Is the End of the MFA a Threat?

Mohamed Ali Marouani*

Abstract
The end of the Multifiber Agreement in January, 2005 had a negative impact on the apparel industry of regional exporters, but the effects were weaker than expected. Using a dynamic general equilibrium model, the article provides a prospective assessment of the impact on Tunisia of the phase out of the MFA, and of the agreement which manages the rate of growth of Chinese clothing exports to Europe, until the end of 2007. The main findings are an increase in unemployment and wage inequality but no significant effects on the main macroeconomic variables, if the exchange rate management takes into account this shock.

1. Introduction
On the January 1, 2005 all the quotas on textile and clothing from World Trade Organization (WTO) member countries were dismantled, according to the Agreement on Textile and Clothing signed in 1995. Countries that took advantage of preferences, indirect protection through quotas, and geographic proximity found themselves in a critical situation. If we want to assess whether trade liberalization is fair for all, it is not enough to think of the interests of developing countries as a homogeneous group, but we have to take into account their different situations. In this article I will examine the Tunisian case, as one of the main regional exporters to the European Union (EU) before 2005.

The Multifiber Agreement (MFA), through its quotas imposed on the most efficient exporters, and the privileged access of Tunisian clothing products to the European market, was behind the spectacular development of the Tunisian apparel industry during the last 20 years. The weight of textile products in Tunisian exports of non-oil goods and services (58% in 2004) and the concentration of clothing exports on the European market (94%) explain why the issue of the MFA phase out is very sensitive economically and politically for Tunisian policymakers. A negative shock endured by the clothing sector could be harmful for the unemployment situation in Tunisia because this sector employs about one-seventh of the labor force. Unskilled workers and especially women, who constitute the bulk of clothing employees (80% according to World Bank, 2006), are the most vulnerable.

Until early 2006, regional exporters (except Turkey) and, among them, Tunisia have seen their share in the European market reduced, but not by as much as some simulation exercises have predicted. The main reason is certainly the agreement of self-restriction of Chinese exports until the end of 2007, signed between the EU and China in June, 2005. China agreed to limit its exports because of the threat of the special textile-specific safeguard clause which can be used by WTO member countries until December, 2008. But what will happen on January 1, 2009? When tariffs on clothing imports begin to decrease due to WTO commitments, the erosion of preferences for regional exporters will be even stronger.

* Marouani: Paris I-Sorbonne University, DIAL and ERF, IEDES 45 Bis Avenue de la Belle Gabrielle, 94736 Nogent Sur Marne Cedex, France. Tel: 33-1-43947230; Fax: 33-1-43947244; E-mail: marouani@univ-paris1.fr.
Most of the studies which dealt with the impact of the MFA dismantling had a global or regional scope. Because our study is on Tunisia we prefer to rely on a single-country model, which allows us to enrich the model with institutional detail and introduce dynamics into its functioning.

Therefore, the quantitative assessment is based on an intertemporal multisectoral general equilibrium model of the Tunisian economy, which incorporates an imperfect functioning of the labor markets. As stressed by Stiglitz and Charlton (2005), to be able to analyze the impact of trade reforms and especially adjustment costs, models need to take into account unemployment and market failures. The model developed in this paper allows for a formalizing of the adjustment path by dealing explicitly with inter-temporal optimization of firms. It also incorporates the intertemporal preferences of households. In addition, disaggregating the economy into industries allows for explicit dynamic analysis of the intersectoral reallocation of resources that is central to the policy debate.

One of the main innovations of the dynamic general equilibrium model developed is that it uses a non-steady-state calibration procedure. As stressed by François et al. (1999), empirical studies have shown that considering developing countries in applied models as growing on a steady-state path is an invalid hypothesis.

Moreover, a significant part of the modeling effort is devoted to the labor market. Intersectoral wage differentials are endogenous, and explained by efficiency considerations. We propose a multisectoral model of efficiency wages based on imperfect monitoring considerations, following the work of Shapiro and Stiglitz (1984) and Walsh (1999).

Section 2 presents the consequences of the end of the MFA observed so far; section 3 deals with the quantitative framework; section 4 presents the simulations and the results; and section 5 concludes.

