

The Impact of the Liberalization of Petroleum Product Prices on the Economy of Cameroon

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Abstract

This paper addresses the issue of the impact of liberalization of petroleum product prices on Cameroon's economy, particularly on its macroeconomic aggregates, public finances and people's living standards. It uses a methodology based on a Computable General Equilibrium model constructed from the Social Accounting Matrix of 43 activity sectors and 43 products.

The results of the study show that the oil refining industry is the main channel through which fluctuations in crude oil prices on the international market affect the economy of Cameroon. If the price of oil per barrel is high, it is preferable, both on the economic level (growth, employment and public revenues) and the social level to maintain a low level of subsidies below 15% and, as a matter of priority, to re-allocate the economies made on these subsidies to social transfer-payment schemes and to measures aimed at sustaining the middle class's purchasing power. But if there is a sharp fall in crude oil prices (below US\$ 50 per barrel), a liberalization of the retail petroleum product prices could have positive effects on economic growth, on labour supply and on poverty reduction.

The paper recommends the following: (i) a reduction in the country's dependence on imports of crude oil by restructuring the national refining company; (ii) restructuring of the petroleum product price subsidy policy by adopting an inclusive approach; (iii) a setting up of a special fund for re-allocating the economies made on subsidies to financing targeted social programmes; (iv) diversification of exports and; (v) a setting up of a strategic structure to monitor the trends in and the forecasts of the prices of Cameroon's main exports on the international market.

Key words: *Petroleum industry, subsidies, social accounting matrix, computable general equilibrium model, Cameroon*

JEL code: *D58, H24, I32.*

1. Introduction

After the oil shocks of 1973 and 1979-1980, the world economy experienced the third oil shock in 2008, which was characterized by a gradual and continuous reduction in the price of crude oil between 2003 and 2007, followed by an increase of unprecedented magnitude, which reached a record price of US\$ 144 per barrel. This peak was followed by a sharp fall in oil prices in early 2009 when a barrel of Brent oil was worth about US\$ 34 only. Then prices rose again until June 2014 (US\$ 115 per barrel) before they went on a downward trend again to reach US\$ 45 per barrel in January 2015 (van Oppens, 2015).

Such fluctuations in crude oil prices have an impact on the global economy. A rise in oil prices increases the oil-exporting countries' current savings and surpluses while at the same time reducing the importing countries' surpluses. Thus, a rise results in an income transfer from net oil importing countries to net exporting ones (IMF, 2009). In oil importing countries, if retail fuel prices are not subsidized, they will automatically increase, thus leading to inflation rises through the transport sector. For net exporting countries such as Chad, Equatorial Guinea, Gabon, Nigeria, and Angola, a price rise enables them to have more foreign currency, which they need to carry out projects and to import certain basic commodities. These countries benefited from a significant financial windfall that followed the relatively high level of oil prices over the 2003-2013 decade.

Although Cameroon is an oil exporting country, it also imports light crude oil. With its oil revenues accounting for only about 30.2% of its total internal revenues, a decrease in the oil price per barrel means that the country will get less revenues and less foreign currency to enable it to import basic commodities (rice, fish, flour, sugar, etc) and the machines it needs for the execution of its large-scale projects. In the early 2000s, oil price increases were fully passed on to the domestic prices of petroleum products through an automatic price calculation mechanism. However, from October 2004, the government implemented a policy for regulating retail petroleum product prices through direct budget subsidies to the National Refinery Company (SONARA). This was done to curb inflation on the prices of basic commodities, and hence to strengthen the poor households' purchasing power.⁴

In 2008, following what was known as the "hunger crisis", the Government of Cameroon decided to completely freeze any increase in oil pump prices; these remained practically unchanged until 2014. Despite this decision, living standards of the population did not improve significantly. The poverty rate dropped by only 2.4 percentage points between 2007 and 2014, dropping from 39.9% to 37.5%. In the rural areas, it even increased by 1.8 percentage points (from 55.0% to 56.8%). On the other hand, the

Gini index rose from 39.0% in 2007 to 44.0% in 2014, thus reflecting an increase in consumption in the country over the seven-year period (INS, 2015).

However, the country's policy to subsidize petroleum product prices became unsustainable: the subsidies increased from CFAF 138 billion in 2008 to CFAF 145 billion (1.3% of GDP) in 2010, and CFAF 309 billion (2.5% of GDP) in 2011. Budgetary constraints forced the government to securitize its payment obligations to the National Refinery Company (SONARA), which amounted to CFAF 445 billion; that is, the equivalent of 3.7% of the country's GDP in 2011 (IMF, 2012). It was against this backdrop that the petroleum product price subsidy policy became the main topic of discussion between the Cameroonian government and the IMF in May 2012. In connection to this, the government expressed its intention to move, as soon as possible, to an automatic mechanism for calculating petroleum product prices.

In July 2014, the government increased retail petroleum product prices while crude oil prices were on a downward trend: indeed, the price per barrel fell from US\$ 111.8 in June 2014 to US\$ 62.2 in January 2015. The government's 15% increase was accompanied by mitigation measures such as a 5% increase in the civil servants' salaries, a 50% reduction in some taxes and levies affecting the transport sector, and an increase in the minimum wage from CFAF 28,500 to CFAF 36,270. These measures were later complemented by an extensive programme of social safety nets, which is currently in a pilot phase.

In this global context of volatility of petroleum product prices, it is important to think about the strategy that the country should adopt to protect its population's purchasing power without jeopardizing the achievement of its growth objectives. Thus, this study's main objective is to highlight the potential effects of the liberalization of petroleum product prices in Cameroon on growth and poverty. On the one hand, the study will analyse the effects of a measure aimed at automatically adjusting the domestic prices of petroleum products to the international market prices, and to certain macroeconomic aggregates and to people's living standards. On the other hand, it will recommend measures that the country can take to mitigate the negative effects of the fluctuation in oil prices on the country's economic growth and the living standards of its populations, especially the most destitute.

The remainder of the document consists of seven sections. Section 2 is a review of the literature, which describes the theoretical framework for the mechanisms for transmitting rises in oil price to the economy. Section 3 presents the recent trends in the Cameroonian economy. Section 4 analyses the importance of the petroleum industry in the same economy. Section 5 sets out the country's petroleum product price subsidy policy. Section 6 describes how the Computable General Equilibrium model used for the simulations in this study was constructed. Section 7 reports on the results of the simulations of the various scenarios. Section 8 is the conclusion; it summarizes the key findings and makes economic policy recommendations.

2. Literature review

The main reason why countries subsidize petroleum products is to protect the living standards of the population. Such subsidies are aimed at achieving three main objectives: (i) reducing the cost of living by reducing households' daily expenses on products such as super petrol, diesel, domestic gas, and kerosene; (ii) maintaining the price of basic commodities and basic services at a level that is accessible to all households; and (iii) reducing the cost of production, especially for small businesses. However, these subsidies are expensive for governments. The question is therefore what, from a theoretical and empirical point of view, can justify the maintaining or removing of such subsidies and, more importantly, what accompanying measures should be taken to mitigate the effects of the latter option on the country's economic activity and the welfare of its population.

Theoretical and empirical framework

State intervention in the economy has always been at the heart of numerous economic debates that oppose two major schools of thought; the (neo)Keynesian and the (neo)classical. For the neo-classics such as Jevons (1871), Menger (1871) and Walras (1874), state intervention is acceptable only in the event of market failure. A market is said to have failed if it does not ensure that there is an efficient⁵ distribution of resources. Imperfect market arises when there are public goods, externalities and natural monopolies, or when perfect information is not known to all market actors. It is only in such situations that the liberals tolerate state intervention, but interventions must be restricted. Indeed, liberals such as Coase (1960) and Buchanan and Tullock (1962), the precursors of the public choice theory, only recognize the duty of enforcing contracts and property rights. For them, state interventionism is likely to introduce distortions into the economic agents' calculations and ultimately produce more unemployment and inflation, and even lead to a slowdown in economic activity.

From this point of view, for the Cameroonian "petroleum market", which is not affected by any of the imperfections mentioned above, state intervention through subsidizing petroleum products is therefore not acceptable. Indeed, these subsidies lead to a reduction in government revenues, which in turn is likely to cause the government to raise taxes to compensate for this reduction. There may also be a decline in the performance of the firms that are protected by subsidies, or a setting of wage levels that are higher than those of the real market. Moreover, there is no evidence that if the resources allocated to these subsidies were reallocated, this would not lead to a more efficient equilibrium.

