

# Budget Variation and Welfare in Cameroon: a Computable General Equilibrium Model Approach

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## Abstract

The objective of this paper is to determine the impact of a variation in government spending on the well-being of the population in Cameroon. We use the Computable General Equilibrium Model (CGEM) developed by Decaluwé et al., [1] calibrated on the 2016 Social Accounting Matrix (SAM) for Cameroon [1]. This SAM is constructed from the Resources and Uses Table (RUT) and national accounts data from the National Institute of Statistics [2]. The welfare is measured by the equivalent variation indicator. The results show that a 20% increase in public expenditure would contribute to improving the well-being of salaried households and capitalist households by 883.58 billion CFAF and 5.47 billion CFAF respectively. This improvement in well-being is achieved through a reduction in the current price of goods and services in the various sectors (0.76% for agriculture, 0.53% for industry, 0.76% for services and 0.57% for public services) on the one hand, and through an increase in household income on the other, whether they are salaried or capitalist earners.

**Keywords:** Public Expenditure, Household Welfare, Computable General Equilibrium Model, Equivalent Variation.

**Code JEL:** C68, H53, I38, R13

## Introduction

It is important to monitor the evolution of public finances in order to mobilize public wealth and include it in social construction policies. This helps us to assess the share of the public sector in the economy. This share can take other forms than public expenditure, such as the presence or regulation of public enterprises and compulsory royalty rates. Indeed, Tsafack shows that most of the above discussions can be found in the case of Cameroon [3]. The observation of Cameroon's budgetary data for about 40 years shows that the overall expenditure of the Cameroonian government is increasing, despite the general economic situation. Four phases of this budgetary evolution in Cameroon can be highlighted.

The first phase of the budget increase is from 1971 to 1978. The second is a downward trend from 1988 to 1996. The third is a phase of resumption of growth in public spending, which runs from 1997 to 2000. The final phase runs from 2000 to 2019 and is characterized by exponential growth. Specifically, Cameroon's budget has more than doubled in 13 years to reach CFAF 5,212 million in 2019, an increase of more than 171.4%. However, despite the health crisis (COVID-19) that the country is currently undergoing, the budget has unexpectedly decreased in 2020.

As far as public expenditure is concerned, the overall volume is increasing. The evolution of public expenditure has followed the

same trends as those of economic activity and budgetary revenue. Public expenditure more than doubled in five years, rising from CFAF 421 billion in 1982 to CFAF 879 billion in 1986. It increased again exponentially from CFAF 451 billion in 1994 to CFAF 1730 billion in 2007. Attempts to justify this increase over the period 2008-2018 include, for example, the crisis of the mid-1980s, which caused the share of public expenditure in GDP to rebound (an increase of 26.9% in 1987), the fight against the Boko-haram terrorists, the fight against the crisis in the English-speaking regions, and the various changes in the finance law.

We can therefore see that public expenditure has continued to grow significantly, despite the fairly stable share of average GDP in the post-devaluation period of 18.8%. Is this increase justified by the well-being of Cameroonian households?

The concept of well-being introduced by Bentham (1789) is generally associated with that of utility [4]. However, Pigou (1920) was the first to formulate the existence of a possible relationship between income and happiness [5]. He defends the idea that income can be used as a tool to get as close as possible to our knowledge of happiness. With reference to the Cameroon Household Survey (ECAM) data of 2001, 2007, 2014, we can see that well-being is studied through: the poverty trend, the poverty index and the number of poor people.

The poverty line was estimated at 232,547 CFAF in 2001, 269,443 CFAF in 2007 and 339,715 CFAF in 2014. This is

equivalent to CFAF 637, CFAF 738 and CFAF 931 per adult equivalent (ECAM4) respectively, and reflects a poverty line of 15.9% between 2001 and 2007 and 26.1% between 2007 and 2014. This variation is mainly due to inflation and changes in consumption patterns during these periods.

Between 2001 and 2014, the poverty rate was decreasing and the percentage of people living below the poverty line was 40.2% in 2001, 39.9% in 2007 and 37.5% in 2014. The poverty rate was down by 2.4 percentage points in 2014. Trends in the depth and severity of poverty reveal a more nuanced situation, as the average annual amount that a poor person needed to be transferred to escape poverty was CFAF 74,002 in 2001, CFAF 83,161 in 2007 and CFAF 130,275 in 2014. This represents a 57% variation in this amount from 2007 to 2014, which is 2.8 times the rate of inflation over the period. In terms of rigidity, its increase from 5% in 2007 to 7.2% in 2014 suggests that inequalities between the poor are exacerbated.