2. What Happened after January 1, 2005?

The first half of 2005 saw a surge of Chinese exports to the EU (by 45% in value terms). China increased its market share by 145% in volume and by 95% in value for products whose quotas had been removed in 2005. This increase had been at the expense of the main regional exporters. If we compare the value of the exports of Jordan, Morocco, Tunisia, and Egypt with the EU, during the January–September 2004 period and the January–September 2005 period, we notice a decrease by, respectively, 11.4%, 9.1%, 5.6%, and 4.2% (World Bank, 2006). Turkey is the only country in the region that managed to increase its exports to the EU in the same period (by 3%).

Safeguard measures can only be used if importing countries are affected and are not competitors, even though the EU has stated, in its guidelines for consideration of safeguards against China, that the East and South Mediterranean Countries “are part of the natural zone of competitiveness of the EU textile and clothing industry and are an important destination of both exports and investments of EU industry.” The European Textile Association started complaining very early, but its position was weakened by three elements. First, China is a significant trading partner and a large market for European products. Second, many European countries do not produce apparel and were thus against imposing any restriction on Chinese imports to avoid trade disputes with China. Third, distributors inside Europe prefer having access to cheaper Chinese products, and some of them had already launched significant orders when the EU and China started negotiating an agreement for self-limitation of exports. An agreement was finally reached on June 10, 2005, and which manages Chinese apparel exports to the
EU until the end of 2007. The agreement imposed on ten categories of products (among
the 35 that were liberalized) fixes the rates of growth of Chinese exports to between 8
and 12.5%, which is higher than the 7.5% which the special safeguard clause would
have allowed the EU to impose (World Bank, 2006).

To be able to assess qualitatively the intensity of competition between Tunisia and
its main competitors in the European market, Cling et al. (2005) have compared
the structure of their exports to the EU. For that purpose they disaggregated apparel
exports into 236 categories (using a six digit nomenclature). The degree of competition
between two countries is then assessed through the cosine of the angle of the 236
dimension vectors which represent the structure of clothing exports of each country.
Morocco, Poland, and Romania seem to be the main competitors of Tunisia. Using the
Export Similarity Index (www.worldbank.org), calculated on the basis of 2004 data, the
World Bank (2006) confirms that east and central European Countries (Bulgaria and
Romania) and Morocco are the closest competitors to Tunisia.

Even if the previous analysis shows that Tunisia and China do not necessarily
produce the same categories of apparel products, the impact of Chinese competition
will be stronger after 2008 when the EU will no longer be able to use the special textile
safeguard clause. We thus will have to distinguish two periods in the simulations. A
2005–08 period in which Chinese exports increase according to an agreed rate with the
EU, and a period after 2008 in which these products will have an unlimited access to the
European market. It is thus necessary to elaborate an ex ante assessment framework
which allows the simulation of various scenarios for the post-2008 period.

3. The Quantitative Framework

A Dynamic General Equilibrium Model of the Tunisian Economy

In this section I present the intertemporal general equilibrium model of the Tunisian
economy. The model built for this purpose draws upon the work of Devarajan and Go
(1998) and Dissou (2002). Its main differences consist in its detailed and innovative
treatment of the labor market and its non-steady-state calibration procedure.

Consumption  Households allocate expenditure across time so as to maximize lifetime
utility, subject to a dynamic budget constraint. Devarajan and Go (1998) derive the
forward change of consumption between two successive periods as a function of the
relative prices of the two periods, the rate of time preference, and the discount rate for
consumption:2

\[
\frac{C_{t+1}}{C_t} = \left( \frac{PC_{t+1}(1+\rho)}{PC_t(1+r_c)} \right)^{1/v}
\]

(1)

where \(\rho\) is the consumer’s constant rate of time preference, \(v\) is the constant elasticity
of marginal utility, \(r_c\) the discount rate, and \(C_t\) is aggregated consumption.

