Poverty and Economic Policies (PEP) Network

Breaking down the Poverty and Growth effects of economic policy package: A Double-Calibration Analysis for Cameroun using Microsimulation CGE Model

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ABSTRACT

This paper aims at explaining the significant poverty alleviation observed in Cameroon between 1993 and 2001. We decompose the poverty and macroeconomic impacts of the major economic policies led in Cameroon during this period (investment in infrastructures, devaluation, and enforcement of Value-Added Tax), in order to assess the intrinsic contribution of those policies taken individually. In this regard, we use the so-called Double-Calibration technique, within a Microsimulation CGE framework. As a result, the technological changes arisen between 1993 and 2001 explain alone: up to 31 percent the nationwide poverty alleviation (FGT 0), 45 percent of the GDP growth, and 4 percent of the rise in consumer price index. The contribution of considered policies: the devaluation of the CFA franc, the rehabilitation of infrastructures, and the customs and tax reform, are respectively two percent, 9 percent and 4 percent in poverty alleviation (FGT 0 index); one percent, 11 percent, and three percent in explaining GDP growth; and 65 percent, zero percent and 11 percent in explaining the rise in consumer price index.

JEL Codes: C68, D58, H22, H54, I32.

I. INTRODUCTION

During the second half of the nineties, Cameroon recorded a sharp decline in poverty. For instance, the proportion of people counted as poor, the so-called “poverty headcount” or FGT0 index, fell from 53.3 percent in 1996 to 40.2 percent in 2001 (Republic of Cameroon, 2002); i.e. a drop of 13.1 percentage points of poor people in five years. This period corresponds in fact to the economic recovery Cameroon registered beyond 1994, after a decade of recession which lasted from 1985 till 1994 and which was translated by a drastic deterioration in the household standard of living (the consumption per capita fell by 40 % between 1986 and 1993). Thanks to the economic recovery, the real GDP grew at around 4.5 percent yearly from 1996 to 2001, and the estimated average income in terms of adult-equivalent spending increased by 14.8 percent during the same five year period.

This study aims at shedding light on how much the major policies implemented during this period contributed to the above-mentioned economic resurgence and poverty alleviation. To what extent those policies might explain this economic improvement? In other words, the exercise consists on breaking down the intrinsic contribution of each single policy considered to that economic performance. Three key policies are assessed: the gradual introduction of the VAT, from its embryonic phase in 1994 until the implementation of its uniform rate in 1999; the 50 percent devaluation of the CFA franc in January 12, 1994; and the rehabilitation and development of some basic infrastructures since 1996.

In spite of the retrospective scope of the study, this exercise also has a topical interest. In fact, since 2001, economic growth has proven to be very weak in Cameroun and the growth rate is almost shrinking from year to year. The poverty prevalence remains high and the recent economic pace is not enough for Cameroon to achieve the Millennium Development Goal in terms of poverty alleviation. At the same time, EPA hangs the prospect of the replacement taxes; the continuous decline of the Dollar with regard to Euro contributes to artificially appreciate CFA franc; and on the other hand, infrastructure development is one of the most important levers Government of Cameroon envisions to activate in order to boost economic growth. Then, it could be worth drawing lessons from the experience of the nineties and see whether the three main economic policies applied during that period could successfully be re-utilized, revamped or should be avoided in similar circumstances or so.

To carry out this study and therefore to disentangle the own impact of each economic policy, we use a double calibration approach within a micro simulation CGE model. One could consider that the use of double calibration approach, applied in empirical works only since the beginning of the third millennium, also gives fundamental dimension to this research by digging deeper into this new technique. The basic mechanics of this methodology is explained in section III whereas the key features of the CGE model are presented in the fourth. Section V set about the scenarios simulated and analyses the consecutive results. But in the first instance, section II gives some insights into the economic policies examined.

II. PRESENTATION OF EXAMINED POLICIES

III. METHODOLOGY: IMPACTS DECOMPOSITION THROUGH DOUBLE CALIBRATION TECHNIQUE WITHIN A MICROSIMULATION CGE MODEL

3.1. The use of calibration in CGE model: a brief explanation of the mechanics [1]

To implement a CGE model, input data must be reproduced in a format such that it translates the benchmark equilibrium of the economy the model is applied to. The elaboration of a well-balanced Social Accounting Matrix (SAM) aims at fulfilling this requirement. However, a number of parameters are generally unavailable and do not appear automatically in a SAM. Thus, to complete the range of necessary parameters of the model, CGE authors generally make use of the so-called calibration procedure.

Set a CGE model represented by a correspondence (a multivoque function) f, which is generally nonlinear, such as:

$$Y = f(X, \beta, \gamma) \qquad [1]$$

where Y is the vector of endogenous variables; X, the vector of exogenous variables; β and γ, parameters vectors. The benchmark values of both endogenous and exogenous variables are known and usually derived from the SAM underlying to the model. Those of parameters β are provided either through isolated econometric estimations or by using values consistent for countries easily assimilated to the country in study. Sometimes these values are just picked up from the literature review and lead to sensitive analysis. However the values of parameters represented by the letter γ are those remaining unavailable before calibration. In order to make up the whole range model parameters, one considers the following equation:

$$Y_0 = f(X_0, \beta, \gamma) \qquad [2]$$

where Y_0 and X_0 are respectively the values of endogenous and exogenous variable at the benchmark year “0”. The equation [2] is then solved for γ through equation [3]:

$$\gamma = g(Y_0, X_0, \beta) \qquad [3]$$

By doing so, we are then using a procedure named calibration, according to the phraseology of CGE models. As it appears from equation [3], this procedure returns to solve equations of the model *back to front*, in the sense that parameters γ (which are exogenous in principle) are considered as unknown of the model while initial values extracted from the SAM are rather considered as parameters in this circumstance. In fact, it is necessary to run the model *back to front* in order to determine the values of parameters γ consistent with benchmark available data; that is: values that will allow replicate the benchmark equilibrium when the model is ran in *the right way round*.[2] In the case of dynamic CGE models, in addition to the requirement of replicating the observed benchmark equilibrium, the calibration should be performed in such a way that the model also outlines the *business-as-usual* path; that is a

[1] For greater details, see Abdelkhalek (1993) and Abdelkhalek (2001).

[2] As stated by Schubert, Katheline (1993), p. 808.

reference path the economy is supposed to follow if the evolution of that economy is not perturbed by any controlled or uncontrolled shock. Parameters γ are then named calibrated parameters, while parameters β are pointed out as strategic, predetermined or free parameters, i.e. parameters involved within the prior minimum string of data necessary to perform calibration.[3]

3.2. Double calibration: principle and rationale

Usually in CGE models, vectors of parameters γ are calibrated by utilizing observed data of only one reference year. To assess the impacts of a shock on a given economy, one considers that parameters β and γ do not change during the time scale of the shock. The equilibrium after the shock is thus the counterfactual state of the economy computed through equation [4]:

$$Y_{cf} = f(X_{cf}, \beta_0, \gamma_0) \qquad [4]$$

where only the vector X of exogenous variables was modified.

