = \lambda_w^h \sum_{j=1}^{16} LD_j.w + TR_{G,h} + DIV_h + TR_{ROW,h} + \lambda_w^h.LG_G \quad (28)$$

$$YDH_h = YH_h - TD_h - TR_{h,e} \quad (29)$$

$$YF = \sum_{j=1}^{16} r_j KD_j + TR_{ROW,f} + \sum_{h=hu}^{hr} TR_{h,f} + TR_{G,f} \quad (30)$$

$$SH_h = \varphi_h YDH_h \quad (31)$$

$$SF = YF - \sum_{h=hu}^{hr} DIV_h - TDF \quad (32)$$

3- Government Revenues and Savings

$$TIP_j = tp_j P_j XS_j \quad (33)$$

$$TI_j = tx_j(Pl_j D_j) + tx_j(1+tm_j+tt_j)e_t Pwm_j M_j \quad (34)$$

$$TIM_j = tm_j Pwm_j eM_j \quad (35)$$

$$TIE_j = te_j Pe_j EX_j \quad (36)$$

$$TDH_h = tyh_h YH_h \quad (37)$$

$$TDF = tyfYF \quad (38)$$

$$YG = \sum_{j=1}^{16} TIM_j + \sum_{j=1}^{16} TIE_j + \sum_{j=1}^{16} TI_j$$

$$+\sum_{h=hu}^{hr} TDH_h + TDF + TR_{ROW,G} \tag{39}$$

$$SG = YG - \sum_{j=1}^{16} G_i - \sum_{h=hu}^{hr} TR_h - TR_{G,f} - wLD_G - TR_{G,ROW} \tag{40}$$

4- Final Demand Bloc

$$PC_iC_{i,h} = PC_iC_{i,h}^{min} + \gamma_{ih}(YDH_h - \sum_i PC_iC_{ih}^{min}) \tag{41}$$

$$INV_i = \frac{\mu_i IT}{Pc_i} \tag{42}$$

$$DIT_i = \sum_{j=1}^{16} DI_{ij} \tag{43}$$

5- Prices Bloc

$$Pv_j = \frac{P_jXS_j - \sum_{i=1}^{16} Pc_iDI_{i,j}}{VA_j} \tag{44}$$

$$r_j = \frac{Pv_jVA_j - w_jLD_j}{KD_j} \tag{45}$$

$$Pm_j = ePwm_j(1+tm_j)(1+tx_j) \tag{46}$$

$$Pe_j = \frac{ePfob_j}{(1+te_j)} \tag{47}$$

$$Pc_j = (1+tx_j)\frac{Pl_jD_j + Pm_jM_j}{Q_j} \tag{48}$$

$$P_j = \frac{Pl_jD_j + Pe_jEX_j}{XS_j} \tag{49}$$

$$Pinv_j = \prod (\frac{Pc_j}{\mu_j})^{\mu_j} \tag{50}$$

$$Pindex = \sum_{j=1}^{16} Pv_j\delta_j \tag{51}$$

$$PCI_h = \sum_{i=1}^{16} \gamma_{hi}.PC_i \tag{52}$$

6- International Trade Bloc

$$XS_j = B_j^e[\beta_j^e EX_j^{-\kappa_j^e} + (1-\beta_j^e)D_j^{-\kappa_j^e}]^{-\frac{1}{\kappa_j^e}} \quad (53)$$

$$EX_j = [(\frac{1-\beta_j^e}{\beta_j^e})(\frac{Pe_j}{Pl_j})]^{\tau_j^e} D_j \quad (54)$$

$$EXD_j = EXD_j^o(\frac{Pwe_j}{Pfob_j})^{\varepsilon_j^e} \quad (55)$$

$$Q_j = A_j^m[\alpha_j^m M_j^{-\rho_j^m} + (1-\alpha_j^m)D_j^{-\rho_j^m}]^{-\frac{1}{\rho_j^m}} \quad (56)$$

$$M_j = [(\frac{\alpha_j^m}{1-\alpha_j^m})(\frac{Pd_j}{Pm_j})]^{\sigma_j^m} D_j \quad (57)$$

$$CAB = e\sum_{j=1}^{16} Pwm_j M_j + TR_{G,ROW} - TR_{ROW,h} - TR_{ROW,G} - TR_{ROW,f} - e\sum_{j=1}^{16} Pfob_j EX_j \quad (58)$$