Investment behavior  The manager chooses the investment path that maximizes the
firm’s value, defined as the discounted value of net income, subject to the capital
accumulation equation. Investment expenditures (INVCOST) include both acquisition
and adjustment costs. Investment expenditures in our model are given by:

\[
INVCOST^i_t = (ID^i_t(1-dist^i_t) + AJC^i_t) \cdot PK^i_t
\]

(2)
where $ID$ represents sectoral investment, $AJC$ are adjustment costs, $PK$ is the price of capital, and $dist$ is a parameter which captures the existence of distortions or incentives to investment. The adjustment cost function is increasing with investment and decreasing with the capital stock ($K$) accumulated by the firm:

$$AJC_i = \frac{\beta_i}{2} \frac{ID_i^2}{K_i}$$  \hspace{1cm} (3)

The intertemporal optimal conditions imply that:

$$ID_i = \frac{K_i}{\beta_i} \left( \frac{q_i}{PK_i} - (1 - dist_i) \right)$$  \hspace{1cm} (4)

and

$$(1 + r_p)q_i = rk_{i+1} + \frac{\beta_i}{2} PK_{i+1} \left( I_{i+1} \right)^2 + (1 - \delta_i)q_{i+1}$$  \hspace{1cm} (5)

where $q$ is the shadow price of capital, $r_p$ is the discount rate of the producer in sector $i$, $\delta$ is the depreciation rate, and $rk$ is the marginal revenue product of capital. The interpretation of equation (4) is that investment will be positive if the ratio of Tobin’s $q$ to the replacement cost of capital is greater than one. Equation (5) gives the dynamic rule of growth of the shadow price of capital.

**Debt evolution** The two components of public debt (internal and external) and the two components of external debt (private and public) are modeled. Yearly public deficit is allocated to the two components of public debt (in fixed proportions).

**Terminal period and steady-state conditions** To solve an infinite-horizon model like ours, we need to impose steady-state conditions at the terminal period. On the capital growth side, the required condition is that the ratio of investment to the stock of capital equals the depreciation of capital plus the exogenous growth rate of the labor force and the growth rate of technical progress. On the consumption growth side, the transversality condition imposes that consumption at the terminal period is equal to the household income, net of investment expenditures financed by households. A transversality condition is also imposed on foreign debt to avoid Ponzi games. The growth rate of external debt is the same as that of capital.  

**Structure of the Intraperiod Model**

The Tunisian economy is disaggregated into ten sectors. The model distinguishes four inputs: three categories of labor, plus capital; and four types of agents: a representative household, firms, the Government, and the Rest of the World.

**The labor market block** In the model, intersectoral wage differentials in urban private sectors and unemployment are endogenous and determined through a multisectoral efficiency wage mechanism.

Following the Shapiro and Stiglitz model (1984) the involuntary unemployment level acts as an incentive for workers to provide a certain level of effort. This is equivalent to a principal-agent problem with rationing at equilibrium, because some individuals proposing to work at a lower wage will not be hired. Indeed, by giving them less than...
the efficiency wage, the firm could not be sure that they would not shirk. The utility function of the employees is increasing with wages and decreasing with the level of effort. If an employee shirks, there is a probability \( q \) that he may be caught and fired. If he provides the level of effort required, the probability of losing his job reduces to \( b \), the exogenous separation rate. To summarize the functioning of this model, we can say that the levels of unemployment and of wages are complementary for eliciting effort from employees.

If we rewrite the utility functions defined by Shapiro and Stiglitz (1984) in a multisectoral framework and disaggregate the labor factor in various skills of qualification, we obtain after some algebraic derivations the expression characterizing the evolution of wages in the multisectoral general equilibrium model applied to Tunisia.

\[
 w_f^* = \left(1 + \frac{b_f + r}{q_f} \right) e_f + \sum_{j=1}^{n} \frac{b_j L_{af}}{U_f} e_f
\]

where \( r \) is the discount rate, \( i \) is the sector, \( f \) is the level of qualification, \( w \) is the wage, \( e \) is the disutility of effort, \( b \) is the exogenous separation rate, \( q \) is the probability of being caught shirking, \( L \) is labor demand by sector and skill, and \( U \) is the unemployment rate by skill.

Equilibrium wages and unemployment levels by skill are obtained through the equalization of the marginal productivity of labor with the efficiency wage in the urban private sectors.

In the agricultural sector the wage is linked to the average urban wage through an extended Harris-Todaro function, capturing the difficulty of getting an urban job for a rural worker. Civil servants’ wages are set by the Government as a fixed proportion of the urban average wage. Labor supply increases from one period to another at a fixed rate.