Yet, except fortuitous coincidence, that equilibrium is always different from a situation really observed after the shock. Among others, this divergence from the evidence would be explained by the fact that technological and behavioral parameters of an economy could change after a given time horizon, such that:

$$Y_{cf} = f(X_{cf}, \beta_0, \gamma_0) \neq Y_1 = f(X_1, \beta_1, \gamma_1) \qquad [5]$$

The whole change observed within the economy between the base year *0* and the ex-post year *1* is equal to:

$$CG = Y_1 - Y_0 \equiv f(X_1, \beta_1, \gamma_1) - f(X_0, \beta_0, \gamma_0) \qquad [6]$$

This whole change is due to a double effect: impacts of economic policies and exogenous shocks (EE = economic effect) on the one hand and impacts of changes in parameter values (EC = calibration effect) on the other hand.

Double calibration techniques aim at separating these two effects, or at least, they allow to disentangle the effects of the change in values of a given range of parameters. In this regard, one computes the values of parameters β and γ for the ex-ante period *0* as well as for the ex-post period *1*. iven the equations:

$$CG = EE + EC = Y_1 - Y_0 \qquad [7]$$

and

$$EE = Y_{cf} - Y_0 = f(X_{cf}, \beta_0, \gamma_0) - f(X_0, \beta_0, \gamma_0) \qquad [8]$$

we have:

$$EC = CG - EE = (Y_1 - Y_0) - (Y_{cf} - Y_0) = Y_1 - Y_{cf} \qquad [9]$$

$$EC = Y_1 - f(X_{cf}, \beta_0, \gamma_0) \qquad [10]$$

[3] As stated by Cogneau, Dénis and François Roubaud (1994), p. 7.

The above decomposition approach is proposed by Abdelkhalek (2001). However, in order to capture only the calibration effect as determined by equation [10], the economic effect as formulated through equation [8] should encompass all the economic policies implemented between periods *0* and *1*. If not, i.e. if *EE* expresses the effect of only some of economic shocks, equation [10] would not determine the exclusive effect of changes in parameters, but would also involve effects of non identified (and non simulated) economic policies and exogenous shocks. An alternative double calibration approach, applied by Weerahewa (2002) and Mujeri and Khondker (2002), consists in computing the calibration effect by substituting values of γ_1 for those of γ_0 within the base model, such that:

$$EC = f(X_0, \beta_1, \gamma_1) - f(X_0, \beta_0, \gamma_0) = f(X_0, \beta_1, \gamma_1) - Y_0 \qquad [11]$$

In this study we use a median variant between this second approach (WMK approach[4]) and the Abdelkhalek (2001) approach:

- In WMK approach (equation [11]), one starts by model version which uses the data of the ***initial period 0*** and the simulation of calibration effect consists in ***replacing the parameter values of period 0 by those of period 1***.

- In our variant, on the contrary, we start with the model which basically utilizes data of the ***final period 1*** and the simulation of calibration effect consists in ***replacing parameter values of period 1 by those of period 0***, such that:

$$EC = f(X_1, \beta_1, \gamma_1) - f(X_1, \beta_0, \gamma_0) = Y_1 - f(X_1, \beta_0, \gamma_0) \qquad [12]$$

We use equation [12] rather than equation [11] of WMK because of the unavailability of household data necessary to perform microsimulations, for period 0 of our study (year 1993). Those data are available only for the period 1 (year 2001).

- One might notice that calibration effect formula we propose in equation [12] is almost similar to the corresponding formula of Abdelkhalek (2001) approach (equation [10]). But in our variant, the difference between the counterfactual state $Y_1' = f(X_1, \beta_0, \gamma_0)$ and the economy state in final period *1* $(Y_1 = f(X_1, \beta_1, \gamma_1))$ is effectively caused only by the changes in values of parameters β and γ, while that difference might be engendered by a phenomenon other than change in parameters if we consider equation [10]. For instance, the counterfactual equilibrium $Y_{cf} = f(X_{cf}, \beta_0, \gamma_0)$ computed with equation [10] by simulating some economic policies and exogenous shocks in period *0* does not incorporate the whole shocks occurred between periods *0* and *1*. Yet, as underlined above, the involvement of all these shocks is the *sine qua non* condition which guarantees that the residual effect $f(X_1, \beta_1, \gamma_1) - f(X_{cf}, \beta_0, \gamma_0)$ is attributable only to the changes in parameters values.

3.3. Decomposing effects of various shocks using double calibration techniques

Double calibration techniques have been used by some authors during the recent years in order to assess the intrinsic impacts attributable to specific shocks. Abrego and Whalley (2000) make use this method to decompose the respective contributions of the trade shocks

[4] WMK for: Weerahewa (2002) and Mujeri and Khondker (2002).

and the technological changes in the explanation of the divergences between incomes of skilled workers and those of unskilled workers in USA. Mujeri and Khondker (2002) conduct a similar study to estimate the separate contribution of various factors (changes in the world prices, technological changes and changes in production factor endowments) in explaining the differential of salaries between the skilled workers and unskilled workers in Bangladesh between 1985 and 1996. Moreover, Jeevika Weerahewa (2002) estimates the respective roles of technology, world prices and public transfers in the evolution of poverty in Sri Lanka between 1977 and 2000.

Generally, to isolate the effect of a given shock via double calibration, the model is applied for the initial period and one simulate first the technological change by replacing the values of parameters calibrated in the initial period by those calibrated in the final period (this is the simple technological scenario). The second stage consists in simulating the considered shock using the model with at initial period, but with the technological parameters of final period (technological scenario with shock). The intrinsic impact of the shock simulated is then assessed by making the difference between the impacts of the second scenario and those of the first one. In this study, we use the same steps, but in backward looking version because, as abovementioned, households input data required for microsimulations are not available in initial year but only in final year (2001). The backward looking method thus consist in using the model in final year, replacing the technological parameters of this year by those calibrated in the initial year (1993) to perform technological scenario, and simulating the specific impacts of each shock considered, by estimating the incidence that the absence of that shock would have had on the observed results of the reference year 2001.

IV. THE MICROSIMULATION CGE MODEL

The aforesaid double calibration and the resulting decomposition of shocks effects are performed in the framework of a microsimulation CGE model. A model with microsimulations implies that detailed data of individuals or micro-agents (households, enterprises and\or other decision micro-units) which interact within an economy are explicitly included in the model, and that the simulation of economic policies and exogenous shocks might distinctly impact on each of these micro-agents. On the input data side, a major advantage of microsimulations is to take into account a more large range of the available information on an economy, with the representation of more interdependence loops and distinct agent objective functions, compared to the standard representative agent rationale. Moreover, on the model output side, impact analyses might be done at a very detailed and targeted level as well as at a macro level of the economy.[5]

In the case of this study, all the 10992 households of the ECAM II household survey undertook in 2001 are included within the model. Technically, microsimulations are made by building upon the studies of Cockburn (2001), Cockburn and Cloutier (2002), and Cloutier and Cockburn (2002). The general architecture of the model EGC is based on the EXTER archetype (Decaluwé et al., 2001), version 2 (Fofana, Cockburn and Decaluwé, 2003). VAT modeling builds upon Emini (2000a, 2000b). A version of the resulting whole model is used in Emini, Cockburn and Decaluwé (2006).

[5] See : Mitton, Sutherland and Weeks (2000); Cockburn and Cloutier (2002) ; Cogneau and Robilliard (2000); Cockburn (2001) ; Cloutier and Cockburn (2002).

Below, we present the modeling specificities introduced for production, VAT, and for poverty and inequality indicators.