The aim of poverty reduction policies is not only to reduce the poverty rate, but also to reduce the number of poor people, which was 8.1 million in 2014, an increase of 1.9 million since 2001. This increase is due to a combination of an estimated 2.6% annual population growth and a gradual decline in poverty. However, in 2014, the amount of money that needed to be transferred to poor individuals to lift them out of poverty was estimated at CFAF 775.3 billion, or 23.4% of the 2014 budget.

The adoption of the Millennium Development Goals (MDGs) in 2000 was intended to help the Cameroonian government reduce poverty. However, the available literature on welfare initially shows that welfare has improved, but not in relation to households. The fiscal balance sheet adopted in Cameroon since 1994 shows a general upward trend. On the other hand, a total of 50.5% people are considered poor, as shown by data from various household surveys in Cameroon (ECAM 1, 2, 3, 4). This gives welfare an important position in terms of government concerns.

Theoretically, as Wagner (1872) shows, there is a link between public spending and the growth of the state, so an increase in public spending should increase the welfare of the population [6]. Musgrave (1959) found that the demand for public services tends to be very low when the level of per capita income is low, as a result of fluctuations in the income elasticity of demand for public services [7]. Indeed, as per capita income increases, the demand for public services such as education, health and transport also increases, thus forcing the state to increase its expenditure on these services to ensure the welfare of the people.

The impact of public spending on happiness has been empirically analyzed by several authors (Radeliff, 2001; Di-Tella et al., 2003; Di-Tella and MacCulloch, 2005; Bjornskov et al., 2007; Kotakorpi and Laamanen, 2010) The common feature of these studies is that they focus on a particular public expenditure, thus neglecting the consideration of total government expenditure in the welfare analysis. Furthermore, most of the works mentioned construct their analysis by focusing on one part of the economy (partial equilibrium) [8-12]. However, although the partial equilibrium model is suitable for this type of analysis, its main

weakness is that it is not able to provide information on what is happening in several markets or sectors at the same time. Thus, in order to examine the issue of budget variation on household welfare in Cameroon in terms of utility gained or lost, analyzed using the Hicksian equivalent (Devarajan et al., 2001; Olopoenia and Aminu, 2007; Obi-Egbedi et al., 2013; Abachi and Iorember, 2017), we focus our analysis on total public expenditure and examine the hypothesis of an increase through the computable general equilibrium modelling (CGE) [13-16].

In order to propose appropriate measures to enable the authorities to better manage public expenditure, this paper aims to evaluate the impact of changing in public expenditure on household welfare in Cameroon. The central question of this study is therefore: What is the impact of a variation in public expenditure on household welfare in Cameroon? The remainder of this paper is organized as follows: section 2 is devoted to the presentation of works that have analyzed the impact of public expenditure on welfare, section 3 presents the methodological approach that will allow us to obtain the results presented in section 4 and the conclusion that closes our analysis is presented in section 5.

## Literature Review

We first present a theoretical review of the effect of public spending on welfare, followed by an empirical review of the works that have addressed the issue of public spending in relation with welfare.

## Theoretical Review

The existing literature shows that several theories have attempted to explain the effect that public spending might have on welfare given the link between public spending and economic growth in a country.

Indeed, Keynes in his work supports the fact that public spending is an exogenous factor and can be used as a policy instrument to promote economic growth [17]. The idea of this support is that, public spending can contribute positively to economic growth in the sense that through multiplier effects on aggregate demand, an increase in public consumption will lead to an increase in employment, investment and profitability. This will in turn contribute to improving people's welfare.

Ricardo (1821) showed that taxation and public borrowing are equivalent forms of financing public expenditure. In the case of a closed economy, the repayment of this debt will be done by an increase in future taxes; which under the rational expectations hypothesis will increase the savings of individuals (by buying the bonds issued by the State). Since the size of the public deficit corresponds to the amount of savings, the immediate consequence is that aggregate demand remains the same as well as the interest rate and the crowding out effect of private investment on public spending is zero. This is why his support is against increased public spending, as it has no positive effect on growth and therefore no effect on welfare. Musgrave (1959) and Wagner (1872) with their theories on the growth of public spending and Wagner's law are not to be outdone in these conclusions [6-7]. It should be noted, however, that the contradiction observed at the theoretical level is also found at the empirical level.