According to the classical theory, the state should therefore put an end to those subsidies. However, it happens very often (it is actually the general rule) that markets are not perfect, or that the conditions for a pure and perfect competition that are necessary for an optimal allocation of resources are not met. That is why the (neo)Keynesian theory insists on the need for state intervention.

According to Keynesianism (see Keynes, 1936), the need to improve the functioning of the market is not the only reason that can justify state interventionism. The state may have to intervene to ensure a certain “equity”. Indeed, while the market can ensure efficient allocation of resources, there is no assurance that this equilibrium is socially acceptable. In order to avoid an unpopular (even if economically optimal) situation where resources are held by a minority, in the face of a multitude of people living in extreme poverty the state has to intervene to make the distribution of income more equitable. As a result, maintaining subsidies could remain a priority for the state if that allows companies to set prices that are “affordable” for households.

There are thus three essential questions that need answers: (i) Does the existence of such subsidies penalize the economy as a whole? In other words, if there were no such subsidies, would levels of production, consumption and investment be higher? (ii) Do those subsidies really benefit the poor households? (iii) What measures can be taken to mitigate the negative impact of a reduction in, or a removal of those subsidies on people’s living standards?

A number of studies have tried to provide answers to such questions. For instance, Bacon and Masami (2006) recognized the usefulness of subsidies, even though their cost is sometimes heavy, especially when they are also given to a population segment that does not need them. That is, according to the two authors, generalized subsidy schemes should be replaced by targeted aid to the poor.

Kangni (2006), in a study of the impact of an increase in petroleum product prices on income distribution in Mali based on a microeconomic analysis of household survey data and an input-output matrix, concluded that an increase in the price of kerosene was, of all the price increases, the one that affected most the poor households. The study also showed that subsidized petroleum products were less effective than targeted subsidies aimed at supporting the poor.

Oktaviani et al. (2007), using a dynamic Computable General Equilibrium model over the 2000-2005 period, focused, in the case of Indonesia, on the removal of fuel subsidies. They found that this removal had led to a decline in economic growth accompanied by an increase in the number of poor people. Coady and Newhouse (2006), in the case of Ghana, also found that the poorest households were more vulnerable to subsidy removal.

The African Institute for Applied Economics (2006) analysed the impact of oil subsidy reduction on poverty in Nigeria using a Computable General Equilibrium model. The study found that if subsidies are removed without social safety nets being put in place, the level of poverty would increase. It further found that this removal would affect the urban households more than the rural ones because of the structure of their consumer expenses, as part of which the “transport” item got a large share.

All in all, from the literature reviewed in the preceding paragraphs, it transpires that generalized subsidies are very costly for governments and unsustainable in the long term.

But removing them often has a negative impact on the economy and households living standards. Petroleum product subsidies, which are common all over the world, should therefore be replaced by targeted subsidy schemes for certain products or by schemes targeting the most vulnerable populations.

Mechanisms of an oil shock transmission to the economy

From a theoretical point of view, some channels for the transmission of a change in the price of crude oil or petroleum products on the economy have been highlighted.

According to Barlet and Crusson (2007), a rise in petroleum product prices leads to several phenomena: (i) an increase in the cost of intermediate consumption, followed by a slowdown in production and productivity; (ii) a transfer of wealth between net oil-importing and net oil-exporting countries; (iii) rising inflation, possibly followed by repercussions on salary adjustment; and (iv) a decline in the consumption of durable goods and in investment, since the economic environment has now become uncertain.

Rising inflation has negative effects on the demand for and supply of goods by distorting the prices of factors of production, thus leading to lower profit margins for companies, which in turn causes the latter to scale down their investment and recruitment (Morocco Financial Analysis and Forecast Directorate, 2006). The impact of rising inflation on households' real incomes manifests itself in two ways: a direct effect resulting from the fact that households have to pay more for petroleum products,⁶ and an indirect effect resulting from rising prices for the other goods and services consumed by the households (e.g. foodstuffs and transport). Indeed, producers pass on the increase in the cost of oil inputs to other goods and services. However, this is not a mechanical process, given the competitive environment that prevents companies from fully passing on the increase in costs.

For Babusiaux and Lescaroux (2006), a theoretical analysis of the mechanisms by which a rise in oil prices can be transmitted through the economy is based on a "decision-tree" type of structure. Depending on the choices made by economic agents, the negative effects of an increase in the price of a barrel of oil will be borne by the different types of players (employees, entrepreneurs, shareholders, consumers, investors, etc) and to varying degrees. Irrespective of the choices made, real economic growth will be lower in the short term than it would have been if there had been no increase in oil prices. On the other hand, the impact on other macroeconomic indicators, notably on the distribution of value added and on real interest rates, is ambiguous and depends on how the price increase spreads out throughout the economy.

Select countries' experiences in petroleum product price liberalization

A study done for Morocco by World Bank (2008) highlights the key lessons to be learnt from the experience of reforming petroleum product subsidies in some countries. The study suggests that it is necessary to remove petroleum product subsidies because they are non-targeted and ineffective. It proposes that focus should be put on social

safety nets, as happened in Brazil, Chile, or India, where the measures taken consisted in making conditional and unconditional transfer payments aimed at increasing access to health care, education, transport and housing. A document produced by the IMF (2013) describes what happened in some countries when fuel subsidies were removed. Below are the examples of Ghana, Nigeria and Mauritania.

The case of Ghana

In 2005, the Ghanaian government launched a reform aimed at removing petroleum product subsidies, since studies such as Coady and Newhouse (2006) had found that they were not pro-poor. This finding was confirmed by Cooke (2015), which showed that more than 77% of the subsidized petroleum product prices benefitted only the quintile of the wealthiest households, while that of the poorest households benefitted from only 2.97%.

The petroleum industry reform in Ghana was accompanied by actions and measures aimed at rallying strong public support. They involved organizing extensive communication campaigns informed by research findings and designing social programmes aimed at mitigating the impact of the rising oil prices on the most vulnerable population segments. Those programmes focused on: (i) abolishing tuition fees in public primary and secondary schools; (ii) intensifying the public transport network; (iii) putting a ceiling on public transport rates; (iv) increasing funding for health care in the poorest areas of the country; and (v) increasing the minimum wage and investing in rural electrification.

The case of Nigeria

In the middle of 2011, the government of the Federal Republic of Nigeria decided to drastically reduce fuel subsidies, and then carried out a wide-ranging awareness-raising campaign to rally the population to this idea. On 1 January 2012, it increased petroleum product prices by 117%. The price of kerosene, used as fuel for cooking by the poorest population segments, remained unchanged. However, strong social unrest followed, which forced the government to reduce the increase to only 49% a few days later.

To support this reform, a programme for the reinvestment of subsidies and the empowerment of the poor (SURE-P⁷) was designed in 2012 with the aim of mitigating the effects of the removal of the subsidies on the poorest population segments. The measures taken as part of the SURE Programme consist in: (i) strengthening urban transport services by facilitating the purchase of diesel vehicles (for example through subsidized loans or reduced customs tariffs); (ii) extending the scheme for granting conditional aid to pregnant women from rural areas and improving hospital facilities; (iii) undertaking public works that would provide to the poorest young people and women temporary employment in environment protection projects or those aimed at maintaining educational and health facilities; and (iv) enhancing the provision of vocational training by setting up training centres throughout the country so as to reduce youth unemployment.

The case of Mauritania

With the discovery of oil in 2006, the country's public spending saw a drastic increase. However, the sharp rises in food prices in 2008 and 2011 led the Mauritanian government to opt for a reform of fuel subsidies to free up additional resources for the social and infrastructure sectors.

The first attempt to reform the energy subsidies in 2008 was unsuccessful. Indeed, in the middle of that year, the government increased petroleum product prices by almost 20% without putting in place a communication strategy and taking mitigation measures. This particular price adjustment triggered protests that fuelled political instability and culminated in the military coup of August 2008. After the coup, the price increase was cancelled.