4.1. Structure and technology of the production

The model involves 10 production sectors. To produce, each sector uses a production technology with multiple nesting levels which combines several primary factors, either through a Constant Elasticity of Technical Substitution (CETS) function or through a Leontief-type function. The foodstuffs agriculture sector and the cash crops agriculture sector utilize four primary production factors: unskilled labor $NQLD$, skilled labor QLD, capital KD and the land $LAND$ (figure 1).[6] The eight other sectors, named thereafter non agricultural sectors and identified by the index $nagr$, use only the three first of the abive production factors (figure 2).

[6] Identification index *agr* indicates the subset composed of these two sectors named thereafter agricultural sectors unless otherwise specified.

Figure 1: Production functions and factors in agricultural sectors

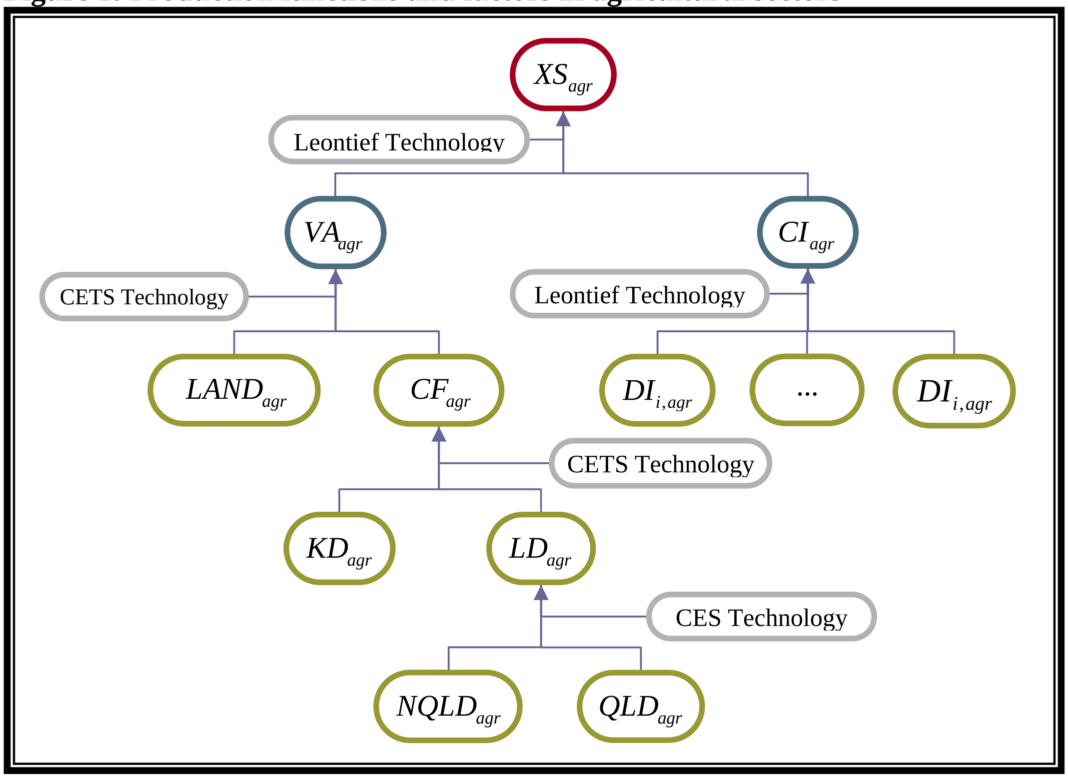
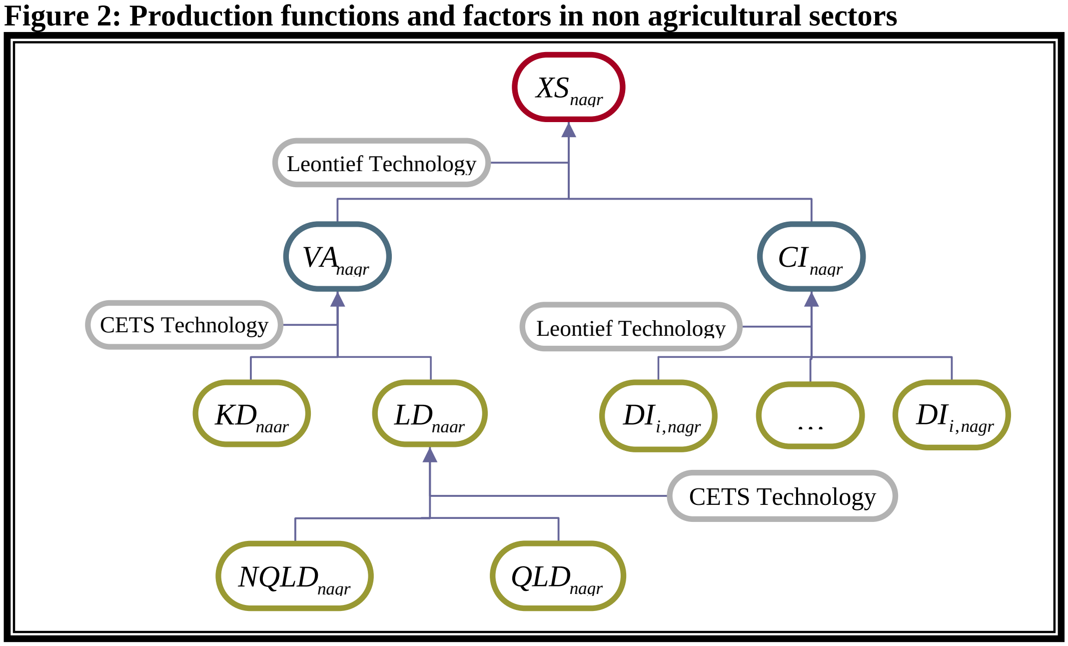


Figure 2: Production functions and factors in non agricultural sectors



Key : agr = Agricultural sector; nagr = Non agricultural sector; XS = Production; VA = Value Added; CI = Total of Intermediate consumptions; LAND = Land; CF = Composite factor including labor in the whole and capital; DI = Intermediate consumption in a specific product; KD = Capital; LD = Composite labor; NQLD = Unskilled labor; QLD = Skilled labor; CETS = Constant Elasticity of Technical Substitution.

With regard to EXTER archetype, the specificity of the model within the production equations is the incorporation of a transmission mechanism which allows shocks on public infrastructurse to be transmitted towards Total Productivity of Factors (TPF)[7]. TPF is represented by the endogenous variable A^{va} in equations **Erreur ! Source du renvoi introuvable.** and [2] which compute value added VA in agricultural and non agricultural sectors respectively:

$$VA_{agr} = A_{agr}^{va}\left[\alpha_{agr}^{cfl}CF_{agr}^{-\rho_{agr}^{cfl}} + (1-\alpha_{agr}^{cfl})LAND_{agr}^{-\rho_{agr}^{cfl}}\right]^{-1/\rho_{agr}^{cfl}} \qquad [1]$$

$$VA_{nagr} = A_{nagr}^{va}\left[\alpha_{nagr}^{kl}LD_{nagr}^{-\rho_{nagr}^{kl}} + (1-\alpha_{nagr}^{kl})KD_{nagr}^{-\rho_{ngr}^{kl}}\right]^{-1/\rho_{nagr}^{kl}} \qquad [2]$$

where α^{kl}, ρ^{kl}, CF, $LAND$, LD and KD are respectively the share parameter, technical substitution parameter, the demand of capital/labor composite factor, the demand of land, the demand of the gross labor, and the demand of capital.