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## Empirical Review

To date, only a few studies have investigated the relationship between public expenditure and welfare [8-12].

The study of Radcliff presented cross-country evidence of a positive and statistically significant effect of generous social spending on average happiness [8]. Di Tella et al., showed that higher unemployment benefits led to an increase in national welfare in European countries over the period 1975-1992 [10]. Di Tella and MacCulloch found a positive but insignificant effect of government consumption on life satisfaction in a panel analysis for ten OECD countries [10]. They use government consumption as a control variable when studying the impact of inflation and unemployment on voter welfare; this might suggest that the available literature on government consumption presents somewhat mixed results. Kotakorpi and Laamanen found that there is a positive effect of health spending on subjective well-being when controlling for respondents' health status [12].

Meanwhile, other works such as Veenhoven and Ouweneel (2002)[18] have studied the influence of certain types of public expenditure on welfare and present equally contradictory evidence[18,19]. Indeed, Veenhoven studied the relationship between social security expenditure and welfare at the global level and found no significant correlation between both variables. In an extension of this study, Ouweneel tested the hypothesis that at least the unemployed should experience a higher average welfare income, which corresponds to a generally high percentage of chief executive officer welfare, and concluded that while large welfare states generally achieve lower levels of income inequality, this has no significant effect on the subjective welfare of the unemployed [19]. Bjornskov et al., conduct a global multi-country study and find that life satisfaction decreases with public consumption, while public capital formation and social spending do not seem to be relevant for SWB; this could suggest that the above-mentioned taxation principle is violated with respect to public consumption [11]. On the other hand, the benefit principle regarding social transfers and capital formation is respected. As far as total expenditure is concerned, it can also be achieved. However, the authors do not include total expenditure in the estimates.

However, in the Cameroonian context, one can observe that no study on the economic consequences (mainly the welfare aspect) of the Government spending has been carried out till now especially through the CGE tool. This limit justifies the main interest of the present study.

## Methodology

During the latter half of the 20th century, computable general equilibrium models have been used in a wide range of analyses and fields. Authors such as (Johansen, 1960; Harberger, 1962; and Scarf, 1973) were the first to develop CGE models for use in developing economies [20-22]

## Description of the Model

The model used here is that of Decaluwé et al., [1]. The presentation of the latter is based on industry accounts. This is because the factor accounts of production (labor and capital) receive income from the sale of their services to production activities in the form of wages and capital income. It is then transferred to institutional units (salaried households, capitalist households and firms) in the form of labor and capital income.

Households receive income not only from the factors of production (income from labor and capital), but also from the relocation of firms, states and the rest of the world. They use their income in exchange for purchases of consumer goods and services, payment of taxes and social transfers or transfers to other institutions. In addition, they can use the remaining income to invest via the capital account or save.

Companies receive part of the profits generated by production activities (agriculture, industry, services and public services) and transfer the income from other residential institutions and the rest of the world. Part of this income is then paid out in the form of interest, dividends, rents, taxes and social security contributions to the owners, shareholders and states of financial assets. The rest of the operating income is transferred to the capital account.

The government collects part of the income of economic agents and transactions in the form of compulsory collections (income and property taxes, production and excise taxes, import and export taxes and customs duties) from other residential institutions and the rest of the world. These revenues are then used to purchase government services, transfers and subsidies to households, corporations and the rest of the world; surplus or deficit income is transferred to the capital account.

The investment account (Accumulation or Savings), which includes gross fixed capital formation and changes in stocks, collects the savings of resident and non-resident institutional units and invests them.

The rest of the world account, in which transactions between resident and non-resident agents are aggregated, receives income from the sale of goods and services to the domestic economy (imports) and transfers from resident agents; and uses this income to purchase goods and services from the domestic economy (exports) and transfers income to resident institutional units (either with a surplus balance or net investment of non-resident agents in the domestic economy, or a deficit balance or net investment of nationals abroad).