In 2011, the new government relaunched the initiative to cut fuel subsidies with the support of the Extended Credit Facility (ECF) negotiated with the International Monetary Fund. A new formula for fixing fuel prices was introduced in May 2012. This reform generated relatively little opposition despite a price increase of more than 20% and the absence of a real communication strategy. However, unlike in 2008, the energy subsidy reform strategy explicitly included accompanying measures, among which was a cash transfer programme (supported by the WFP) and well-targeted permanent social protection schemes.

3. Recent state of the Cameroonian economy

This section presents the state of the Cameroonian economy between 2005 and 2014. It focuses on five points: (i) the overall trends in the economy; (ii) the trends in the sector-based contribution to GDP; (iii) factors of production; (iv) the trends in external trade; and (v) the structure of households' salary incomes and final consumption.

General trends in the Cameroonian economy

Between 2005 and 2009, Cameroon recorded an average GDP growth rate of about 2.7%. Since 2010, the situation has markedly improved, with an average annual rate of 4.7%. Its non-oil GDP growth rate has, overall, followed a similar trend to that of its overall GDP, with an average annual rate of 4.1% over the period under review (Table 1).

In addition, the rate of the country's non-oil tax burden on GDP was above 12% for the 2005-2014 period, except for 2010 when it was relatively low (11.7%).⁸ Over the period under review, the contribution of investment to GDP was 18.4%, on average. Specifically, during the 2005-2009 and 2010-2014 sub-periods, this contribution was 17.4% and 19.5%, respectively. The 2010-2014 sub-period marked the beginning of the implementation of the Growth and Employment Strategy, one of the objectives of which is to increase the contribution of investment to GDP to 23.4% by 2020.

With regard to the level of prices overall, the years 2006 and 2008 were marked by a sharp rise in the consumer price index. During the two years, the inflation rate exceeded 5%. This increase was driven by rising retail oil prices and the global food crisis of 2008. Since 2011, inflation rate has remained below 3%, in line with the convergence criteria of the Central African Economic and Monetary Community (CEMAC).

Table 1: Some key macroeconomic indicators

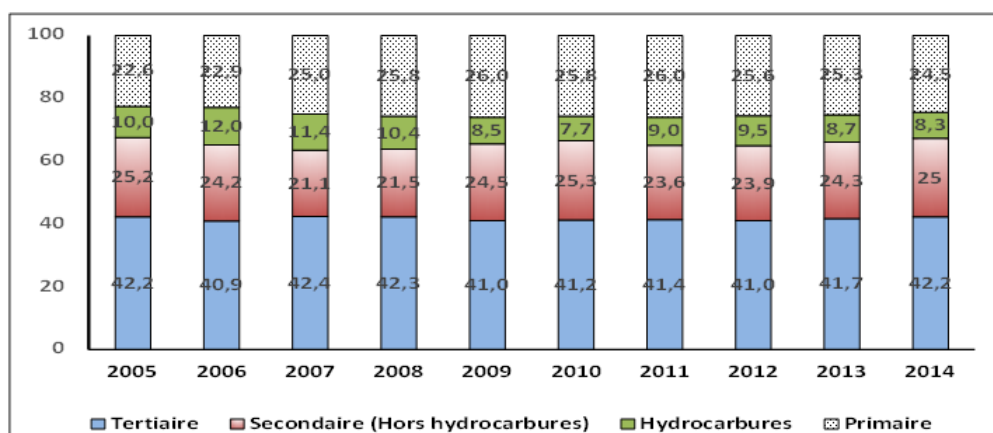
Indicators	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Real GDP growth	2.3	3.2	3.3	2.9	1.9	3.3	4.1	4.6	5.6	5.9
- Oil GDP	-9.5	7.7	-8.1	-1.8	-13.6	-12.6	-7.3	3.5	8.5	13.3
- Non-oil GDP	3.2	2.9	4.1	3.2	2.9	4.1	4.6	4.6	5.5	5.7
Non-oil tax burden (non-oil revenues/ GDP)	12.6	12.4	12.8	12.5	12.1	11.7	12.4	12.4	12.7	13.9
Investment rate (GFCF/GDP)	17.7	16.7	17.4	17.6	17.8	19.0	20.6	19.2	19.4	20.5
Inflation rate (in %)	2.0	5.1	1.1	5.3	3.0	1.3	2.9	2.4	2.1	2.0

Source: MINEPAT (2015)/ Compilation of medium-term budgetary frameworks

Trends in the sector-based contribution to GDP

The Cameroonian economy is largely dominated by the tertiary sector. Since 2005, this sector has generated, on average, almost 42% of the national value added; it is driven by the trade and catering industries. The contribution of the secondary sector has, on average, been 33%, about 8.5% of which has been the contribution of petroleum products since 2013 due to a very high intermediate consumption. As for the primary sector, it generates almost a quarter of the total value added.

Figure1: Contribution of the various industries to total value added



Source: Authors' computations based on data from the National Institute of Statistics (NIS)

NB: IN BLUE: Tertiary sector; IN BROWN: Secondary sector (non-oil and non-gas); IN GREEN: oil and gas industries; DOTTED WHITE: Primary sector

In terms of the various sectors' contribution to the country's total value added (Table A3 in the Annex), the wholesale trade sector comes first, with a share of 17.3%. It is followed by the agriculture sector with a share of 10.7%, then by the energy extraction sector with a share of 7.6%.

Factors of production by activity sector in the Cameroonian economy

The data computed using the input-output matrix of 2010 (Table A1 in the Annex) shows that, overall, the Cameroonian economy used the capital factor more intensively than the labour factor. Indeed, for the vast majority of the various activity sectors, capital represented more than three quarters of the value added. Oil industries (oil extraction and refining) also used the capital factor more than the labour one. Only a few sectors used the latter more. These are: public administration and social security (79.4%), education (73.9%), and health and social work (66.5%).

In relation to employment, the main source of it is the agriculture sector, as is the case in almost all countries in Sub-Saharan Africa: it provides nearly 30% of all the jobs, most of which are in the subsistence farming sub-sector. The second source is the real

estate sector, which provides 19.7% of the jobs. It is followed by the water supply and sanitation sector, with 12.7% of all the jobs. The fourth source is the wholesale trade sector, which provides 8.8% of all the jobs.

Trends in external trade

Trends in imports

Over the period 2005-2014, imports consisted mainly of three major commodity clusters, which by themselves accounted for more than half (55.0%) of the value of total imports. The three are: (i) oil and gas extraction products; (ii) chemical, mineral and metal products; and (iii) food products (meat, fish and other foodstuffs).

Between 2005 and 2008, imports of oil and gas extraction products accounted for almost a quarter of the country's total imports; they were basically imports of light crude oil destined for the National Refining Company (SONARA). Over the 2009-2012 period, the share of imports of basic commodities (meat, fish, cereal products, other foodstuffs, beverages, etc) was very high, fluctuating between 19% and 22%, most likely as a consequence of the global food crisis. However, since 2013, the imports of these products have been declining. For instance, their share was only 13.8% in 2014 following the many initiatives taken by the government to boost agriculture and livestock.

Table 2: Trends in the import structure by activity sector

Products/ Services	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Agricultural and forestry products	0.4	0.5	0.4	0.3	0.4	0.4	0.3	0.3	0.2	0.2
Oil and gas extraction products	22.7	24.6	24.7	26.1	13.5	15.5	18.7	15.0	11.0	14.3
Refining and cooking products	1.4	1.8	1.9	1.5	1.2	1.4	0.7	4.3	4.7	5.6
Meat, fish and other foodstuffs	12.4	13.2	13.8	15.8	19.6	19.3	19.0	22.3	17.8	13.8
Textile and footwear	3.1	2.4	3.0	2.7	3.1	2.9	2.5	2.9	2.4	2.1
Wood products and paper	2.8	2.9	2.1	2.3	2.8	2.4	2.4	2.3	1.8	1.5
Chemical, mineral and metal products	20.5	21.0	19.7	17.0	19.9	22.0	21.3	19.9	18.2	18.0
Electrical and audio-visual equipment	11.1	11.0	12.6	13.2	16.4	14.5	14.4	13.8	10.9	11.1
Transport equipment and furniture	7.6	6.3	6.7	6.5	6.1	6.2	7.1	5.9	5.6	7.0
Construction, hotel, transport and communication services	7.2	4.5	3.8	3.7	4.0	3.5	3.2	3.1	7.5	8.4
Other products	10.8	11.8	11.3	10.9	13.0	11.7	10.3	10.1	20.0	18.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors' computations based on data from the National Institute of Statistics (NIS)