In nongovernmental sectors ngs, total productivity of factors A^{va} (equation [3]) is positively linked to the stock of public capital in infrastructures KG. But the positive externalities of public infrastructures on TPF depend on the extent to which those infrastructures are available or accessible with regard to the size of the economy. In other words, the positive externalities are mitigated by the congestion effects; i.e. the level of difficulty economic agents face in accessing basic services provided by public goods. In this model, congestion effects are approximated by dividing the public capital in infrastructures by the capital stock of the whole private sectors:

$$A_{ngs}^{va} = B_{ngs}^{va}\left(\frac{KG}{\left(\sum_{ngsj}KD_{ngsj}\right)^{cef}}\right)^{\varepsilon_{ngs}} \qquad [3]$$

where B^{va}, ε and cef are respectively the scale parameter, the elasticity which measures the sensitivity of TPF following a relative change in public capital stock with regard to private capital stock, and the elasticity which measures the magnitude of the disincentive effect of the congestion on productive activities.

Another special feature of the model is to take into account the production tax and the non refundable VAT (applied on some intermediate consumption) in the computation of the production at factor costs:

$$XXS_i = \left(XS_i + \sum_j DI_{ji}\left(1-CIF_i\right)LCI_{ji}TVG\right)\left(1+tp_i\right) \qquad [4]$$

[7] We apply a rationale used by Dumont and Mesplé-Somps (2000).

4.2. Specific equations related to VAT modeling and its substitution for previous taxes on goods and services

Indirect taxes should be modeled with special care for at least two reasons: first, the imperfect VAT introduced since 1994 has peculiar features to be appropriately taken into account; and in addition, a replacement tax mechanism needs to be built within the model for a better simulation of the cancellation of old indirect taxes and their replacement by the VAT system.

Apart from customs duties on imports and exports, indirect taxes in force since the 1994 tax reform are the VAT (TVA), excise duties levied on domestic goods ($TIAL$) and those levied on imports ($TIAM$). The domestic taxation prevailing before that 1994 tax reform are synthesized as taxes applied to domestic products sold in local market ($TINDL$) on the one hand and those levied on imports ($TINDM$) on the other hand.

In equation [5], all these indirect taxes, those in force before 1994 tax reform as well as those introduced through that reform, coexist in the function of government's total revenue (YG). However, at the reference period (2001), the previous domestic taxes $TINDL$ and $TINDM$ are nil, while variables TVA, $TIAL$ and $TIAM$ keep their values as of year 2001. When the *backward simulation* consisting in coming back to the former domestic indirect taxation shall be performed for ex-post analysis, the three variables TVA, $TIAL$ and $TIAM$ will rather be reduced to zero while $TINDL$ and $TINDM$ will regain their respective 1993 levels.

$$
\begin{aligned}
YG = {} & \lambda^{kg}\sum_i r_i KD_i + \sum_i PTAX_i + \sum_i TVA_i + \sum_i TIAL_i + \sum_m TIM_m \\
& + \sum_m TIAM_m + \sum_x TIE_x + \sum_h DTH_h + DTF + \sum_{inst} TRF_{gov,inst} \\
& + \sum_i TINDL_i + \sum_m TINDM_m
\end{aligned}
\qquad [5]
$$

with λ^{kg} : The government's share in total remuneration of capital;
$PTAX_i$: The amount of production tax levied on sector *i*;
TIM_m : The amount of customs duties levied on imported product *m*;
TIE_x : Amount of customs duties levied on exported product *x*;
DTH_h : Proceeds from income tax applied to household *h*;
DTF : Proceeds from income tax applied to firms;
$TRF_{gov,inst}$: Transfer received by government *gov* from the economic agent *inst*.

The VAT rate is uniform whatever the product and whatever the origin of the product, but is set to zero for exports and capital goods. This rate is applied on a tax base exclusive of VAT; hence the use of the price exclusive of VAT $PCHT$ in the VAT settlement, in equation **Erreur ! Source du renvoi introuvable.**. For each composite good *i* the VAT base includes the final consumption of household *h* ($C_{h,i}$), the government's consumption (CG_i), and intermediate consumptions $DI_{i,j}\left(1-CIF_j\right)$ not liable to the VAT legislation (not "VATable").

$$TVA_i = TVG \cdot PCHT_i \left(\sum_h LCH_{h,i} C_{h,i} + LCG_i CG_i + \sum_j LCI_{i,j} DI_{i,j} \left(1 - CIF_j\right) \right) \qquad [6]$$

Variables $LCH_{h,i}$, LCG_i, and $LCI_{i,j}$ are effective rates to which composite good *i* is liable to VAT, respectively for the quantity consumed by household *h*, by the government, and by the production sector *j*. These variables are endogenous and are determined by equations **Erreur ! Source du renvoi introuvable.**, **Erreur ! Source du renvoi introuvable.** and **Erreur ! Source du renvoi introuvable.** in the case of importable products *m*, and are exogenous in the case of products *nm* without imported substitutes.

$$LCH_{h,m} = \frac{\xi^{chl}_{h,m} PL_m \left(1 + tal_m\right) D_m + \xi^{chm}_{h,m} PWM_m e\left(1 + tm_m + tam_m\right) IM_m}{PL_m \left(1 + tal_m\right) D_m + PWM_m e\left(1 + tm_m + tam_m\right) IM_m} \qquad [7]$$

$$LCG_m = \frac{\xi^{cgl}_{m} PL_m \left(1 + tal_m\right) D_m + \xi^{cgm}_{m} PWM_m e\left(1 + tm_m + tam_m\right) IM_m}{PL_m \left(1 + tal_m\right) D_m + PWM_m e\left(1 + tm_m + tam_m\right) IM_m} \qquad [8]$$

$$LCI_{m,j} = \frac{\xi^{cil}_{m,j} PL_m \left(1 + tal_m\right) D_m + \xi^{cim}_{m,j} PWM_m e\left(1 + tm_m + tam_m\right) IM_m}{PL_m \left(1 + tal_m\right) D_m + PWM_m e\left(1 + tm_m + tam_m\right) IM_m} \qquad [9]$$

with $\xi^{chl}_{h,m}$: Effective rate to what extent the **local product** *m* consumed by **household** *h* is liable to VAT;

$\xi^{chm}_{h,m}$: Effective rate to what extent the **imported produc**t *m* consumed by **household** *h* is liable to VAT;

ξ^{cgl}_{m} : Effective rate to what extent the **local product** *m* consumed by the **government** is liable to VAT;

ξ^{cgm}_{m} : Effective rate to what extent the **imported product** *m* consumed by the **government** is liable to VAT;

$\xi^{cil}_{m,j}$: Effective rate to what extent the **local product** *m* consumed by the **production sector** *j* is liable to VAT;

$\xi^{cim}_{m,j}$: Effective rate to what extent the **imported product** *m* consumed by the **production sector** *j* is liable to VAT;

D_m : Total volume of locally-produced goods *m* sold in the domestic market;

IM_m : Total volume of imported product *m*;

PL_m : Producer price of locally-produced goods sold in the domestic market;

PWM_m :World price of imported goods *m*;

e : Nominal Exchange rate;

tal_m : Tax rate of excises and other taxes levied on D_m;

tam_m : Tax rate of excises and other taxes levied on IM_m;

tm_m : Tariff rate of customs duties applied on imports.