7- Equilibrium Equations Bloc

$$LS(1-UN) = \sum_s \sum_{j=1}^{16} LD_{j,s} + \sum_s LDG_s \quad (59)$$

$$\frac{w}{CPI} = awc.UN^{\zeta} \quad (60)$$

$$Q_i = DIT_i + \sum_{h=hu}^{hr} C_{i,h} + INV_i + G_i \quad (61)$$

$$IT = \sum_{h=hu}^{hr} SH_h + SF + SG + CAB \quad (62)$$

$$IT = Pinv.\sum Ind_i \quad (63)$$

$$ITVOL = \frac{IT}{Pinv} \quad (64)$$

$$EXD_j = EX_j \quad (65)$$

$$EV_h = (\prod_i (PCO_i/PC_i)^{\gamma_{i,h}} * YH_h) - YHO_h \quad (66)$$

Appendix C: Sensitivity Analysis

Table 17: Labor Demand Variations for Women

	Region				Gender				Skilled			
	Rural		Urban		Rural		Urban		Rural		Urban	
	Skilled	Unsk.	Skilled	Unsk.	Skilled	Unsk.	Skilled	Unsk.	Skilled	Unsk.	Skilled	Unsk.
AGRANM	-1.5%	-1.2%	-1.2%	-0.7%	-1.4%	-1.1%	-0.8%	-0.4%	-1.6%	-1.2%	-1.6%	-1.0%
AGRVEG	-1.9%	-1.6%	-1.6%	-1.1%	-1.8%	-1.5%	-1.2%	-0.8%	-2.0%	-1.6%	-2.0%	-1.4%
INDBAS	-0.9%	-0.6%	-0.8%	-0.3%	-0.8%	-0.5%	-0.7%	-0.3%	-0.9%	-0.6%	-0.8%	-0.2%
INDCHM	0.5%	0.9%	0.7%	1.1%	0.6%	0.9%	0.7%	1.1%	0.5%	0.9%	0.6%	1.2%
INDCLO	0.9%	1.3%	1.0%	1.5%	1.0%	1.3%	1.1%	1.5%	0.9%	1.3%	1.0%	1.7%
INDENG	-2.7%	-2.3%	-2.6%	-2.1%	-2.6%	-2.3%	-2.5%	-2.1%	-2.7%	-2.3%	-2.6%	-2.0%
INDFOOD	-1.3%	-1.0%	-1.2%	-0.7%	-1.3%	-0.9%	-1.1%	-0.8%	-1.4%	-1.0%	-1.2%	-0.6%
INDMET	-2.9%	-2.5%	-2.8%	-2.3%	-2.8%	-2.5%	-2.7%	-2.4%	-2.9%	-2.6%	-2.8%	-2.2%
INDNMET	-1.4%	-1.1%	-1.3%	-0.9%	-1.4%	-1.1%	-1.3%	-0.9%	-1.5%	-1.1%	-1.3%	-0.7%
INDOTH	-2.3%	-2.0%	-2.2%	-1.8%	-2.3%	-2.0%	-2.2%	-1.8%	-2.4%	-2.0%	-2.2%	-1.6%
INDSPIN	0.1%	0.4%	0.2%	0.7%	0.1%	0.4%	0.2%	0.6%	0.0%	0.4%	0.1%	0.8%
INDTOB	-8.0%	-7.7%	-7.9%	-7.5%	-8.0%	-7.7%	-7.9%	-7.5%	-8.1%	-7.7%	-7.9%	-7.4%
SEROTH	-0.1%	0.3%	0.1%	0.5%	-0.1%	0.2%	0.0%	0.4%	0.0%	0.3%	0.1%	0.7%
SERTRA	2.0%	2.3%	2.1%	2.6%	2.0%	2.3%	2.1%	2.5%	2.0%	2.4%	2.2%	2.8%
SOCSER	0.4%	0.7%	0.5%	1.0%	0.4%	0.7%	0.5%	0.9%	0.4%	0.8%	0.6%	1.2%

Notes: i. Source: Authors calculations. ii. Those figures are calculated with respect to the base year scenario.

