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Proceedings of the 5th International Conference on Economics and Social Sciences (2022), ISSN 2704-6524, pp. 905-916

The 5th International Conference on Economics and Social Sciences
Fostering recovery through metaverse business modelling
June 16-17, 2022
Bucharest University of Economic Studies, Romania

Hydrocarbons Price Subsidy and Poverty in Cameroon

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DOI: 10.24789788367405072-084

Abstract

Subsidies for petroleum products increasingly burden the state budget and prove ineffective in reducing poverty. However, their removal could also harm the well-being of poor or vulnerable households. In this work, we analyse the impact of subsidy abolition on poverty using a computable general equilibrium model.

The main results of this work show that the removal of subsidies does not benefit households. The poverty rate increases by 0.6 points in urban areas and 1.7 points in rural areas after the removal of subsidies. Direct transfers to the poor eased the shock, but do not help reduce poverty. The other poverty indices, in this case the depth and severity of poverty, have experienced the same trends. However, when these measures are accompanied by an improvement in public services by increasing government spending, the poverty indices improve or remain at their baseline levels.

Keywords: Subsidies, Computable General Equilibrium Model, Micro-simulation, Cameroon.

JEL Classification: C68.

1. Introduction

Many countries often use public price subsidies to meet several objectives depending on the nature of the products. The first is the stabilization of the price level in the domestic market and the guarantee of an adequate supply of certain basic products. The second is the protection of existing and infant industries with the aim of maintaining a remunerative price level in certain disadvantaged regions.

The practice of subsidies has been applied in Cameroon since the twentieth century, and they are put in place in order to protect the purchasing power of citizens, to guarantee the supply of the market with basic products, as well as to support the

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development of certain sectors, in particular the oil and gas sector. According to data collected in the database of the Hydrocarbon Price Stabilization Fund (HPSF), the overall cost of the subsidies amounts to 1523 708 652 820 FCFA over the period 2008-2019, and the government budget amounted to about 41069 billion FCFA over the same period. It therefore appears from the above that the cost of petroleum products subsidies in Cameroon is considerable compared to its budget over the same period probably for the benefit of consumers who represent households and whose objective is to contribute to the eradication of poverty. Although Cameroon makes a considerable profit from subsidizing hydrocarbons, amounting to 292 164 992 450 FCFA over a period of 2014-2017. Likewise, according to the World Bank in its economic books, Cameroon's subsidies for petroleum products at the pump reached a sum of FCFA 450 billion in 2014, i.e., about 3% of gross domestic product (GDP) from the country. This sum according to the World Bank is in clear increase of 30 billion FCFA compared to 2013 which it peaked at 420 billion according to the Cameroonian government. However, according to the financial institution, it is only 220 billion FCFA that would have been planned for that year (2014 budget), i.e., a little less than 50% of the sum necessary to support the subsidies. Furthermore, the International Monetary Fund (IMF) suggested to the government to remove the subsidies because, according to them, said subsidies benefit the rich more than the poor. Therefore, it is the starting point of a stormy (interesting) national debate around the subsidy of petroleum products. A posture not shared by civil society and even employer organisation such as the Cameroon Inter-Patronal Grouping best known under its French acronym as GICAM, which made the removal of the subsidy conditional on the implementation of certain accompanying measures clearly proposed to the government. However, the removal of subsidies on petroleum products would have a significant adverse impact on low-income populations, since they spend more of their income on energy than the rich. Thus, an increase in the prices of petroleum products would lower the standard of living of the poor, thus affecting the well-being of the various categories of the population.

Nowadays, several studies have been conducted around the world to precisely study the effectiveness of subsidies or also to determine the impact of their removal, particularly on poverty and inequalities.

2. Problem Statement

Many economists focused on the study and analysis of the issue to measure the effectiveness of these subsidies or to determine the impact of their removal, as well as compensatory measures to alleviate the effect of removal.