Equations [10], [11], and [12] show how VAT levied on each composite product is broken down into VAT on locally-produced goods (equations [10] and [11]) and VAT on imported goods (equation [12]):

$$TVAL_m = TVA_m \frac{lrl_m PL_m \left(1 + tal_m\right) D_m}{lrl_m PL_m \left(1 + tal_m\right) D_m + lrm_m PWM_m \left(1 + tm_m + tam_m\right) IM_m e} \qquad [10]$$

$$TVAL_{nm} = TVA_{nm} \qquad [11]$$

$$TVAM_m = TVA_m \frac{lrm_m PWM_m \left(1 + tm_m + tam_m\right) IM_m e}{lrl_m PL_m \left(1 + tal_m\right) D_m + lrm_m PWM_m \left(1 + tm_m + tam_m\right) IM_m e} \qquad [12]$$

where parameters lrl_m and lrm_m are respectively the broad effective rates to what extent domestic product D_m and imports IM_m are VATable.

Although the uniform nominal rate of VAT (TVG) is the same whatever the origin of goods, the VAT effective rates may however be different from one type of goods to another, and depending on whether the good is locally produced of imported. The variable tvl_i is then the VAT effective rate applied to the good *i* produced in the country (equation [13]), while the variable tvm_m is the VAT effective rate applied to the imported good *m* (equation [14]).

$$tvl_i = \frac{TVAL_i}{PL_i \left(1 + tal_i\right) D_i} \qquad [13]$$

$$tvm_m = \frac{TVAM_m}{PWM_m e \left(1 + tm_m + tam_m\right) IM_m} \qquad [14]$$

Besides VAT, the other taxes levied since 1994 are computed through equations [15] and [16], respectively concerning taxes on domestically produced goods and services and taxes on imported substitutes.

$$TIAL_i = tal_i PL_i D_i \qquad [15]$$

$$TIAM_m = tam_m PWM_m IM_m e \qquad [16]$$

The domestic indirect taxes in force before the 1994 tax reform, $TINDM_m$ and $TINDL_i$, are determined by equations [17] and [18], where txl_i and txm_m are the respective effective tax rates applied on domestically produced and import goods.

$$TINDL_i = txl_i PL_i D_i \qquad [17]$$

$$TINDM_m = txm_m PWM_m IM_m e \qquad [18]$$

The variable $ITAX$ (equation [19]) encompass the whole revenue generated from domestic indirect taxes in force before as well as after the 1994 tax reform.

$$\begin{aligned} ITAX &= \sum_i TVAL_i + \sum_m TVAM_m + \sum_i TIAL_i + \sum_m TIAM_m \\ &\quad + \sum_i TINDL_i + \sum_m TINDM_m \end{aligned} \qquad [19]$$

Production tax $PTAX$ is determined by equation [20], where the production tax rate is applied on a tax base which includes non refundable VAT on intermediate consumptions DI_{ji}, to the proportion of $\left(1 - CIF_i\right)$.

$$PTAX_i = tp_i P_i \left(XS_i + \sum_j DI_{ji} \left(1 - CIF_i\right) LCI_{ji} TVG \right) \qquad [20]$$

In fact, for each sector, only activities that are subject to VAT system (proportion CIF within the sector) have the right to claim VAT rebates.[8] This is also illustrated in equation [21] for the computation of value added price *PV*, where the exclusive-of-VAT price $PCHT$ is applied to intermediate consumptions just to the amount of the proportion CIF, which represents the share of activities that are authorized to benefit from VAT rebates. Activities out of this share bear permanently the VAT levied on their inputs. The price inclusive of VAT, $PCCI_j$, is then applied for the settlement of these inputs.

$$PV_i = \frac{P_i XXS_i - PTAX_i - \sum_j PCHT_j DI_{j,i} CIF_i - \sum_j PCCI_j DI_{j,i} (1 - CIF)_i}{VA_i} \qquad [21]$$

The prices exclusive of VAT are determined through equation [22] concerning importable composite goods *m*, and through equation [23] for non importable goods *nm*.

$$PCHT_m = \frac{PL_m \left(1 + tal_m + txl_m\right) D_m + PWM_m e \left(1 + tm_m + tam_m + txm_m\right) IM_m}{\left(1 + tal_m + txl_m\right) D_m + \left(1 + tm_m + tam_m + txm_m\right) IM_m} \qquad [22]$$

$$PCHT_{nm} = \frac{PL_{nm} \left(1 + tal_{nm} + txl_{nm}\right) D_{nm}}{\left(1 + tal_m + txl_m\right) D_m} \qquad [23]$$

Equations [24] and [25] compute market prices inclusive of VAT, respectively for the absorption of locally-produced goods and for absorption of imported goods. The algebraic juxtaposition of different tax rates implies that all taxes but VAT are included in the VAT taxation base.

$$PD_i = PL_i \left(1 + tal_i + txl_i\right)\left(1 + tvl_i\right) \qquad [24]$$

$$PM_m = PWM_m e \left(1 + tm_m + tam_m + txm_m\right)\left(1 + tvm_m\right) \qquad [25]$$

Apart from the market prices of absorption formulated in equations [24] and [25], the model computes specific market prices inclusive of VAT, applied to product *i* bought by a household *h* (equation [26]), by the government (equation [27]), or by a production sector (equation [28]).

$$PCCH_{h,i} = PCHT_i \left(1 + LCH_{h,i} TVG\right) \qquad [26]$$

$$PCCG_i = PCHT_i \left(1 + LCG_i TVG\right) \qquad [27]$$

$$PCCI_{i,j} = PCHT \left(1 + LCI_{i,j} TVG\right)_i \qquad [28]$$

These market prices are subsequently considered in various accurate equations to determine households' consumptions (equation [29]) and the change in their welfare – the

[8] All activities within a production sector are not covered by the VAT legislation. Small businesses and informal sector for instance are excluded from the VAT base, and their outputs are not "VATable".

Hicks Equivalent Variation – (equation [30]), the quantities of goods consumed by government (equation [31]).

$$C_{h,i} = C_{h,i}^{MIN} + \frac{\gamma_{h,i}}{PCCH_{h,i}}\left(CTH_h - \sum_j C_{h,j}^{MIN} PCCH_{h,j} \right) \qquad [29]$$

$$\begin{aligned} EV_h = & \prod_i \left(\frac{PCCHO_{h,i}}{PCCH_{h,i}} \right)^{\gamma_{h,i}} \left(CTH_h - \sum_j C_{h,j}^{MIN} PCCH_{h,j} \right) \\ & - \left(CTHO_h - \sum_j C_{h,j}^{MIN} PCCHO_{h,j} \right) \end{aligned} \qquad [30]$$

$$CG_i = \frac{G_i}{PCCG_i} \qquad [31]$$

With respect to capital goods and to intermediate consumptions that open onto VAT rebates, market prices applied for their settlement are excluding VAT (at the end of the VAT rebate process), as in equations [32], [33], and [34].

$$INV_i = \mu_i \frac{IT}{PCHT_i} \qquad [32]$$

$$\sum_i INV_i PCHT_i = \sum_h SH_h + SF + SG + e \cdot CAB \qquad [33]$$

$$\begin{aligned} PC_i Q_i = & \sum_h PCCH_{h,i} C_{h,i} + PCCG_i CG_i + PCHT_i \left(\sum_j DI_{i,j} CIF_j + INV_i \right) \\ & + \sum_j PCCI_{i,j} DI_{i,j} \left(1 - CIF_j \right) \end{aligned} \qquad [34]$$

Equilibrium equation [34] emphasizes the fact that the variable PC is a weighted mean price of total absorption for each composite good. Prices excluding VAT apply to some components of this absorption, while prices including VAT permanently apply to others.