Table 18: Labor Demand Variations for Men

	Region				Gender				Skilled			
	Rural		Urban		Rural		Urban		Rural		Urban	
	Skilled	Unsk.	Skilled	Unsk.	Skilled	Unsk.	Skilled	Unsk.	Skilled	Unsk.	Skilled	Unsk.
AGRANM	-1.1%	-0.8%	-1.0%	-0.7%	-1.1%	-0.8%	-1.0%	-0.8%	-1.1%	-0.9%	-1.1%	-0.8%
AGRVEG	-1.5%	-1.3%	-1.4%	-1.1%	-1.5%	-1.2%	-1.4%	-1.2%	-1.5%	-1.3%	-1.5%	-1.2%
INDBAS	-0.5%	-0.2%	-0.5%	-0.2%	-0.5%	-0.3%	-0.5%	-0.2%	-0.5%	-0.2%	-0.4%	-0.1%
INDCHM	1.0%	1.2%	1.0%	1.2%	0.9%	1.2%	1.0%	1.2%	0.9%	1.2%	1.0%	1.3%
INDCLO	1.3%	1.6%	1.4%	1.6%	1.3%	1.6%	1.4%	1.6%	1.4%	1.6%	1.4%	1.7%
INDENG	-2.3%	-2.0%	-2.3%	-2.0%	-2.3%	-2.0%	-2.2%	-2.0%	-2.3%	-2.0%	-2.2%	-1.9%
INDFOOD	-0.9%	-0.6%	-0.9%	-0.6%	-0.9%	-0.7%	-0.9%	-0.6%	-0.9%	-0.7%	-0.9%	-0.6%
INDMET	-2.5%	-2.2%	-2.5%	-2.2%	-2.5%	-2.3%	-2.5%	-2.2%	-2.5%	-2.2%	-2.4%	-2.2%
INDNMET	-1.0%	-0.8%	-1.0%	-0.8%	-1.1%	-0.8%	-1.0%	-0.8%	-1.0%	-0.8%	-1.0%	-0.7%
INDOIL	0.4%	0.6%	0.5%	0.7%	0.4%	0.6%	0.4%	0.7%	0.4%	0.7%	0.5%	0.7%
INDOTH	-1.9%	-1.7%	-1.9%	-1.7%	-2.0%	-1.7%	-1.9%	-1.7%	-1.9%	-1.7%	-1.9%	-1.6%
INDSPIN	0.5%	0.7%	0.5%	0.7%	0.5%	0.7%	0.5%	0.8%	0.5%	0.7%	0.5%	0.8%
INDTOB	-7.7%	-7.4%	-7.6%	-7.4%	-7.7%	-7.5%	-7.6%	-7.4%	-7.7%	-7.4%	-7.6%	-7.4%
SEROTH	0.4%	0.6%	0.4%	0.7%	0.4%	0.6%	0.4%	0.7%	0.4%	0.6%	0.4%	0.7%
SERTRA	2.4%	2.7%	2.5%	2.7%	2.4%	2.7%	2.5%	2.8%	2.4%	2.7%	2.5%	2.8%
SOCSER	0.8%	1.1%	0.9%	1.1%	0.8%	1.1%	0.9%	1.2%	0.8%	1.1%	0.9%	1.2%

Notes: i. Source: Authors calculations. ii. Those figures are calculated with respect to the base year scenario.

Table 19: Macroeconomic Results: Real Wage Variations

	Region Elasticity	Gender Elasticity	Skill Elasticity
Females rural skilled	1.4%	1.0%	0.8%
Females rural unskilled	0.3%	-0.1%	0.5%
Males rural skilled	0.5%	0.5%	0.0%
Males rural unskilled	-0.4%	-0.3%	-0.2%
Females urban skilled	1.0%	0.6%	0.6%
Females urban unskilled	-0.6%	-0.6%	0.1%
Males urban skilled	0.3%	0.3%	0.0%
Males urban unskilled	-0.5%	-0.5%	-0.2%

Notes: i. Source: Authors calculations. ii. Those figures are calculated with respect to the base year scenario.