Among the first, Audet (2007) and Soile (2015) analysed the utility and effectiveness of subsidies in Egypt and fuel subsidies in Nigeria, respectively. These authors have come to converging results, concluding that these subsidies do not benefit the poor especially and there is a great outflow to the rich. Therefore, subsidies do not have a systematic effect on poverty reduction (Audet, 2007).

The subsidy reform sparked the interest of another group of researchers who analysed the impact of the subsidy removal. These studies focused on reforms related

to energy and fuel subsidies, in particular poverty, government spending, prices, and the environment. These authors used different approaches in different countries to measure the effect of these reforms.

The first method consists of the estimation of income by proxy means (PMT) using an appropriate econometric model. This method is widely used because it relies on easily observable characteristics correlated with income and poverty. Household consumption is often used among its characteristics. However, this method remains incomplete, since it only takes into account a single sector while ignoring the others. This approach was used by Bibi (2002) who showed that although the poor benefit from subsidies, the leakage to the non-poor is considerable. He also stressed that there are no products consumed exclusively by the poor. Thus, targeting these products is not an effective policy against poverty. In contrast, targeted transfers have a more effective impact on poverty than these subsidies.

The second approach is that of input-output models, which were also used in the analysis of subsidies on petroleum products in China (Jiang, 2013) and Morocco (Bentour, 2016). These models offer a possibility to simulate the effect of shocks on the output of a particular industry or the expenditure of a given good or service on the rest of the economy. On the contrary, the major limitation of this approach is the lack of a price adjustment mechanism that would ensure a balance between supply and demand. The authors simulated the effect of removing these subsidies on the general price level. They effectively resulted in an increase in the general price level as a result of this policy.

Moreover, in the United States, Choi (2016) proceeded in a similar manner to approximate the effect of reusing the gasoline tax in subsidizing biofuels on the environment.

Finally, computable general equilibrium models (MCEGs) represent a more complete approach than the previous ones. They have demonstrated their power and utility in the evaluation of economic policies on poverty (Decaluwé, 1999). They make it possible to analyse the effect of income redistribution; they also trace the mechanisms of resource allocation between agents, which represents an important channel for the assessment of poverty. However, with a representative household, these models do not provide information on the effects of the policy within each group of households and, therefore, on poor households. A first way to capture the variance difference between groups of households is to subdivide the household agent into several categories according to the income level. This is the case of Widodo (2012) who considered eight household categories to analyse the effect of the removal of fuel subsidies in Indonesia on government spending. They concluded that the distribution of household, industries, and state income would be affected and that the impact of the reallocation of subsidies is less than the total removal of subsidies. At the same time, Siddig (2014) for their part studied the impact of the removal of the subsidy on imported oil on poverty in Nigeria by considering twelve categories of households. They concluded that this policy had a positive impact on the GDP. On the other hand, it negatively affected household income. They

suggested that a replacement policy, such as direct transfers to poor households, could alleviate the effect.

In addition, a more refined approach of the so-called micro-simulation MCEGs consists in considering a multitude (thousands) of types of households instead of a few categories as before, often those resulting from surveys on household expenditure (Savard, 2004). This method guarantees a certain homogeneity within each group of households. Thus, it allows for inter-group and intra-group analyses and comparisons. Dartanto (2013) used this method to approximate the effect of the removal of fuel subsidies on fiscal balance and poverty in Indonesia.

3. Research Questions / Aims of the Research

Many studies that have dealt with the problem of subsidies in Africa have looked a lot at the ineffectiveness of subsidies based on household surveys, highlighting the leak to the rich. Although this method shows that the poor do not fully benefit from these subsidies, it does not measure the effect of poverty in their absence. On the other hand, the input-output modelling used by Bentour (2016) does not make it possible to determine the incidence on poverty because this modelling does not consider household income. Based on this fact, our analysis would like to answer the question: What is the effect of a simulation of the removal of subsidies on petroleum products?

Therefore, this paper contributes to the literature in two ways. First, it examines the impact of subsidy abolition on poverty using a computable general equilibrium model. Second, this study assesses the effects of abolition of subsidies on petroleum products in the particular case of Cameroon.