The VAT modeled in this way is an imperfect VAT, as currently implemented in Cameroon.

4.3. Poverty and inequality indicators

- ***Poverty indicators: FGT indices***. We consider here the poverty P_α-class indices developed by Foster, Greer and Thorbecke (1984), and otherwise named FGT indices. Their general formula is the following in equation [35]:

$$P_\alpha = \frac{1}{n} \sum_{i=1}^{q} \left(\frac{z - y_i}{z} \right)^\alpha \qquad [35]$$

with : n being the number of households within population studied;
q, the number of poor households;
z, the poverty line;

y_i, the consumption expense of individual i; and

α, the parameter measuring the aversion towards poverty.

When the analysis unit is the household as it is the case in this study, statistic observation might be weighted by the size w_i of the household, du ménage; hence:

$$P_\alpha = \frac{1}{\sum_{i=1}^{n} w_i}\left(\sum_{i=1}^{q} w_i\left(\frac{z-y_i}{z}\right)^\alpha\right) \qquad [36]$$

The parameter α might alternatively be equal to *0, 1* and *2*. With $\alpha = 0$, P_α represents the proportion of people under the poverty line and then measures the poverty Headcount Ratio in terms of percentage of poor people. To assess how far the expenses of poor people are under the poverty line, i.e. the poverty gap index or income gap ration, one computes P_1 (i.e. $\alpha = 1$). A value $\alpha \geq 2$ implies a higher preoccupation about or aversion against poverty: in this regard the index P_2 measures the poverty severity and considers not only the poverty gap and the percentage of poor, but also the distribution scheme of resources amongst people counted as poor.

- ***Inequality indicator: the Gini index.*** The Gini index is computed here according to the method of "relative deprivations" widely utilized in numerous studies. In terms of modeling, this method has the advantage not to require to arrange household income vector in increasing or decreasing order prior to computing the Gini index, as it is the case for instance with trapezium and triangle methods. For each individual or household, the relative deprivation measures the distance between his income and the income of all those relative to whom he feels deprived. With relative deprivations method, Gini index corresponds to the half of the mean of means of the average absolute deviations of incomes for each couple of individuals within the total population studied. In other words, it is the mean of relative deprivations of individuals, divided by the mean of incomes of those individuals:

$$G = \frac{1}{2\mu_y \tilde{N}^2}\sum_{i=1}^{N}\sum_{j=1}^{N}\left|y_i - y_j\right|.pds_i.pds_j \qquad [37]$$

with: μ_y, the mean income of the population; $\tilde{N}$, total population (weight); pds_i, the weight of the household i within the population. The term $\left|y_i - y_j\right|$ is the absolute value of the difference between the mean income in household i and the mean income in household j. Otherwise expressed, it measures the absolute value of the ***mean absolute deprivation*** of i in comparison to j. This mean absolute deprivation becomes a ***mean relative deprivation*** when it is divided by the mean income of the household sample considered. In our case, μ_y constitutes this mean income.

The numerical value of Gini index ranges between « 0 » to « 1 » inclusively. The more that value tends towards 1, the higher the corresponding inequality level.

V. SIMULATION SCENARIOS AND RESULTS

Besides the shock of double calibration, three scenarios are performed:

- The implementation of the VAT in 1994 and replacement of the previous indirect taxes;
- The rehabilitation and development of public infrastructures since 1996;
- The 50 percent devaluation of the CFA franc in 1994, through the real exchange rate. It is important to note that one cannot simulate a nominal devaluation itself using a model where only the real sphere of the economy is represented. In fact, given that there is no monetary sector in the model, the variable "*e*" which acts as nominal exchange rate in the model is not really a nominal exchange rate as such, but a simple conversion device which allows converting the "prices expressed in foreign currencies" into "prices expressed in CFA franc". However, a proxy of 50 percent devaluation of CFA franc was simulated by making use of its likely effect on the real effective exchange rate (REER); that is, by hypothesis, doubling this REER. Given that the REER is equal to the ratio of world prices level on domestic prices level (consumer price index in this case), multiplied by the nominal exchange rate (here the conversion factor "e"), doubling the REER was made by multiplying "e" by 2.[9] As we use backward looking approach for simulations, the simulating devaluation rather consisted in dividing the conversion factor by 2.

5.1. The impacts of changes in parameter values

Parameters concerned here are scale parameters involved in the production functions and in functions of product differentiation by origin and by destination.

5.1.1. Price impacts of the changes in parameter values

It arises from the double calibration simulation that changes in scale parameters occurred between 1993 and 2001 contributed to roughly lower prices at the national level during the period 1993-2001. Except the domestic prices of exports which underwent no effect in nominal terms and the index of domestic prices of imports which slightly increased (0.16 percent), all other price indices declined at around 3 percent. Considering the increase of the consumer price index observed between 1993 and 2001 (77.04 percent), one can consider that the technological changes held back this increase by contributing to it negatively, at -3.98 percent.

5.1.2. Volume effects of the changes in parameter values

Contrary to prices effects, technological changes rather contributed to increase various volume aggregates: during the period 1993-2001, their intrinsic impact leads a 12.05 percent increase of the national production, among which 0.21 percent increase of the exported production and 13.98 percent increase of production intended for domestic market. The whole resources in products consumed within the country increased by 12.33 percent, among which 0.25 percent increase of imported products and 12.06 percent increase the quantities consumed by the households.

[9] World prices used in the formula of the REER are exogenous, considering the small country hypothesis and the consumer price index is endogenous.

As the real GDP in factor costs increased between 1993 and 2001 by 36.82, it appears that technological changes contributed very strongly to that growth, to the amount of 44.78 percent.

On the sector-based point of view, the technological changes were unfavorable only to the crude oil and public utilities production sectors, by with 44.58 percent and 2.77 percent decline production volumes respectively. On the other hand, the sectors where production most benefited from the whole improvement are cash crops agriculture (42.87 percent), wood industries (22.00 percent), manufacturing industries (19.99 percent), oil refinery (17.72 percent), and trade services (18.17 percent).

The weak incidence on the exports and the imports, in volume at the national level, results from the fact that the strong positive variations of commercial flows recorded in some sectors are mitigated by negative variations registered in other sectors.

5.1.3. Household income and welfare impacts of the technological changes

Changes in scale parameters arisen between 1993 and 2001 had a positive influence on household incomes. At the national level, the total income and consumption budget of households respectively increased by 17.32 percent and 17.54 percent due to these changes in scale parameters. The combination of the increase in consumption budget and the above mentioned decline in consumer price index consequently led to a strong increase of household welfare: the whole Hicksian Equivalent Variation amount to 19.93 percent of the household total consumption in 2001.