Trends in exports

An analysis of the structure of exports over the period 2005-2014 shows that exports were dominated by crude oil, which on average represented 40% of the total exports. In 2014, the second largest source of foreign currency earnings (with 13.4%) was the construction, hotel, transport and communication services sector, while the third source (12.5%) was the agricultural and forestry products sector. These results bring to light the heavy dependence of the Cameroonian economy on petroleum product exports.⁹

Table 3: Trends in the export structure by activity sector

Products/ Services	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Agricultural and forestry products	9.2	8.6	8.5	8.5	13.4	15.9	13.2	11.9	10.4	12.5
Oil and gas extraction products	36.9	43.0	40.9	48.0	42.3	38.0	39.7	41.7	36.1	37.9
Refining and cooking products	11.0	12.6	12.3	12.2	8.4	12.0	14.8	13.9	6.3	5.0
Meat, fish and other foodstuffs	2.1	1.8	1.7	1.6	2.5	2.9	2.5	2.4	2.6	2.4
Textile and footwear	1.2	0.9	0.5	1.2	1.8	1.5	1.4	4.7	0.6	0.0
Wood and paper products	15.6	14.5	15.8	10.7	12.2	11.6	11.0	10.4	9.5	6.1
Chemical, mineral and metal products	7.3	7.6	7.8	7.2	6.0	6.0	5.2	4.3	5.7	6.6
Construction, hotel, transport and communication services	7.3	5.0	5.6	4.8	5.9	5.2	6.0	4.9	12.9	13.4
Other products	9.2	6.0	7.0	6.0	7.5	6.7	6.2	5.8	15.8	16.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors' computations based on data from the National Institute of Statistics (NIS)

Households' wages, incomes and final consumption

An analysis of the structure of wages received by households in return for their work shows that the Public Administration and Social Security sector is the one that contributes the most. The wages that it pays to households represent 16.4% of the total. It is followed by the Professional and Scientific Services sector (11.3%), then by the Education sector (10.5%) and finally by the Construction and Wholesale and Retail Trade sector (about 9%). The agricultural sector, which employs 29.9% of the workers, contributes only 6.5% of the total amount of the wages paid to households. Finally, the wages paid by the oil extraction and refining sectors represent only 1.8% of the total paid to households.

The data in Table 4 show that the wages received by households in return for their labour and the returns on their capital investments constitute the bulk of their incomes. The table shows that poor households derive the bulk of their income from their labour. It further shows that capital investments are the primary source of income for the non-

poor households, especially those living in urban areas, and that it is the same non-poor households that benefit most from transfers from both the government and non-profit institutions (NPIs).

Table 4: Structure of households' incomes according to living standards

Source of income	The urban poor	The rural poor	The urban non-poor	The rural non-poor
Capital income	22.8	7.9	43.7	66.8
Labour income	75.0	87.2	38.2	18.9
Transfer payments from the government	0.7	1.3	4.5	3.4
Transfer payments from NPIs	0.2	1.1	1.1	3.7
Transfers from companies	0.8	1.4	8.8	4.4
Transfers from the urban poor households	0.0	0.0	0.0	0.0
Transfers from the rural poor households	0.0	0.1	0.2	0.2
Transfers from the urban non-poor households	0.3	0.6	1.6	1.5
Transfers from the rural non-poor households	0.2	0.4	1.0	0.9
Transfers from the rest of the world	0.0	0.0	0.9	0.2
Total	100.0	100.0	100.0	100.0

Source: Authors' computations based on data from the National Institute of Statistics (INS)

Regarding the households' final consumption (Annex Table A2), it mainly consists of agricultural products (14.8%), restaurant and hotel services (10.8%), real estate services, that is housing (7.6%). Beverage products account for 4.4% of their final consumption while refined petroleum products (petrol, diesel, kerosene and domestic gas) account for 2.6%.

4. The oil sector in the Cameroonian economy

This section highlights the importance of the oil sector in the Cameroonian economy. It first shows the weight of the intermediate consumption of petroleum products, then the oil trade balance, and ends with an analysis of oil revenues.

Intermediate consumption of petroleum products

As in most countries, petroleum products are an important input for many activity sectors in Cameroon. Over the period 2005-2010, the sectors that were most dependent on petroleum products are: forestry and forest product exploitation; fishing and fish farming; transport, storage and communication; and water supply and sanitation.

In 2010, petroleum products accounted for 58.6% of the intermediate consumption in the fishing and fish farming sector, 33.4% in the transport, storage and communication sector, 18.9% in the forestry and forest product exploitation sector, 13.5% in the water supply and sanitation sector, and 13.2% in the sector of repair and installation of machinery and equipment. It is these sectors that are said to be directly affected by fluctuations in petroleum product prices.

Apart from the above-mentioned sectors, petroleum products also play an important role in the production process of the sectors of energy product extraction, vehicle repairs, professional and scientific services, and public administration and social security, where they account for between 6% and 9% of the intermediate consumption.

Table 5: Relative weight (in %) of the intermediate consumption of refined petroleum products in the 10 activity sectors most dependent on them in their production process

Sector code	Activity sector	2005	2006	2007	2008	2009	2010
4	Fishing and fish farming	57.8	64.2	69.3	66.1	50.7	58.6
35	Transport, storage and communication	34.4	37.1	33.2	28.9	26.7	33.4
3	Forestry and forest product exploitation	39.1	39.9	38.7	29.6	18.7	18.9
30	Water supply and sanitation	18.2	18.6	16.3	13.6	8.7	13.5
28	Repair and installation of machinery and equipment	19.7	19.4	25.3	18.7	10.6	13.2
33	Repair and maintenance of motor vehicles and motorcycles	5.0	6.6	7.5	7.4	4.4	9.0
5	Energy product extraction	6.0	6.6	8.7	7.9	5.6	8.9
39	Professional and scientific services	2.9	4.0	4.5	4.7	2.8	6.7
37	Financial services	6.3	7.9	12.5	8.8	5.2	6.3
40	Public administration and social security	12.4	13.2	13.8	8.3	4.9	6.2
	Total of the 43 sectors	5.5	6.1	6.3	5.2	3.7	5.1

Source: Authors' computations based on data from the National Institute of Statistics (NIS)

Trends in the oil trade balance

According to data from the Ministry of Finance, crude oil exports grew at an average annual growth rate of 11% between 2005 and 2014. The rise in the export value peaked in 2008 at CFAF 1,115 billion but the same value dropped in 2009 to CFAF 686 billion due to the sharp fall in the price of a barrel of crude oil as a result of the 2008 global crisis. Over the 2010-2014 period, there was an average annual increase of 14.8% in export value.

With regard to oil imports, there was an upward trend over the 2005-2014 period, with an average annual growth rate of 13.1%. As in the case of exports, the import value dropped dramatically in 2009 from CFAF 670.6 billion in 2008 to CFAF 306.8 billion. But over the 2010-2014 sub-period, the import value sharply increased, with an average growth rate of 23.8% per year.

Table 6: Trends in the oil trade balance (in CFAF billion)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Exports	661.2	928.0	877.9	1115.1	686.4	698.4	761.2	1097.1	1088.4	1303.8
Imports	424.4	482.3	687.3	670.6	306.8	607.2	764.4	664.0	605.9	708.3
Trade balance	236.7	445.7	190.6	444.4	379.6	91.1	-3.2	433.1	482.5	595.5

Source: Authors' computations based on data from Cameroon's Ministry of Finance

Table 6 shows that Cameroon is a net oil exporter. Indeed, with the exception of the year 2011, the country recorded a surplus in its crude oil trade balance for the entire

period from 2005 to 2014, even though the surplus was uneven. The atypical situation of 2011 could be explained by the sharp rise in crude oil prices on the international market. For instance, the price of a barrel of Brent crude oil increased from US\$ 79.4 in 2010 to US\$ 111.2 in 2011. An in-depth analysis (Annex Table A5) reveals that a 1% increase in the price of a barrel of oil led to a 0.93% increase in the crude oil trade balance (all other things being equal). This confirms Cameroon's status as a net exporter of crude oil.