## Model Variables and Parameters

We present here the key variables used in our model and therefore the notations are those of Decaluwé et al.,

**Table 1: Variables**

1	$p(i)$	Producer price of product $i$	4
2	$div$	Dividends paid to capitalist households	1
3	$sm(h)$	Savings of household $h$	2
4	$ydm(h)$	Disposable income of household $h$	2
5	$ye$	Income of enterprises	1
6	$yg$	Government income	1
7	$ym(h)$	Household income $h$	2
8	$g$	Government expenditure	1
9	$tew$	Transfers from enterprises to the rest of the world (rdm)	1
10	$ev(h)$	Equivalent change	2
11	$trow$	Transfer received by salaried households from the rest of the world (rdm)	1
$i, j \subseteq \{agriculture, industry, market services and non-market services\}, h \subseteq \{wage-earning household, capitalist household\}$			

**Equations**

In this subsection we present the key equations of the model presented above. In this way, it will be possible to clearly distinguish the equations of production, employment, income and

savings, demand, prices, international trade, the equilibrium equations and other equations such as the equivalent variation and GDP.

**Table 2: Equations**

$YM_{hs} = \sum_j LD_j + TG_{hs} + TROW$	1
$YE = ROD \cdot \sum_{tr} (R_{tr} \cdot KD_{tr})$	1
$YG = \sum_{tr} TI_{tr} + \sum_h TD_h + TDE + DOUANE + SLACK$	1
$YM_{hk} = DIV + TG_{hk}$	1
$YDM_h = YM_h - TD_h$	2
$SG = YG - G - DETTE$	1
$LD_{ntr} = P_{ntr} \cdot \left( \frac{VA_{ntr} - KD_{ntr}}{W} \right)$	1
$EV_h = YM_h \cdot \prod_{tr} \left( \frac{PO_{tr}}{P_{tr}} \right)^{\beta_{ctr,h}} - YMO_h$	2

The data used for our analyses are presented in the following section.

**Social Accounting Matrix**

The data that are essentially used to construct the SAM are derived from 2 sources: the resources and uses table (RUT) from the NIS and national accounts data [2]. The latter is an alternative in the absence of the 2016 Integrated Economic Account Table (IEAT) data.

The reference year is 2016. The availability of data and the completeness of the data offered by the national accounts for this year with regard to the various economic and financial operations in Cameroon are the main reasons for this choice.

According to Fofana (2007), one of the particularities of the SAM is its flexibility, which allows for a great deal of flexibility in the disaggregation of activities, institutional units and productive factors [23]. According to it can incorporate the financial sector of an economy, or so-called non-economic production



activities [24-27]. Another common feature of the SAM is its presentation in the form of an input-output table, which makes it possible to trace the accounting flows that take place in an economy in a given period and which are presented in the form of income in the row and expenditure in the column.

Our SAM is presented in the form of six aggregate accounts, namely: a current account of productive factors (labor and capital); a current account of resident institutional units (households, firms and government); a productive activities account; a product account (goods and services); a capital account; and finally a current account of the rest of the world.

There are several techniques for balancing the SAM. The most commonly used are the Racking-Ration (RAS) method and the cross-entropy method. The RAS method is used when there are differences between the various data sources and allows to find a new matrix very close to the initial one by just specifying the checksums for each row and column of the matrix to be balanced. For the case of our study, the balancing method chosen is the cross-entropy method, because according to the available literature, it gives estimates that are much more accurate to the initial values.

### Model Calibration

The model calibration procedure consists of choosing a numerical value for the different parameters and coefficients of the model that is compatible with the baseline equilibrium of the SAM, i.e. reproducing the SAM data before the simulations are performed [28]. As for the calibration of our model (computation of the numerical values of all parameters and coefficients), we followed the following steps:

We start with a linear CGE as illustrated by Emini and Feunou [29];

$$Y=f(X,\beta,\gamma)$$

With the values of  $\beta$  and the endogenous variables known, the following model is obtained:

$$Y_0=f(X_0,\beta,\gamma)$$

Solving this model gives us the values of  $\gamma$ .

$$\gamma=g(Y_0,X_0,\beta)$$

### Closure of the Model

Completing a model consists of identifying the arguments in favor of a particular way of operating in the economy that is able to reflect its realities and characteristics as faithfully as possible and to better grasp the impact of the simulated policies, as reported by the results of the simulations carried out on the basis of the model [30].

According to Suwa-Eisenmann, there are theoretically four main closure techniques in the literature: Keynesian closure: which allows for unemployment in the economy. Labor demand is endogenous; neo-classical closure: here savings play a very im-

portant role and investment varies to adjust ex post; Johannsen closure: investment plays a determining role and consumption or savings adjust residually; Kaldorian closure: factors are paid at their marginal productivity. The balance between investment and saving is achieved through a redistribution of income that influences the saving rate [31].