The positive influence of this scenario on the remuneration of production factors was stronger for wage rates, with a 23.01 percent increase on average, while the increase of the rate of return to capital is 12.68 percent on average, and the average increase of the rate of return to land is 7.70 percent. The increase in remuneration rates of production factors is higher in the non agricultural branches: 23.62 percent for wage rate against 21.64 percent in agriculture; 13.55 percent increase of the rate of return to capital in the non agricultural branches against 4.82 percent in the agricultural sectors. Besides, the growth of the wage rates was stronger in favor of the skilled workers (24.50 percent) than for the unskilled workers (20.40 percent).

The proportion of the remuneration generated by skilled labor within the total factor income is higher for urban households (58.10 percent) than for rural households (34.40 percent). Likewise, the weight of the return to non agricultural capital is higher for urban households than for the rural (22.01 against 7.01 percent). This explains the more important increase in total factor income earned by urban households (23.45 percent) compared to rural households (19.88 percent). This differential impacts is also observed for total incomes (17.83 percent and 16.58 percent increase respectively), for consumption budgets (17.67 percent versus 17.33 percent), and for welfare (20.67 percent versus 18.80 percent). The distributional structure of factor incomes also influenced the differential impacts on total income, consumption and welfare of households distinguished according to the sex of the household head. In this regard, these three variables increased more strongly in households headed by a man (17.59, 18.76 and 21.17 percent respectively) than in those headed by a woman (16.27, 13.75 and 16.09 percent respectively).

5.1.4. Poverty and inequality impacts of technological changes

The technological changes led to substantial poverty alleviation between 1993 and 2001 in Cameroon. The national headcount ratio (FGT0) declined by percentage 6.50 points; that is a contribution of about the third (31.01 percent) in the overall decline in poverty observed from 1993 to 2001.

Poverty gap and poverty severity (FGT1 and FGT2) also fell under the influence of the technological changes, respectively by 3.21 and 1.87 percentage points on the national level, despite the very light increase in disparities, as measured through the Gini index.

FGT0, FGT1 and FGT2 declined in male-headed households as well as in female-headed households; in urban households as well as in rural households, though more importantly in urban zone. The technological changes so contributed to shape the observed widening of the gap between values of poverty indicators in urban zone and values of those indicators in rural zone.

Technological changes essentially reduced the poverty through their growth effects, whereas their redistribution effects have rather slightly acted in the direction of worsening the poverty situation. At the national level, the decline of FGT0 led by technological change is then made of a growth effect of 100.52 percent and redistribution effect of -0.52 percent. Considering the residence area, the redistribution effect was negative only among the rural households (-1.56 percent), while it positively contributed to alleviate poverty in urban zones (20.29 percent against 79.71 percent of growth effect). Considering the sex of the household head, the redistribution effect on poverty alleviation was negative in woman-headed households (-5.26) and slightly positive within the group of male-led households (3.11 percent against 96.89 percent of growth contribution).

5.2. Impacts of the 1994 50percent devaluation

5.2.1. Price impacts of the devaluation

Decomposing the effects shows that the devaluation widely contributed to the rise in price levels experienced between 1993 and 2001. 65 percent of the 77 percent increase of the consumer price index is attributable to devaluation. In nominal terms, the rise in almost all the domestic price indices is around the rate of devaluation (50 percent).

5.2.2. Volume effects of the devaluation

Devaluation intrinsically contributed just for a very little proportion to the growth observed between 1993 and 201. Its contribution amounted to 0.82 percent in the growth of the real GDP at factor costs during this period. Nevertheless, for the whole period, it led to the increase of exports in real terms (4.99 percent) and a decrease in imports in real terms (3.34 percent). This is in accordance with the classic functioning of its mechanical effects on the international trade field.

The overall volume of exports increased under the combined effects of a light increase of the national production (0.22 percent) and a cutback of the production intended for the domestic market, which falls by 0.56 percent. The sectors where exports essentially grew thanks to increase of their production are foodstuffs agriculture, cash crops agriculture, crude oil, wood processing and miscellaneous manufacturing industries. Those where the production was essentially diverted towards foreign market, following a decline in that production, are the forestry, the food industry, the refined petroleum and the sector of trade services.

Devaluation led to a 0.89 percent decrease in the whole volume of absorption, given the decline of imports as well as of the domestic production intended for the domestic market. In this absorption, household consumption underwent the most drastic decline (-17.49 percent), auguring in the same line a deterioration of the household welfare at the national level.

5.2.3. Welfare and income effects of the devaluation

Devaluation induced a 30.31 percent increase of household income, and a consecutive increase of their consumption budget amounted to 30.71 percent. However, the intrinsic effect of devaluation led to a severe deterioration of household welfare (-17.56 percent), because the increase in consumption budget was relatively weak compared to the increase in the consumer price index (50.15 percent).

The above-mentioned increase in household incomes derives from the rise of factor incomes: 37.78 percent increase of the average wage rate, 42.12 percent increase in the average rate of return to capital, and 51.70 percent increase of the rate of return to land. The gain from wage increases was higher for unskilled workers (41.60 percent increase in wage rate for skilled labor) than for skilled workers (35.60 percent increase). The agriculture being more intensive in unskilled labor comparing to non agricultural sectors, the improvement of average wage rate in agriculture was therefore more important compared to the mean wage rate of the whole economy.

As a consequence, the rural households benefited from income increases than urban households (35.74 percent against 26.52 percent in terms of total income). Indeed, more than 60 percent of primary incomes of the rural households results from production factors allocated to agriculture; i.e. the factors for which the increases in rate of returns were highest. Urban households earned only 10 percent of these factor incomes. The deterioration of the welfare was consequently more drastic to the urban (-25.22 percent) than to the rural households (-5.96 percent). The increase in the total income is almost the same for both male-headed and female-headed households (around 30 percent). However the consumption budget of female-headed households increased relatively less (25.48 percent against 32.40 percent for male-led households) because they are in situation of dissaving at the benchmark state. Consequently, the loss in welfare is more important for woman-headed households (-31.08 percent) than for man-headed households (-13.20 percent).

5.2.4. Inequality and poverty impacts of the devaluation

Simulation results of the devaluation illustrate well the fact that the welfare and the poverty within a household group do not vary automatically in opposite directions. While the devaluation strongly lowered the overall welfare of households, it contributed at the same time to reduce the poverty at national level. The decreases in poverty gap and poverty severity under the influence of devaluation were most important, with respectively reductions of 7.72 and 8.53 percentage points at national level, whereas the national headcount index only decreased by 0.36 percentage point.

Consequently, the devaluation contribution to poverty alleviation observed between 1993 and 2001 in terms of headcount ratio amounted to 1.72 percent. Inequalities among households considerably decreased thanks to devaluation (Gini Index declined by 0.11 at national level), in accordance with the above-mentioned strong decline in FGT1 and FGT2 and important redistribution effect amongst households.

Indeed, the net decline in poverty headcount (-0.36 percentage point) is made of a redistribution effect favorable to this alleviation (-7.04 percentage points) and a growth effect rather favorable to an increase in poverty headcount ration (6.68 percentage points).