Oil revenues

Oil revenues consist of two components: Oil revenues and taxes on petroleum products.

Oil revenues

There are two components of oil revenues. The first is the licence fees paid by the National Oil and Gas Company (SNH) as its share of the sale of Cameroon's crude oil. Those fees represent almost 75% of all the country's oil revenues. The second component, representing the remaining 25%, is the taxes paid by the oil companies.¹⁰ Between 2010 and 2013, oil revenues accounted for about 28% of the country's internal revenues. However, since 2014, the contribution of oil revenues to the country's income has fallen significantly to 23.5%. According to MINEPAT (2015), this downward trend is expected to continue. The contribution of oil revenues to the country's internal revenues could be only around 12% in 2018.

Table 7: Trends in oil revenues (in CFAF billion)

Oil revenue components	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Licence fees paid by the SNH	381.6	573.0	547.6	685.9	318.5	413.0	541.2	532.4	530.0	517.2
Taxes paid by oil companies	51.3	70.0	83.4	124.3	188.8	84.0	96.7	160.6	169.7	161.7
Total oil revenues	432.9	643.0	631.0	810.2	507.3	497.0	637.9	693.0	699.7	678.9
Contribution (in %) of oil revenues to the country's internal revenues	28.2	35.5	33.5	38.3	27.6	26.6	29.1	29.3	27.1	23.5

Source: Authors' computations based on data from the Ministry of Finance

Taxes on petroleum products

The taxes on petroleum products consist of the following: Customs duties, value-added tax (VAT), and the special tax on petroleum products.

Customs duties: These are directly included in the price of the product and are determined on the basis of a rate of 5% of the value of the crude oil imported from countries outside the CEMAC zone.

Value-added tax: There are three forms of it: (i) A product-based VAT, which applies to the price of the product and to customs duties (19.25% of the price and the duties); (ii) VAT levies on coastal navigation, storage and city delivery services, at a rate of 19.25%; and (iii) a VAT on distribution.¹¹

Special tax on petroleum products: This tax is principally used to finance road maintenance. It is levied on super petrol and on diesel; it is fixed at a flat rate. Before July 2014, it had been fixed at CFAF 120 per litre of super and CFAF 65 per litre of diesel. In July 2014, the amount was reduced through a presidential decree to CFAF 75 for super petrol and CFAF 60 for diesel. On its own, this tax accounts for nearly 35% of the total taxes on petroleum products.

Over the 2005-2014 period, the contribution of petroleum products tax to the country's total internal revenues was uneven, but it fluctuated around 11%. It reached a peak of 13.9% in 2007 before dropping to its lowest weight (over the period) in 2009, estimated at 8.7%. This drop could be explained by the economic crisis of 2008 coupled with the drastic fall in international prices of crude oil.

Table 8: Trends in the taxes on petroleum products (in CFAF billions)

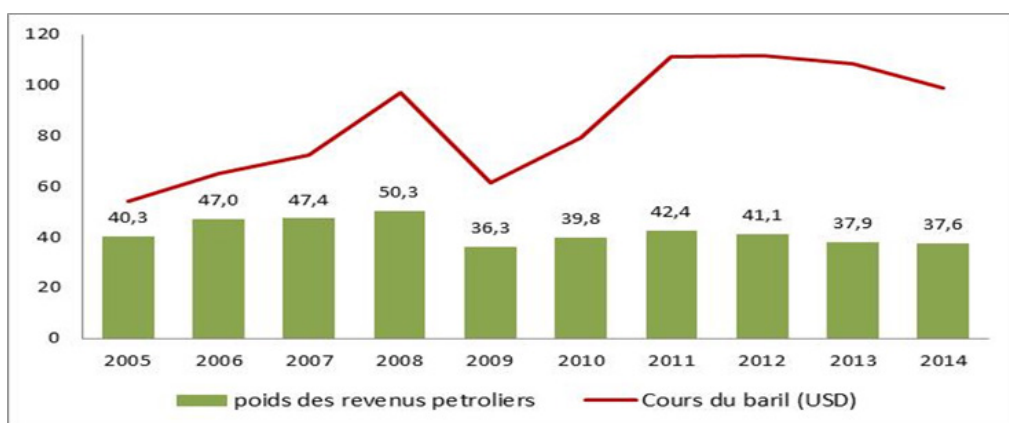
Components of the taxes on petroleum products	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Customs duties	21.2	24.1	34.4	33.5	15.3	30.4	38.2	33.2	30.3	35.4
VAT on products	85.8	97.5	138.9	135.5	62.0	122.7	154.5	134.2	122.5	143.2
Other types of VAT (on services and distribution)	9.7	11.0	15.7	15.3	4.1	10.9	12.4	15.1	13.8	16.2
Special tax on petroleum products	69.6	74.1	73.4	71.5	78.1	83.0	84.6	97.4	109.6	118.9
Total taxes on petroleum products	186.3	206.7	262.4	255.9	159.6	247.0	289.7	280.0	276.2	313.7
Share (in %) of taxes in government internal revenues	12.1	11.4	13.9	12.1	8.7	13.2	13.2	11.8	10.7	10.9

Source: Authors' computations based on data from the Ministry of Finance

Weight of oil revenues in government internal revenues

The figure below shows that oil revenues (oil receipts plus taxes on petroleum products) represent a fairly large share of the government's budget. Indeed, over the 2005-2014 period, they represented, on average, 42% of government internal revenues. But the figure also shows that fluctuations in oil prices affect this share. For example, between 2008 and 2009, the sharp drop in oil prices from US\$ 97 to US\$ 61.5 (i.e. a 37% drop) led to a fall in the share of oil revenues in government internal revenues. The share fell from 50.3% to 36.3%.

Figure 2: Trends in the share of oil revenues in total government internal revenues as a function of the price of a barrel of oil



Source: Authors' computations based on data from the Ministry of Finance

NB: IN GREEN: Relative weight oil revenues; IN BROWN: Oil price per barrel (in US\$)

Relationship between the total government internal revenues and crude oil prices on the international market

A comparison of the total government internal revenues with crude oil prices on the international market (Annex Table A6) shows that a 1% change in the price of a barrel of oil leads to a 0.3% change in government internal revenues in the same direction. For example, a 50% drop in the price of a barrel of oil would lead (all other things being equal) to a 13.5% fall in internal revenues. Therefore, in accordance with this prediction, a drop in the price of a barrel of oil, which fell from US\$ 99 in 2014 to US\$ 48 in 2015 must have resulted in a revenue loss of about US\$ 405 billion (i.e. 13% of the country's internal revenues).

5. Petroleum product subsidy policy in Cameroon

Petroleum-related activities in Cameroon can be divided into two “sub-sectors”: that of exploration and production, and that of refining, importing, exporting, transporting, storing and distributing refined petroleum products. In 2000, these two sub-sectors were liberalized.¹² Since then, several operators have entered the oil exploration-production sub-sector and the petroleum product distribution one. However, refining and storage activities have remained the preserve of the government.

Despite this liberalization of the oil sector, in 2004 the government initiated a policy of stabilizing pump prices through subsidy mechanisms in order to cushion the households’ purchasing power against the rising oil prices on the international market.

Mechanisms for the petroleum product subsidy policy

There are five major players in the oil sector in Cameroon: the Ministry of Water and Energy, which devises the modalities for implementing the government’s energy policy; the National Oil and Gas Company (SNH), which manages the government’s portfolio in the oil sector; the National Refining Company, (SONARA), which refines crude oil; the Cameroon Oil Deposits Company (SCDP), which is responsible for the storage of petroleum products; and the Oil and Gas Prices Stabilization Fund (CSPH), which is responsible for regulating the oil and gas prices throughout the country.

The petroleum product subsidy policy was launched in 2004. But it was in 2008, following the so-called “hunger” riots, that the policy was actively applied to maintain pump prices at a constant level despite rising oil prices on the international market. This decision was taken to protect the most disadvantaged households from spill-over effects of an increase in petroleum product prices on the prices of other goods, especially those of essential commodities.

To implement this subsidy policy, the Oil and Gas Prices Stabilization Fund (CSPH) continuously collects information on crude oil prices and sets the prices that should be applied in the event of an automatic adjustment to prices on the international market. This makes it possible to determine the profit margin to be made by the government. This profit margin is paid to the National Refining Company (SONARA), nearly 80% of whose supply of crude oil comes from the international market, particularly from Nigeria and Equatorial Guinea. Indeed, SONARA does not have adequate equipment to refine Cameroonian crude oil, which is too heavy.