4. Research Methods

Computable general equilibrium models aim to simulate the impact of public policies on a given economy by using a set of equations that define the behaviour of supply and demand in several markets. Since the 1980s, several authors have attempted to use MCEGs in the evaluation of economic policies on income distribution and poverty (Abdelkhalek, 2009; Adelman, 1979; Annabi, 2013; Decaluwé, 1999; Dervis, 1982; Morrisson, 1991).

4.1 The Household Model

The microeconomic model of households is derived from the theory of the consumer who maximizes his utility while respecting his budget constraint. The household problem retains a simple formulation. Indeed, a household h has preferences for consuming several products which are translated by its utility function u_h ($q_h{}^d$) where $q_h{}^d$ is the vector of product requested by household h. Household income is made up of wages, capital income and comes from other sources such as transfers. The household problem is given by the following expression: $Maxu_h\left(q_h^d\right)$

$$p^d q_h^d = sL_h + \sum_j r_j K_j^h + m_H$$

where:

p^d **:** Price vectors of products demanded by the household;

s **:** Wage rate;

L_h **:** Labor offered by household *h*;

K_j^h **:** Capital of branch *j* detained by household *h*;

r_j **:** Capital turnover of branch *j*;

m_H **:** other sources of revenue.

Thus, following the change in prices caused by the simulation, the variation in household well-being is measured by the variation in its indirect utility v_h (p^d, s, r_j, m_H). This is obtained by differentiating the equation with respect to the prices and by applying the Envelope Theorem in the neighbourhood of an optimum. The change in household well-being (g_h) is given by the monetary value of the change in utility:

$$g_h = \frac{du}{\upsilon_{mh}} = -\sum i\left[p_i^d q_{ih}^d \frac{dp_i^d}{p_i^d} \right] + sL_h \frac{ds}{s} + \sum jr_j K_j^h \frac{drj}{rj}$$

Where v_{mh} is the marginal utility of the income and p_i^d is the price of product i demanded by the household. This formulation is nothing more than a weighted average of changes in the prices of products and factors that will be used as a measure of the change in household well-being. Thus, the income of the household h after simulation of the shock is calculated by summing its former income with g_h. Since the poverty line is calculated relative to expenditure and often income data is poorly measured, g_h will be added to the total household expenditure to analyse poverty. Moreover, the most widely used poverty indices are those constructed by Foster (1984), denoted FGTα, where α corresponds to the degree of poverty aversion. When α = 0, the index measures the incidence of poverty, when α = 1, it is the depth of poverty index, and if α = 2 the index measures the severity of poverty.

$$FGT_\alpha = \frac{1}{Nz^\alpha} \sum_j^J \left(z - y_j\right)^\alpha$$

Where J is the subgroup of individuals whose income is below the poverty line z, N is the total number of individuals in the sample, and y_j is the income of individual j (see Cockburn 2002). Again, the total hill should be used for the calculation of these indices instead of the household income.

4.2 Description of the Household Survey Data

The data that will be used for the construction of the microeconomic model of the household come from the national surveys on household income and living standards

conducted by the National Institute of Satistics (NIS) in 1996, 2001, 2007 and the last one in 2014.

5. Findings

In this section, we will present the results of our economic analyses. Therefore, in its first part we present the macroeconomic and sectoral results and in the second part we present the microeconomic presentations of households and poverty result. The main simulation in the context of this work is to remove the subsidies applied to petroleum products. This consists of resetting the subsidy rates for these products to zero.

Three scenarios will be simulated for this purpose. In a first scenario, the subsidies will be dismantled for the product without any replacement measures. In the second scenario, along with the removal of subsidies, transfers to poor urban and rural households by the state will be doubled. Finally, in the third scenario, a 9% increase in total government consumption would be simulated at the same time as the measures simulated in scenario 2. In this last scenario, the amount injected into the economy is equal to the base amount of subsidies.

5.1 Macroeconomic and Sectoral Presentations

The removal of subsidies is not without effect. Table 1 presents the variation of the main macroeconomic indicators following the simulation of the three scenarios[4].