The production and factor demand block

The production function is a nested one which permits the capture of substitution and complement relations among the various inputs. At the highest level, output is a Leontief of value added (VA) and intermediate input. Aggregate intermediate input is a Leontief function of intermediate input from different sectors, whereas value added is a nested constant elasticity of substitution (CES) function with two stages. At the first stage, VA is a CES of two composite bundles. At the second stage, the first bundle is a CES function of unskilled and skilled labor, whereas the second bundle is a CES of capital and highly skilled labor, which are supposed to be highly complementary. Concerning the Government sector, capital and the three labor categories are set in fixed proportions.

Labor is supposed to be mobile across sectors, while physical capital is sector specific in the short run. It grows from one period to another through investment, following the path defined by the intertemporal optimization rule.

Income and expenditures

Households earn their income from wages, returns to capital, interests on Government bonds, and transfers (public or migrants’ remittances). Their expenditures are composed of interest payments on private external debt and of consumption of goods and services. After determining the optimal path of total consumption and savings (equation 1), households choose the optimal composition of their basket of goods and services at each period following a Cobb-Douglas utility function maximization rule.
The Government earns income from various taxes (income taxes, corporate taxes, tariffs, and value added taxes) and from foreign transfers. Its expenditures consist in Government consumption, social transfers, and interest payments on public debt. The Government closure chosen is to fix the ratios of public spending to GDP and of public deficit to GDP and to leave tax rates endogenous.7

**The foreign trade block**  The allocation of output between domestic and foreign markets is modeled as a constant elasticity of transformation (CET) function. On the demand side, the Armington assumption is adopted to describe an imperfect substitution between domestic products and imports (the first nest of the CES), and between imports originating from different geographical areas, mainly to distinguish the EU from the Rest of the World (the second nest of the CES). The small country assumption holds for imports, which implies that world import prices are exogenous. However, an export demand function is modeled, which means that Tunisian exporters need to lower their prices if they want to increase the volume of their exports (for an unchanged demand of exports).

\[
EXD_i = EXDP_i \left( \frac{PED_i}{PWE_i} \right)^\eta
\]  

where \(EXD\) is the demand for export of product \(i\), \(EXDP\) is a sectoral scale parameter, \(PED\) is the sectoral price of Tunisian exports, \(PWE\) is the world price of the same products, and \(\eta\) is the elasticity of demand of exports.

The current account balance is composed of the foreign trade balance, of net transfers from abroad, and of interest payments on foreign debt. The ratio of external debt to GDP is fixed to its first-year level, and the nominal exchange rate adjusts to equilibrate the current account balance.

**The Database**

The model is calibrated from a 1994 database for the Tunisian economy. The year 1994 is considered a good approximation of the Tunisian economic situation in the 1990s because it is not characterized by a severe drought or a significant international shock. Moreover, the advantage of using the 1994 data is that it enables the performance of a dynamic calibration of the model by comparing the path of evolution of the main variables produced by the model with the actual path observed in the national accounts (1994–2002). The social accounting matrix (SAM) has been built on the basis of the Input–Output table provided by the Tunisian National Institute of Statistics (INS, 1997). Aggregate investment by sector is provided in the national accounts. Information on the different components of private and external debts and on transfers comes from the annual Central Bank report (www.bct.gov.tn). The data on employment and labor supply are from the population and employment census (INS, 1994). Wage differentials by level of qualification in each sector are determined using tables appended to industrial collective agreements.

The elasticities of substitution and transformation of the CES and CET functions of the trade bloc come from the econometric estimations of Devarajan et al. (1999). The interest rates are those set by the Tunisian Central Bank (Table 1).

The disutility of effort parameter of the efficiency wages function is calibrated using the base-year values of wages, employment, unemployment, the turnover rate, and the probability of being detected shirking. The elasticity of mobility of rural workers in the
Harris-Todaro function is calibrated from the benchmark data on agricultural and urban (average) wages, on employment in agricultural and non-agricultural sectors, and on urban unemployment. The depreciation rate of capital, the household elasticity of intertemporal substitution of consumption and the sectoral adjustment cost function scale parameters are dynamically calibrated.

**The Dynamic Calibration Procedure**

Most of the existing dynamic general equilibrium models rely on a steady-state calibration procedure. It has the advantage of being relatively simple because it consists in manipulating the data to impose a steady-state growth of the jumping variables. However, it relies on a false hypothesis, especially in relation to developing and transition countries (François et al., 1999). The procedure used in this model consists in implementing a non-steady-state dynamic calibration in three steps.