Cost of the petroleum product subsidy policy

The policy under implementation has enabled the National Refining Company to supply petroleum products at fixed prices since 2008. From then up to June 2014, the prices of the various products were as follows: CFAF 569 per litre of super petrol, CFAF 520 per litre of diesel, and CFAF 350 per litre of kerosene. To maintain the prices at this level, in 2011, for example, the government subsidized a litre of super petrol by CFAF 228.2, which corresponds to a subsidy rate of 28.6%. For diesel oil, the subsidy rate was 36.9% while for kerosene it was 29.1%.

However, since 1 July 2014, the government has revised its retail petroleum product prices. The new prices are as follows: (i) the price of one litre of super petrol rose from CFAF 569 to CFAF 650 (i.e. a 14.2% increase); (ii) that of one litre of diesel rose from CFAF 520 to 600; (iii) that of the 12.5kg cylinder of domestic gas rose from CFAF 6,000 to 6,500 (i.e. + 8.3%); while (iv) that of one litre of kerosene, which is more consumed by the most vulnerable populations, remained unchanged.

This subsidy policy cost the government nearly CFAF 1,900 billion between 2005 and 2014. In 2005, government subsidies amounted to nearly CFAF 20 billion. They rose to CFAF 138 billion in 2008 then fell to CFAF 23 billion in 2009 (with crude oil prices falling on the international market), then rose again to CFAF 145 billion in 2010, to CFAF 434 billion in 2012, and to about CFAF 438 billion in 2013. Given the high cost of this subsidy policy and its all-encompassing nature, its impact on mitigating the shocks suffered by the poorest households were at the heart of the economic debate in Cameroon during that period.

An analysis of the trends in the cost of the subsidies to and taxes on petroleum products shows that over the 2011-2014 period, the differential between taxes and subsidies became negative, reaching CFAF 161.8 billion in 2013. This means that from 2011 to 2014, the government had recourse to revenues other than taxes on petroleum products to subsidize the prices of the latter. This state of affairs was indicative of the urgent need for the government to review its petroleum product subsidy policy, as this deficit was unsustainable in the long term. That is why in July 2014 the government reduced its level of subsidies on various petroleum products, with the exception of kerosene.

**Table 9: Trends in the taxes on and subsidies to petroleum products
(in CFAF billions)**

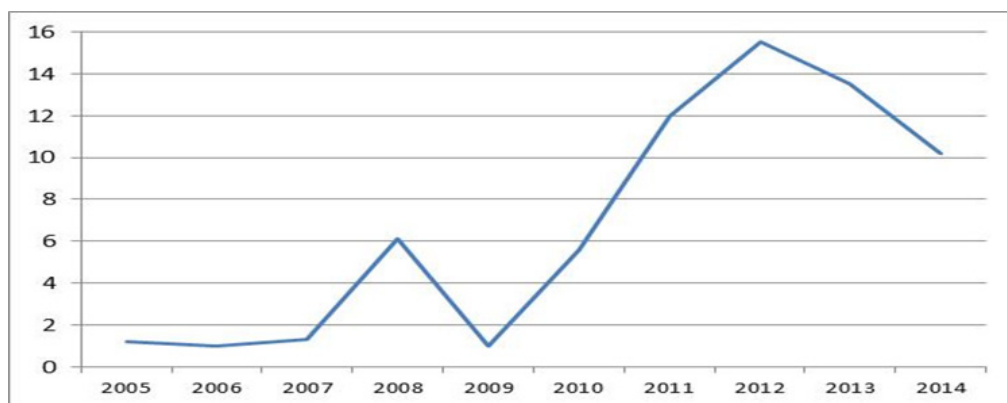
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Taxes	186.3	206.7	262.4	255.9	159.6	247.0	289.7	280.0	276.2	297.4
Subsidies	19.8	19.1	30.3	138.0	23.0	145.0	309.0	434.0	438.0	339.0
Differential (taxes - subsidies)	166.5	187.6	232.1	117.9	136.6	102.0	-19.3	-154.0	-161.8	-41.6

Source: Authors' computations based on data from the Ministry of Finance

Weight of subsidies in Cameroon's budget

An analysis of the trends in the weight of subsidies to petroleum products in Cameroon's budget reveals that there was an upward trend over the 2005-2014 period. Two sub-periods can be taken into account: The first is the 2005-2009 sub-period during which the share of petroleum product subsidies in the country's budget remained below 2%, except for the year 2008 when it reached 6%. The second is the 2010-2014 sub-period, during which there was a strong upward trend in the weight of the subsidies to fuel in the country's budget, which was 11.2%, on average.

Figure 3: Trends in the weight of petroleum product subsidies in Cameroon's budget



Source: Authors' computations based on data from the Ministry of Finance

Beneficiaries of the petroleum product subsidy policy

Zamo's (2012) study on the effectiveness of safety-net programmes, which based its methodology on a descriptive data analysis, showed that the most destitute households (the first quintile) allocated 1.8% of their total budget to petroleum products, while the wealthiest (the fifth quintile) allocated 2.8%. For the former, the bulk of their spending on petroleum products was on kerosene (1.7% of their total budget), with only 0.12% being spent on super petrol. But for the latter, the 2.8% was spread across the various petroleum products: 1.26% was spent on super petrol, 0.15% on diesel, 0.58% on kerosene, and 0.83% on domestic gas (LPG).

According to the same author, subsidies benefit the wealthier households more than the poor ones. In addition, an increase in the price of kerosene affects the poor households' income more than does an increase in the prices of super petrol, diesel, and domestic gas. These findings suggest that subsidies to kerosene prices are pro-poor, while subsidies to the prices of the other petroleum products (super petrol, diesel, and domestic gas) benefit the wealthier households more.

Zamo's study, although relevant, was based on a descriptive analysis of data and did not point out the interaction between different economic agents (households, companies and the government). Yet, a subsidy policy concerns all these to varying degrees, through transmission mechanisms that need to be analysed.

6. Impact analysis methodology

Framework for an economic policy impact analysis

In the literature, the analytical framework for analysing ex-ante impacts of economic policy measures is generally based on three types of models: Vector Autoregressive models (VAR), Computable General Equilibrium (CGE) models (static and dynamic), and partial equilibrium models.

Vector autoregressive models: Their main advantage is that they are not too restrictive, since they do not impose any prior classification of variables in terms of whether these are endogenous or exogenous. In their study, Diopand Fame (2007) used VAR models to analyse the impact of rising oil prices on macroeconomic stability in Senegal. Raguindin and Reyes (2005) used them as well. VAR models are called a-theoretical because they favour the data structure over economic theory. Besides, due to their focus on forecasting, they are little adapted to an economic policy impact analysis.

Computable general equilibrium (CGE) models: These are based on the microeconomic theoretical framework for the competitive general equilibrium and are used to determine the Arrow-Debreu model of general equilibrium. Their use requires a social accounting matrix. CGE models were used by Guissou and Coursangama (2011) in their analysis of the impact of international price fluctuations on Burkina Faso's economy. They have also been used by McDonald and van Schoor (2005) and also Essama-Nssah et al. (2007) in their study about South Africa. The main shortcoming of CGE models is that they rely on the assumption of a representative household. But the assumption of a representative producer assumes that all producers in the same sector behave in the same way, which in reality is highly unlikely. Another limitation is that the substitutability between capital and labour is assumed to be the same for all types of labour (Iqbal and Siddiqui, 2001).

Partial equilibrium models: These are often used instead of the CGE models because they have the advantage of requiring a smaller number of data; they are also easier to use. They were used, for example, in the study by Cooke et al. (2015). However, they do not enable an analysis of the overall structure of an economy.

Conceptual model used for simulations in this study

The model used in this study is a Computable General equilibrium one. It has the advantage of taking into account the interaction between the behaviours of different economic agents and that between the prices of different products. This model, which

rests on a social accounting matrix, was constructed on the basis of the research done by Decaluwé, Martens and Savard (2001), Cooke et al. (2015), Emini and Fofack (2004), and Omgba and Djiofack (2009). The latter two publications are about the Cameroonian economy. The equations of the constructed model are presented in Annex Table A9.