Table 1. % variation in main macroeconomic aggregates

	Variables	Benchmark	Scenario 1	Scenario 2	Scenario 3
Scenarios	Government Revenu	261 869	3.76	3.70	6.11
	Government Saving	413119	16.61	12.78	-6.42
	Government Consumption	134 042	0	0	9
Households Revenu	Poor urban	10 246	-2.39	3.85	8.8
	Non-poor urban	447 071	-3.18	-3.19	0.76
	Poor rural	6075	-2.78	10.31	13.75
	Non-poor rural	145 788	-3.07	-3.08	0.39
Households Consumption	Poor urban	5 155	-2.35	4.3	9.22
	Non-poor urban	338 856	-3.29	-3.3	0.7
	Poor rural	5 215	-2.75	10.57	14.03
	Non-poor rural	102 119	-3.09	-3.09	0.38
Household savings	Poor urban	4 444	-2.35	4.3	9.22
	Non-poor urban	20 645	-3.29	-3.3	0.7
	Poor rural	752	-2.75	10.57	14.03
	Non-poor rural	39 614	-3.09	-3.09	0.38
	Firms Revenu	322 430	-3.41	-3.42	-0.51
	Firms saving	117 479	-4.97	-5.02	-2.2
	Total investment	261 075	-0.24	-0,83	-4.19
	Gross domestic product	713 211	-1.53	-1,56	1.16
	Wage rate	1	-2.86	-2,88	2.54
	Price index at consumption	1	-1.16	-1,11	1.94

Source: Author.

[4] Values are millions of FCFA.

The first component affected is government income, which increased in the three scenarios by 3.8%, 3.7%, and 6.1%, respectively. Since the subsidies are counted as negative income for the government, their removal consequently generates a positive impact which has benefited public savings which increased by 16.6% in scenario 1 and 12.8% in scenario 2. However, in scenario 3, savings fell by 6.4% due, in particular, to the increase in total government consumption expenditure.

On the other hand, households are also the agents directly confronted with this policy. The removal of subsidies without any replacement measures negatively affected their income as well as their consumption and savings. In this scenario, both poor and non-poor households in both areas saw their income decrease from 2.4% to 3.2% depending on the category. However, in scenario 2 the government transfer granted to poor households benefited them to increase their income and consumption, respectively, by 3.9% and 4.3% for urban residents and 10.3% and 10.6% for rural people. Finally, scenario 3 is beneficial for all categories of households. The incomes of the non-poor increased by 9% for urban households and 14% for rural households. As for the income of non-poor households, it stabilized at its initial level. However, companies did not take advantage of this policy, and their income and savings declined from their initial levels.

The gross domestic product fell slightly in the first two scenarios, particularly because of the drop in household consumption and total investment. On the other hand, in scenario 3 it recorded an increase of 1.2%, which is generated by the increase in government spending.

At the sectoral level, Table 2 shows the variation in value added for each branch. The branches most affected are those that have suffered the shock directly, namely the food and tobacco industry and petroleum refining. Their added values fell by nearly 2.2% and 2.1%, respectively, in the first two scenarios. As a result, road and maritime transport, which are major consumers of petroleum products, also saw their added value decrease in the three scenarios. On the other hand, non-market production benefited from this drop in subsidies, in particular, thanks to the gain generated for the State.

In fact, the added values of the public administration and security branch, as well as the education and health branch, increased by 1.4% and 1.7% respectively in the first two scenarios and by 4.9% and 3.9% respectively in the third scenario.

Table 2. Variation in added value by branch in%[5]

Branch	Benchmark	Scenario 1	Scenario 2	Scenario 3
Agriculture	10 271	-0.13	-0.12	-0.25
Peach (fishing)	6 124	-1.92	-1.81	-1.27
Extraction Industry	15 910	-1.4	-1.48	-2.67
Tobacco and alimentary Industry	33 962	-2.24	-2.2	-2.02

[5] Benchmark values are in millions of FCFA.