It is interesting to notice that the devaluation had diametrically opposed poverty effects, depending on whether a household is situated in urban zone or in rural: while the number of people counted as poor decreased in rural zone (-1.74 percentage point of FGT0), it rather increased in urban areas (+2.20 percentage points). The devaluation growth effect contributed to reduce the poverty in rural areas (by 2.11 percentage points of FGT0) and to raise the number of poor people in urban areas (+11.10 percentage points). Conversely, the redistribution effect of devaluation contributed to mitigate the increase of poverty in urban zones (-8.90 percentage points) and to slow down its reduction in rural areas (+0.37 percentage point of FGT0).

5.3. Impacts the 1994 tax reform

5.3.1. Price impacts of the tax reform

Beside the 1994 devaluation, the reform of the indirect tax system engaged in 1994 is another reform which strongly contributed to the rise in prices during period in review. Its contribution in the 77.07 percent increase of the consumer price index between 1993 and 2001 amounts to 10.60 percent. The rise in prices is not only due to the redeployment of customs tariffs and the introduction of the VAT, but also to the abolition of numerous customs exemptions granted before reform.

5.3.2. Volume impacts of tax reform

According to simulation results, approximately 3 percent of real GDP growth observed between 1993 and 2001 is due to the implementation of the 1994 tax reform. The increase of the total production was coupled by an important reorientation of this one in favor of the domestic market and, consequently, a strong decline of exports in volume. The increase of the production intended for domestic market has more than compensated the decline of the imports, so that the net incidence on the national absorption was positive. However, this increase concerned only the positive change in intermediate consumptions and capital goods, the household consumption having considerably fallen.

5.3.3. Welfare and income impacts of the tax reform

Tax reform considerably deteriorated the household welfare (3 percent decrease in terms of consumption volume of 1993), the consecutive increase of incomes (3.62 percent) and of the consumption budget (3.66 percent) having been weak with regard to the rise in the consumption prices (8.17 percent).

Incomes of rural households (mainly employed in agriculture sectors) increased more than incomes of urban households, owing to the higher rise in remuneration rates of production factors used in agriculture. This explains the more drastic deterioration of welfare observed within urban household compared to rural households. From gender point of view, tax reform more lowered welfare within female-headed households than in male-headed households; the consumption budget of the first type of households having increased less strongly than that of the last.

5.3.4. Poverty and inequality impacts of the tax reforms

At the national level, the tax reform raised the poverty headcount ratio (FGT0) by 0.71 percentage point. This represents But it contributed, although slightly, in the reduction of poverty gap (-0.19 percentage point), poverty severity (-0.30 percentage point), as well as of Gini index (-0.01).

According to the residential area, the rise in FGT0 due to the tax reform was in relative terms more drastic among the urban households (+1.69 percentage point) than within the rural households (+0.18 percentage point). The reduction FGT1 and FGT2 observed at the national level is in fact effective only for the rural households.

The poverty and inequality impacts according to the sex of the household head are almost the same as what is observed at national level, except that the severity of poverty worsens within female-led households.

Except households whose the head is mainly occupied in agriculture, fishing, hunting, food industry, textile industry, chemical industry, and in building materials, all other groups of households considered according to the main occupation of the leader recorded an increase of their poverty headcount ratios.

On the national level as well as according to gender or the residence milieu of the household, the unfavorable growth effect of tax reform dominated its favorable redistribution effect with regard to poverty alleviation.

5.4. Impacts of the rehabilitation of basic infrastructures

5.4.1. Price impacts of rehabilitating infrastructures

The rehabilitation of basic infrastructures hardly had an effect on prices. Its contribution to the increase of consumer price index observed during period in review amounts only to 0.06 percent.

5.4.2. Volume impacts of the rehabilitation of basic infrastructures

Contrary to price impacts, the various volumes variables were more sensitive to the rehabilitation of infrastructures. This measure contributed up to 11.37 percent in the real GDP growth recorded between 1993 and 2001. The increase of the total production was translated into an increase of export volumes as well as of goods and services intended for the domestic market. On the other hand, increase of the total absorption is made of rise in imports as well as in domestic production, and is translated by an increase of household consumption.

5.4.3. Income and welfare impacts of the rehabilitation of basic infrastructures

The remuneration rates of production factors increased less under the influence of the infrastructure rehabilitation than in the case of previous scenarios. However, given the weak rise in consumption prices, the household welfare increases appreciably, at the national level and whatever the sex of the household head, and whether the household belongs to rural zone or urban zone.

Nevertheless, the total income of rural households (more active in agricultural activities) and their overall welfare increase more strongly than those of the urban, rises in return rates of factors used in agriculture being higher than return rate rises of non agricultural sectors that mainly hire urban households.

5.4.4. Poverty and inequality impacts of the rehabilitation of basic infrastructures

Infrastructure rehabilitation induces reduction of all the poverty indices FGT0, FGT1 and FGT2, as well as of the Gini index, not only at the national level, but also in both rural and urban areas, and indifferently within male-headed and female-headed households.

Thus, considering the reduction of poverty headcount ratio recorded between 1993 and 2001, the intrinsic contribution of this policy amounted to 8.9 percent at the national level, 4.53 and 13.45 percent with respect to urban and rural households respectively, 9.24 and 12.76 with respect to male-led and female-led households respectively.

For all the households and whatever the household group according to the sex of its head or according to residence milieu, the growth effect of rehabilitating infrastructures was more important than its redistribution effect.

VI. CONCLUDING REMARKS

The results of this study give an indication about the direction and the magnitude of impacts of the studied shocks, as well as about the intrinsic contribution of these shocks onto the changes in poverty and growth between 1993 and 2001 in Cameroon. In this respect, it appears that devaluation on one hand and rehabilitation of basic infrastructures on the other hand positively contributed to alleviate poverty between 1993 and 2001, while the tax and customs reform has rather acts out in disfavor of this reduction of poverty.

Beyond the study of impacts of these above three controllable shocks, the decomposition approach used, the so called double calibration technique reveals the very considerable contribution of the technological changes arisen between 1993 and 2001. These changes explain by their own 31 percent of the reduction of poverty headcount ratio at the national level, 45 percent of the real GDP growth, and 4 percent of the rise in consumer price index during the considered period. The intrinsic contributions the devaluation, the rehabilitation of infrastructures, and of the tax reform are respectively 2, 9 and -4 percent in the decrease of nation headcount ratio; 1, 11, and 3 percent in explaining the growth of real GDP; and 65, zero and 11 percent in the rise in consumer price index observed during the same period.

The technological changes and the rehabilitation of infrastructures reduced the poverty as well in rural zone as in urban areas and in all household groups indifferently with the sex of the household head. On the other hand, the devaluation effectively contributed to reduce the poverty at the national level and in rural zone, but rather contributed to aggravate poverty in urban zone. Indeed, the activities which benefited from the production and export revival led by devaluation were essentially rural, while the price devaluation-led increase of import products mainly struck the urban households.

This study suggests that the direct contribution of the policies in achieving the objectives of development might turn out considerable, but also that the technological changes and the indirect incidences of those policies on the adoption of better technological processes could prove to be very important. Besides, the results of this study support the measures currently implemented or envisioned by policymakers in Cameroon, which aim at pursuing the rehabilitation and the development of basic infrastructures. The negative poverty impact of the tax reform introduced in 1994 implies that there is a necessity of carrying out with a lot of dexterity ad hoc taxation measures and the trade negotiations concerning the Economic Partnership Agreement with European Union and in the framework of the World Trade Organization, given that the risk of an aggravation of poverty proves to be plausible if the fiscal measures are used to offset tariff losses.

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