Construction of the social accounting matrix

This study constructed a Social Accounting Matrix (SAM)¹³ by updating the one that had been developed in 2005 by the National Institute of Statistics by incorporating into it data from the national accounting for 2010, while at the same time adapting it to this study's specificities.¹⁴ It was important to include data for 2010 because this was the first year of the country's implementation of its 2010-2020 national development strategy. It was also during the same year that the level of subsidies was already quite high, in excess of CFAF 145 billion.

The Social Accounting Matrix used in this study was constructed on the following basis:

- The 43 activity sectors and 43 products of the national accounting system were used, which makes it possible to highlight the oil activity sectors ("energy product extraction" and "oil refining and cooking") and those that are most vulnerable to fluctuations in petroleum product prices.
- The National Account was broken down into three components: subsidies, salaries, and others, with the aim of highlighting the petroleum product subsidies that are of particular interest to this study.
- The household account was divided into components based on data from the 3rd Cameroon Household Survey conducted in 2007, in order to take into account the households' living standards (poor vs non-poor) and their areas of residence (urban vs rural). This enabled the study to better bring to the fore the rural area, where 89% of the country's poor population lived (according to INS, 2008).

Modelling of production

Each activity sector was specified by: (i) a production function; (ii) the import price; (iii) the export price; (iv) the national price; and (v) the production price. This specification enabled the study to integrate into its model not only the impact of crude oil price fluctuations but also the impact of the petroleum product price rise on the prices of other products. In fact, the model includes a price-modelling cluster that enables it to take into account the interaction between prices.

Value added: This is based on two primary factors of production: Productive capital, and labour. Productive capital is supposed to be specific to each sector, while labour can move from one sector to another. Thus, a sector's value added can only be

increased by recruiting additional workers.

Production: This is characterized by a Leontief production function, and by a CES production function for the primary factors of production. In economics, a sector usually produces several goods at the same time. Thus, the quantity of sector j 's production of product i is a ratio of its total production.

Intermediate consumption: A given sector's intermediate consumption depends on its production technology. It is then distributed among the sector's various products, with the production of each of these products requiring a fixed specific fraction.

Modelling of the institutional agents' income and consumption

Households: Household income is composed of wages paid by the government and other institutional sectors, of returns on capital, of property income and of transfer payments. But since the wages paid by the government go entirely to households, while part of the wages paid by other institutional sectors goes to the rest of the world, it is important to dissociate the two types of wages.

With regard to the consumption of petroleum products, it can be assumed that the urban non-poor households' consumption is not very sensitive to an increase in their prices. In fact, part of their consumption of those products is in the form of various benefits (fuel vouchers, vehicle maintenance allowances, etc).

Companies: Companies' income is composed of the share of capital income that is meant to be theirs, of property income and of transfer payments received from other institutional sectors. Companies use this income mainly to pay taxes and property income, to make transfers to other institutional sectors, and to make savings.

Non-Profit Institutions (NPIs):¹⁵ The NPIs' income comes from their invested capital, from their property income and from transfer payments they receive from other institutional sectors. Part of this income is given to households, to companies, and to the rest of the world in the form of property income and transfers; the rest is saved.

The government: The government's income essentially comes from taxes imposed on other institutional sectors, from property income and current transfer payments received, and also from income from capital. The government's savings are obtained by subtracting from its income its final consumption and the property income and transfer payments, which it allocates to other institutional sectors.

The rest of the world: The state of the national economy vis-à-vis the rest of the world is assessed through the balance of the current account. In the context of this study, this balance is assumed to be constant. That is, an increase in imports necessarily results from an increase in foreign exchange of equivalent value.

Modelling of international trade

The modelling of international trade is inspired by that of a small open economy, which has been largely commented on in the literature. It is based on two main assumptions:

- The first is that of a “small country”, which implies that the country in question is a price taker. This means that the prices of its trade with the rest of the world are set on the world market and are thus exogenous to the small country’s national economy; that is, the small country has no influence at all over those prices.
- The second is Armington’s hypothesis, which stipulates that a country’s imports and domestic production are imperfect substitutes.

For example, producers of goods consumed domestically and internationally trade their production by arbitrating between what is to be sold on the export market and what will be sold on the local market. This arbitration is modelled through a Constant Elasticity of Transformation (CET) function, with a constant and finite elasticity.

Moreover, the total quantity of products sold on the domestic market comes from the imports and local production of this product. Thus, the consumer has to arbitrate between the two sources of supply, and this arbitration is modelled through a constant-elasticity-of-substitution (CES) function.

Modelling of prices

For each product, the equilibrium price equalizes the value of the total supply to the sum of values, excluding the profit margins of its components (local production and imports), a value to which are added the margins from trade and transport, and from which are subtracted government subsidies; that is, the equilibrium price at which the product is sold on the domestic market, whether imported or not. This kind of price modelling makes it possible to take into account the impact of an increase in petroleum product prices (for example following a reduction in government subsidies) on other prices, notably through profit margins from transport.

Type of loop used in the model

The tests carried out on the different types of loops (classical, Kaldorian, Johansen) led to the use of the Keynesian-type loop, which is specified in the following way: on the market of factors of production, the nominal wage is fixed, whereas the real wage rate is flexible. The demand for labour is endogenous, which makes unemployment likely, because supply is fixed. Labour is mobile between the different activity sectors. The factor “capital” is sector-specific and its output is flexible. Investment is exogenous (thus, fixed in the model), while adjustment is made through savings, which are endogenous. The trade with the outside world is based on a floating exchange rate, chosen as cash. The trade balance is kept fixed.

Effects on poverty

A number of authors have developed approaches aimed at combining the results of general equilibrium models with household data for a better assessment of macroeconomic effects on people's living standards. This study used the traditional approach. It collected the data provided by the Computable General Equilibrium model about the trends in the consumption by each category of household (the rural poor, the rural non-poor, the urban poor, and the urban non-poor) for different scenarios. The observed variations were then related to these same household categories by using data from the 3rd Cameroon Household Survey (ECAM 3). In addition, the trends in the price index were used to adjust the poverty line.

Authors such as Dervis et al. (1982), Janvry et al. (1991), Decaluwé et al. (1999), and Agenor et al. (2001) used this approach, which has the advantage of being easy to use. However, it has a major shortcoming – it does not offer a within-group distribution of income. Thus, a specific group's average behaviour is biased, as its value is high because of the income of the wealthiest households in the group (Savard, 2010).

7. Results of the simulations

Presentation of the different scenarios

The results of each simulation done in this study are analysed below by relating them to a reference scenario.

Reference scenario

The reference scenario reflects the economic situation of 2010. It assumes the maintenance of petroleum product price subsidies. The trends in the profit margins from the transport sector reflect those in petroleum product prices. This means that a rise in petroleum product prices is passed on to other products. Table 10 describes some key indicators for the reference scenario.

Table 10: Key macroeconomic indicators for the reference scenario

Indicators	Value
Real GDP growth rate	3.3%
GDP (in volume)	CFAF 9,156.7 billion
GDP (in value)	CFAF 11,699.7 billion
Absorption	CFAF 10,134.7 billion
Imports	CFAF 2,692.5 billion
Exports (in value)	CFAF 2,029.6 billion
National budget	CFAF 2,570 billion
Internal government revenues	CFAF 2,340 billion
Oil revenues	CFAF 497 billion
Taxes on oil products (in value)	CFAF 247 billion
Trade balance for crude oil	CFAF 355 billion
Petroleum product subsidies	CFAF 145 billion
International price for a barrel of oil	US\$79.4
Inflation rate	1.3%

Source: Data from the National Institute of Statistics (INS)

Alternative scenarios for the liberalization of petroleum product prices

Five scenarios were envisaged in this study. They all centred around the assumption of a fixed trade balance; that is, the study assumed a situation where the level of financing

of the national economy by foreign savings was constant. The first three scenarios test three economic policy options for the liberalization of petroleum product prices, while scenario 4 and scenario 5 explore the strategies to be implemented in the case of a sharp increase or a sharp drop in international prices of a barrel of oil.