Branch	Benchmark	Scenario 1	Scenario 2	Scenario 3
Leather and textile Industry	18 080	1.85	1.9	-2.54
Cheimical and semi-chemical Industry	15 319	0.98	1.01	-0.69
Mechanical, metallurgical and electrical Industry	21 866	0.62	0.5	-2.33
Other production industries	19 939	-0.54	-0.6	-2.37
Oil refining	1 102	-2.12	-1.95	-1.89
Water and Energy	18 747	-0.39	-0,33	-0.62
Public works	48 270	0.2	-0.01	-2.46
Commerce	70 789	-0.89	-0.92	-0.26
Hotels and restaurants	16 981	0.17	0.2	-0.19
Railway Transport	2 062	-1	-0.44	-0.34
Road Transport	97 438	-2.43	-2.3	-2.12
Air Transport	27 689	0.14	0.15	-1.31
Maritime Transport	6 369	-3.57	-3.38	-3.67
Other transports	2 631	-1.42	-1.35	-0.97
Posts et telecommunications	22 042	-0.15	-0.1	-0.21
Insurance and financial activities	29 478	-0.33	-0.26	-0.55
Real estate, rental and rendered services to companies	85 331	0.02	0.02	-0.3
Public administartion and social security	60 208	1.37	1.39	4.93
Education, health and social action	62 129	1.7	1.77	3.86
Other non financial services	96 425	-0.18	-0.12	-0.42

Source: Author.

The market prices of products have experienced slight decreases following the simulation of the first two scenarios except for the price of petroleum products, which recorded a relatively large increase (+ 18%). This increase is due, in particular, to the large share of subsidies allocated to these products. Transport prices were also affected by the shock. The price variation is shown in Table 3.

Table 3. Market price variation per product and capital turnover per branch in %

Branch	Benchmark	Market price			Capital turnover		
		Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
Agriculture	1	-3.67	-3.6	-0.68	-4.98	-4.89	-1.69
Peach (fishing)	1	-2.96	-2.81	3.44	-7.95	-7.69	-1.03
Extraction Industry	1	-3.26	-3.42	-3.52	-10.94	-11.39	-13.21
Tobacco and alimentary Industry	1	-0.63	-0.54	3.25	-14.38	-14.19	-8.45
Leather and textile Industry	1	-0.84	-0.81	0.65	0.99	1.06	-2.88
Cheimical and semi-chemical Industry	1	-0.96	-0.97	0.12	0.18	0.24	0.33
Mechanical, metallurgical and electrical industry	1	-0.35	-0.4	-0.05	-1.13	-1.48	-4.1
Other production industries	1	-0.27	-0.32	0.7	-4.4	-4.62	-4.53
Oil refining	1	17.88	17.82	18.18	-10.1	-9.55	-4.3
Water and Energy	1	-1.79	-1.71	1.31	-4.33	-4.11	0.11
Public works	1	-0.77	-1.12	-1.77	-2.03	-2.93	-7.78
Commerce	1	-3.18	-3.25	2.24	-5.95	-6.08	1.6
Hotels and restaurants	1	-1.58	-1.51	1.93	-1.98	-1.86	1.51
Railway Transport	1	-2.04	-1.9	2.68	-4.47	-4.19	1.45
Road Transport	1	-0.11	0	3.81	-10.29	-9.95	-4.35
Air Transport	1	1	1.08	-0.02	-2.24	-2.23	-3.28
Maritime Transport	1	3.12	3.29	12.64	-9.78	-9.44	-4.97
Other transports	1	-1.28	-1.26	3.55	-4.52	-4.46	1.33
Posts et telecommunications	1	-2.96	-2.81	1.72	-3.66	-3.44	1.33
Insurance and financial activities	1	-3.23	-3.13	1.29	-3.86	-3.67	0.79
Real estate, rental and rendered services to companies	1	-2.78	-2.8	0.11	-2.66	-2.67	-0.36
Public administration and social security	1	-1.6	-1.61	3.07	-1.4	-1.39	8.09
Education, health and social action	1	-2.4	-2.4	3.16	-0.86	-0.79	7.34
Other non financial services	1	-2.74	-2.62	1.37	-3.67	-3.4	0.56

Source: Author.