In the case of our model, in order to better represent the Cameroonian economy, we make a loop which is specified as follows. In the factors market, the wage rate is flexible and the labor supply is exogenous; in the savings-investment equilibrium, investment is flexible and therefore endogenous and the adjustment is made by savings which is fixed; for trade with the rest of the world, the exchange rate is exogenous; the equality of uses and resources for the state budget is very important and the adjustment is made by a flexible deficit while the revenues and expenditures are fixed.

Given the objective of this work, which is to determine the impact of a variation in public expenditure on household welfare in Cameroon, we organize this work around a scenario of a 20% increase in public expenditure.

### Results

As mentioned above, we use the equivalent variation to capture household welfare. The latter according to its equation is an increasing function of income and decreasing prices. Thus, the results of our analysis are presented in three steps. In subsection 4.1 we present the result on income, in subsection 4.2 the impact on the producer price and finally in subsection 4.3 the impact on welfare [31].

#### Impact on Income

Based on the simulation of a 20% increase in public expenditure, we observe an increase in household income (salaried and capitalists) of 10.14% and 1.04% respectively. Indeed, the income equation of salaried households is given by:

$$YM_{hs}=\sum_j LD_j + TG_{hs} + TROW.$$

This shows that the income of salaried households is a function of the labor demand of industry  $j$ , government transfers to salaried households and transfers received by salaried households from the rest of the world. Thus, the increase in the income of salaried households could be explained by the increase in each of these three variables. We also observe a positive variation in public transfers to salaried households of 549.70% following this increase; transfers received by capitalist households from the rest of the world being negative. Also, the demand for labor in the agricultural, industrial and service sectors increased by 12.23%, 6.78% and 15.76% respectively. This justifies the increase in household income.

However, the income equation for capitalist households given by:  $YM_{hk}=DIV+TG_{hk}$  shows that the income of capitalist households depends on dividends paid to them and public transfers to households  $h$ . Thus, the increase in the income of capitalist households can be explained by the growth of either dividends paid to capitalist households or public transfers to these households. Dividends paid to capitalist households grew by 13.82%

following a 20% increase in public expenditure; public transfers fell by 297.65%. This justifies the fact that the income of salaried households is higher than that of capitalist households.

### Impact on The Producer Price

The results show that following a 20% increase in public expenditure, producer prices in all sectors of activity fall (-0.76% in the agricultural sector, -0.53% in the industrial sector, -0.76% in the services sector and -0.57% in the public services sector). This fall in prices is conducive to the improvement in welfare presented in section 4.3.

### Impact on Welfare

Since the main objective of our study is to assess the impact of a variation in government expenditure on the welfare of the population in Cameroon, the evaluation of the effect of increased government expenditure on household welfare in terms of utility gained or lost is analyzed using the Hicksian equivalent following (Obi-Egbedi et al., 2013; Olopoenia and Aminu, 2007; Devarajan et al., 2001 and Abachi and Iorember, 2017). The results show that a 20% increase in public expenditure in Cameroon leads to an improvement of salaried and capitalist households' welfare by CFAF 883.58 billion and CFAF 5.47 billion respectively. However, it is remarkable that this increase is higher for salaried households than for capitalist households. This can be explained by the fact that, the disposable income of salaried households (CFAF 8962.47 billion) is higher than that of capitalist households (CFAF 819.39 billion); government transfers are higher for salaried households (CFAF 36.32 billion) than for capitalist households (CFAF 33.62 billion).

### Conclusion

The objective of this paper was to evaluate the impact of a variation in public expenditure on household welfare in Cameroon. To achieve this objective, we used the 2016 SAM, whose data come from two sources: the resources and uses table (RUT) from the NSI (2017) and the national accounts data, which are an alternative in the absence of the 2016 Integrated Economic Account Table (IEAT) data. Subsequently, we used the CGE method. On the basis of a 20% increase in public spending, our analysis shows that a 20% increase in public spending contributes to an increase in household income (salaried and capitalists) of 10.14% and 1.04% respectively; a decrease in the producer price in the various branches of activity (agriculture, industry, market and public services) of 0.76%, 0.53%, 0.76% and 0.57% respectively; and an improvement in the well-being of the population. Indeed, the improvement in the welfare of salaried and capitalist households was 883.58% and 5.47% respectively.

We recommend directing public spending to areas that will increase consumption through income and producer prices. These include:

- To direct part of public expenditure towards helping companies to develop better and, in turn, to increase the income of mainly capitalist households;
- To direct part of public expenditure to support production in the various branches of production. This will have the effect of influencing the producer price.

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