First we calibrate the parameters which determine the evolution of the main macroeconomic variables (total household consumption, total investment, external debt, and the GDP growth rate). These parameters are the elasticity of intertemporal substitution of consumption, the capital depreciation rate, and the annual growth rate of technical progress. They are calibrated by implementing many simulations until the main macroeconomic variables are close to their actual value during the 1994–2001 period. The second step consists in calibrating sectoral parameters, mainly the adjustment cost function scale parameters. In this case we use the historical evolution of sectoral investment to obtain the value of the parameters. The third step consists in recalibrating the macroeconomic parameters to take into account the impact of the second step modifications. After several iterations we obtain relatively satisfactory values for macroeconomic and sectoral parameters.

### 4. Simulations and Results

**The Scenarios**

The reference scenario includes the tariff dismantlement on imports from the EU, according to the Euro-Tunisian Free Trade Agreement. It also includes a compensa-
tion of the fiscal losses due to the tariff dismantling by a uniform increase of the different taxes (VAT, income tax, and corporate tax). The main impact of the liberalization with the EU is to decrease imported capital goods prices and thus to boost investment and reduce unemployment (Marouani, 2004).

Two shocks are simulated to analyze the impact of the MFA phase out on the apparel sector, on unemployment, and on other relevant variables in Tunisia. The idea is that not only the export demand addressed to Tunisian firms from the EU can decrease, but also prices, due to higher competition. In the first scenario we simulate a decrease of volumes (holding international prices of clothing products constant). In the second we assume that both volumes and international prices of apparel products decrease due to the end of the special safeguard measures in 2009.

The first scenario consists in implementing a gradual decrease of export demand (through the export demand scale parameter EXDP, equation 7) from 2002 to 2004 (10% in three years), then a decrease by 10% in 2005 and a decrease by 20% in 2009.

The second scenario adds to the first one a decrease of world prices of apparel products (\(P_{WE}\) in equation 7) by 10% in 2009. We do not simulate a price decrease between 2005 and 2008 because it seems that the agreement between the EU and China has limited the impact on world prices of apparel products.

The Results

As shown in Table 2, the decrease of the world prices of textile products is very harmful for the Tunisian textile and clothing sector. Investment is the first variable that reacts strongly to the shock, due to the forward looking behavior of firms in terms of capital accumulation. The results of the second scenario are much stronger because the combined effects of export demand and prices decreases. The less competitive firms and those who cannot move to a higher segment of the apparel industry will be forced to exit the market.

Labor demand decreases dramatically from 2009 and does not recover afterwards. These negative effects on the textile sector were expected due to the nature of the shock. What is less obvious is to what extent this shock is transmitted to the rest of the economy and its effects on unemployment.

The first shock induces a rise in total unemployment, which harms mainly unskilled workers, due to the labor composition of the textile and clothing sector (Figure 1). After a dramatic increase in 2009, total unemployment decreases slightly, due to the

Table 2. Evolution of the Main Variables Characterizing the Apparel Sector in Tunisia, 2009–20 (change in % of the reference scenario level)

| Variable            | 2009     | 2015     | 2020     |
|---------------------|----------|----------|----------|
| SIM1                | SIM2     | SIM1     | SIM2     |
| Production          | –17.3    | –32.4    | –19.5    | –36.7    | –20.4    | –38.3    |
| Exports             | –19.0    | –35.6    | –21.3    | –39.9    | –22.2    | –41.5    |
| Investment          | –29.5    | –57.8    | –26.2    | –49.6    | –24.2    | –45.2    |
| Unskilled labor     | –19.0    | –36.5    | –19.9    | –38.1    | –20.1    | –38.4    |
| Skilled labor       | –19.5    | –37.3    | –20.5    | –39.0    | –20.8    | –39.4    |
| Highly skilled labor| –16.7    | –30.2    | –19.8    | –36.6    | –21.0    | –38.9    |

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evolution of the labor force in Tunisia where the share of unskilled workers decreases over time.

In the second scenario the rise of unemployment is much stronger (by about 10%, which represents 1.5 percentage points, given a 15% unemployment rate in Tunisia). For unskilled workers, the number of unemployed in 2009 is about 12% higher than would have been the case without the removal of the quotas.