5.2 Microeconomic Presentations of Households and Poverty

In order to calculate the well-being of households which depends on the variation in the prices of the products consumed and of the factors, price indices of the

Laspeyres-Paasche type are calculated from the prices generated by the MCEG since the types of product present in the database are more aggregated than the products existing in the SAM.

The analysis of Table 4 which presents the main poverty indices, shows that the removal of subsidies would have a negative impact on the well-being of households. As we could see in the three scenarios, the policy accentuated poverty contrary to the results obtained from the MCEG. This confirms the limits of the representative agent approach in the analysis of poverty.

Table 4. Poverty index values in %

Scenario		Urbain	Rural	Total
FGT0	Benchmark	4.8	14.7	8.9
	Scenario 1	5.4	16.4	9.9
	Scenario 2	5.2	16.4	9.8
	Scenario 3	4.3	15,4	89
FGT1	Benchmark	0.8	3.4	1.9
	Scenario 1	1.1	4	2.3
	Scenario 2	1	3.8	2.1
	Scenario 3	0.7	0.4	1.8
FGT2	Benchmark	0.2	1.2	0.6
	Scenario 1	0.5	1,8	1
	Scenario 2	0.5	1.7	1
	Scenario 3	0.2	1.2	0.6

Source: Author.

Indeed, the incidence of poverty increased by 0.6 points in urban areas for the first scenario. Direct transfers to poor households did not contribute to poverty reduction, but the magnitude was smaller compared to their absence. However, when these transfers are accompanied by improved public services by increasing government consumption, the effect was positive, poverty fell by 0.5 point. On the other hand, in rural areas, the incidence of poverty increased by 1.7 points for the first two scenarios and 0.7 points for the third. The depth of poverty measured by FGT1 also showed an increase of 0.3 points in urban areas and 0.6 points in rural areas for the first scenario. Here again, transfers to households can ease the shock but have not helped reduce poverty. Scenario 3 just manages to stabilize the poverty depth index at its initial level.

Finally, the last index which measures the severity of poverty also saw an increase of 0.3 points in urban areas and 0.6 points in rural areas. The policies initiated in scenario 3 made it possible to maintain this indicator at its base level.

The variation in average expenditure per person (Table 5) also reflects the decline in household well-being caused by the removal of subsidies despite direct transfers to poor households. However, the policies simulated in the third scenario are beneficial to the poor.

Table 5. Average variation of expenses per person in %

Scenario	Urban		Rural		National	
	Non-Poor	Poor	Non-Poor	Poor	Non-Poor	Poor
Benchmark	14 438	3 180	8 553	2 739	12 156	2 877
Scenario 1	-1.6	-4.07	-1.8	-1.6	-1.5	-2.42
Scenario 2	-1.8	-1.79	-1.96	0.06	-1.68	-0.62
Scenario 3	-1.04	0.7	-1.66	1.4	-1.07	0.72

Source: Author.

6. Conclusions

The objective of this paper was to analyse the impact of the removal of petroleum product subsidies on poverty, using the general equilibrium modelling approach. In this work, three scenarios were simulated. The first is to eliminate subsidies without any other countermeasures. In the second scenario, a direct transfer to poor households was also simulated along with the removal of subsidies. The third scenario follows the second with a 9% increase in total government spending. The main results of this work have shown that removing subsidies does not benefit households. The poverty rate increased by 0.6 points in urban areas and 1.7 points in rural areas. Direct transfers to the poor eased the shock but did not reduce poverty. The other poverty indices, in this case, the depth and severity of poverty have seen the same trends. However, when these measures are accompanied by an improvement in public services by increasing state expenditure, the poverty indices can fall or at least remain at the initial state.

In conclusion, removing subsidies is not an easy task. Despite its positive effect on the state budget, it is not without effect on poor and vulnerable households. In order to counter this negative effect, the state must intervene not only with direct transfers to the poor but also with policies to stimulate demand.

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