Wage inequality between skilled and unskilled workers also increases after 2008 (by about 2% on average in simulation 2), due to the high intensity of the textile and clothing sector in unskilled labor. The pace of the rise of inequality decreases after 2009.

To understand the evolution of unemployment, we need to look at the evolution of investment, which is the main vector of change in a dynamic model (Figure 2).

Total investment is higher than its reference scenario level until 2008, then it decreases to around its base scenario level. This increase of investment is due to the depreciation of the Tunisian dinar, induced by the decrease of apparel exports,

![Figure 1. Evolution of Unemployment in Scenario 1 (2006–20)](image1)

![Figure 2. Evolution of Total Investment (volume)](image2)
exerts a positive effect on the exports of other sectors, mainly tourism and mechanical and electrical industries (MEI). As the apparel sector in Tunisia is highly labor intensive, the dramatic decrease of investment in this sector does not have a significant impact on total investment.

Figure 3 shows the evolution of investment of four significant sectors. We can see that investment increases in all except the construction sector, which bears the cost of the decline of the apparel industry investments (Table 2).

Total household consumption decreases slightly in scenario 1, more in scenario 2, though the decrease does not reach 1.5% even in the worst case. This decrease is due to higher unemployment, which has a negative impact on households’ income.

When we look at the potential impact on GDP, in the worst case (scenario 2, after 2009), the losses do not go beyond 0.5%. However, it is important to note that these figures are the outcome of the simulated export demand and prices decreases. If prices decrease by more than 10% after 2009, the effects could be stronger.

5. Conclusion

As expected, the MFA phase out appears as a very negative shock for the textile and clothing sector and for unemployment, which is already high in Tunisia. It also raises wage inequality due to the high intensity of the textile and clothing sector in unskilled labor.

To be able to analyze more in detail the effects of the MFA dismantling, we would need disaggregated data on the textile and clothing industry. The real effects will depend on the degree of substitutability between each country’s exports and those of its competitors. If the structure of exports of Tunisia and the most competitive countries (mainly China) remain different (as shown by the export similarity index) Tunisia could be less affected by the MFA phase out and the end of the special textile safeguard clause. Because the Tunisian textile and clothing sector is mainly constituted by European offshore companies, the amplitude of the shock will also depend on the capacity of these companies to switch to the highest segment of the clothing sector. Indeed, the comparison of the two simulations shows clearly that even if the European export demand decreases, when export prices remain stable (or increase), the negative impact of the shock is much more limited.
Moreover, the negative effects on the main macroeconomic variables (investment, consumption, and GDP) are very limited due to the hypothesis of a depreciation of the Tunisian dinar which exerts a positive effect on the other main exporting sectors. This puts a higher pressure on the Tunisian Central Bank, which manages the exchange rate, to be very reactive to the evolution of clothing exports.

One of the limitations of the model used in this article is that it does not take into account heterogeneity because it is a representative agent one. It would be interesting to link the Computable General Equilibrium model to a microsimulation model in order to analyze the effects of the shock on individual firms and households. Another issue raised in the introduction of the article is the gender dimension of the shock. Indeed, the clothing sector relies mainly on female labor, which will consequently be the most affected by the dismantling of the MFA. If data were available it would be interesting to study the impact of this shock on women’s employment and income.

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Notes

1. We focus on the EU because Tunisia sells around 95% of its exports to Europe. Its share of the US market is around 0.03%.
2. See Devarajan and Go (1998) for a detailed presentation of the optimization process.
3. Many variables (not described above) grow at an exogenous rate, imposed by the modeler on the basis of their historical evolution (migrants’ remittances, foreign direct investment) or their forecasted evolution (labor force, technological progress).
4. See Walsh (1999) for a pioneering contribution on multisectoral efficiency wage models.
5. See Marouani (2004) for a detailed presentation of the algebraic derivations.
6. The extension in the Harris-Todaro function consists in adding an elasticity of mobility for rural workers, calibrated from the base year values.
7. All domestic tax rates are supposed to vary by the same magnitude.
8. The tariff dismantling scenario is implemented at a very disaggregated level, than we aggregate at the sectoral level.
9. Since we are interested in capturing the effect of the MFA dismantling in this article we do not present the results without the liberalization process which has started in 1996 and will be completed the 1st January 2008.
10. The nominal exchange rate adjusts to ensure a stable external debt to GDP ratio.