Scenario 1: This is a scenario of a 50% reduction in subsidies on petroleum products, which would mean an average subsidy rate of about 14%. The economies made on the subsidies, corresponding to CFAF 72.5 billion (i.e. 2.8% of the national budget), would be allocated to a 5% increase in civil servants' salaries (which would cost CFAF 30 billion), while the rest (CFAF 42.5 billion) would finance the 50% reduction in corporate income tax.¹⁶ This scenario was inspired by the reforms undertaken by the Cameroonian government in July 2014.

Scenario 2: This is a scenario of a 50% drop in subsidies on petroleum products, which would mean an average subsidy rate of about 14%. The economies made on the subsidies would be allocated to financing the accompanying measures, namely a 5% increase in civil servants' salaries, while the remaining CFAF 47.5 billion would be distributed in the form of direct transfer payments to poor urban and rural households. It is assumed that there would be no shock on the international oil prices, thus remaining unchanged at US\$ 79.4 per barrel.

Scenario 3: This is a scenario of a complete removal of subsidies. The economies thus made (CFAF 145 billion, corresponding to 5.6% of the national budget) would be allocated to social spending. The wage bill would increase by 5% while the remaining CFAF 115 billion would be redistributed to poor households in the form of direct transfer payments.¹⁷ This would amount to giving CFAF 20,200 to each individual per year or an average of CFAF 8,000 to each poor household per month.¹⁸ In this scenario, it is also assumed that the price of a barrel of oil would remain unchanged.

Scenario 4: This is a scenario of total removal of subsidies and a 40% increase in the price of a barrel of oil, meaning that this price would increase from US\$ 79 to around US\$ 110. This is a price similar to that of between 2011 and 2013. The economies made, which correspond to what the government would have spent to maintain the subsidy rate at 28.6%, would be CFAF 203 billion (i.e. 7.9% of the national budget). These economies would be allocated to social spending: there would be a 5% increase in civil servants' salaries, while the rest would be redistributed to poor households, with each receiving about CFAF 12,000 per month.

Scenario 5: This is a scenario of a 40% drop in crude oil prices on the international market, leading to a price of around US\$48 per barrel. Further, it is a scenario of the removal of pump price subsidies on the domestic market and of no direct transfer payments to households. This scenario was inspired by the current international economic situation characterized by a significant drop in the price

of a barrel of oil. For instance, it fell from US\$ 111 in June 2014 to US\$48 in 2015. In this scenario, the economies made on subsidies, which would amount to about CFAF 87 billion, would be re-allocated to public spending to offset the drop in oil revenues.

Results of the different scenarios

State of macroeconomic aggregates

The results of the first three scenarios indicate that a reduction in, or a removal of, petroleum product subsidies in favour of social measures would lead to a slowdown in economic activity, a drop in labour supply and in government revenues, particularly taxes on petroleum products. This conclusion corroborates those arrived at by some authors, among whom Depratto, de Resende, and Maier (2009), who argued that a rise in petroleum product prices (resulting from a drop in, or a removal of subsidies) would have negative effects on growth trends, which would result in a permanent decline in the level of production (whether potential or real).

It should be noted, however, that of the three scenarios, it is the second one (consisting in maintaining a low level of subsidies and re-allocating the economies made to targeted social measures) that would be the best economic policy choice in terms of growth, employment and government revenues. Conversely, scenario 3 (consisting, for the government, in re-allocating to targeted social measures, all the economies made by removing petroleum product subsidies) would be the least appropriate option. The results of scenario 4 indicate that in a situation where pump prices have been liberalized, an oil shock will lead to a sharp slump in economic activity and will have an effect on the relative price level.

The observations made above were also pointed out by Streit's (2007) study on developing countries in general and by Channing et al (2008), in a study on the specific case of Mozambique. It has also been observed that an increased purchasing power for households through higher public sector wages and increased government transfer payments to households will lead to an increase in imports of food products (frozen fish, maize, rice, flour, wheat, canned food, etc)¹⁹ and electronic and audio-visual equipment (televisions, mobile phones, etc) in order to satisfy an increased demand for them. At the same time, local food products will become more expensive because of increased transport costs. On the other hand, it should be pointed out that an increase in oil prices, through global spill-over effects, has often led to a drop in the global demand for Cameroon's main export products, namely wood, rubber, oil, cocoa, cotton, aluminium, etc (World Bank, 2011).

According to scenario 5, in the event of a sharp fall in oil prices (below US\$ 50), the liberalization of petroleum product prices may be a good policy option. It could have a positive effect on economic growth and labour supply. The drop in oil prices is generally accompanied by an appreciation of the US dollar against the CFA franc via the euro,²⁰

which would boost exports (+ 2.1% compared to the reference scenario). However, in order to benefit from the exchange rate situation, it would be necessary to diversify the base of exportable products in order to accumulate more foreign exchange that would enable the country to import the equipment needed to carry out major structural projects. But, for Alley et al. (2014), a sharp fall in oil prices in a producing country may increase uncertainty over economic policy, public finance, infrastructure projects, etc and may ultimately negatively affect growth.

Table 11: Variation in key macroeconomic variables according to the different scenarios

Variables	Scenario 1 (%)	Scenario 2 (%)	Scenario 3 (%)	Scenario 4 (%)	Scenario 5 (%)
Real GDP	-0.3	-0.2	-0.5	-4.2	3.8
Demand for intermediate consumption	-0.5	-0.5	-1.1	-3.7	1.0
Labour supply	-1.2	-0.8	-1.6	-2.6	1.1
Trade balance	0.0	0.0	0.0	0.0	0.0
Exports	-0.2	-0.2	-0.4	-3.3	2.1
Imports	-0.2	-0.2	-0.4	7.4	-10.6
Budget revenues	-2.4	-0.2	-0.5	-0.3	-0.8
Taxes on petroleum products	-2.9	-2.7	-5.6	1.0	-11.3
Other tax revenues	-2.4	0.0	0.0	-0.4	0.1
Public revenues related to returns on capital	-0.4	0.0	0.0	-1.3	0.9
Price index	0.1	0.1	0.2	2.9	-2.7

Source: Authors' computations based on the model and data used by the National Institute of Statistics

State of activity sectors

Table 12 shows the variation in the value added of certain activity sectors according to the different scenarios. There are significant variations in the sectors that are most dependent on those products in their production function (in intermediate consumption). The sectors in question are (i) transport, storage and communication; (ii) fishing and fish farming; (iii) forestry and forest product exploitation; (iv) repair and installation of machinery; and (v) public administration and social security. It has also been observed that oil price fluctuations on the international market affect the economy mainly through the petroleum refining sector.

The activity sectors through which effects can be disseminated to all the economic sectors are (i) water supply and sanitation; (ii) professional, scientific and technical services; (iii) financial activities; (iv) construction; and (v) the wood industry, but excluding furniture manufacturing. Indeed, according to the *Quarterly Report of the Euro Area* (2011), a rise in the prices of petroleum products has negative effects on the sectors that consume these products most, effects which spill over and spread to almost all the sectors of the economy.

Table 12: Variation in the value added of specific activity sectors according to the different scenarios

Activity sector	Scenario 1 (%)	Scenario 2 (%)	Scenario 3 (%)	Scenario 4 (%)	Scenario 5 (%)
Transport, storage and communication	-1.5	-1.5	-3.2	-5.1	1.7
Fish and fish farming	-1.1	-1.1	-2.2	-3.3	1.4
Forestry and forest product exploitation	-1.1	-1.1	-2.2	-3.3	1.4
Repair and installation of machinery and equipment	-1.2	-1.2	-2.7	-4.0	1.6
Public administration and social security	-2.3	-2.0	-2.5	-3.2	0.5
Oil refining and cooking	0.0	0.0	0.0	-28.9	24.3
Water supply and sanitation	-0.2	-0.1	-0.3	-0.5	0.2
Professional, scientific and technical services	-0.4	-0.4	-0.9	-2.4	0.7
Financial activities	-0.3	-0.3	-0.7	-1.1	0.2
Construction	-0.2	-0.2	-0.5	-0.8	0.3
Wood industry, excluding furniture manufacturing	-0.2	-0.2	-0.4	-0.6	0.2

Source: Authors' computations based on the model and data used by the National Institute of Statistics

State of household final consumption

Scenario 1, which was inspired by the measures taken by the government in 2014 to mitigate the effects of the 33% reduction in oil price subsidies, would lead to a decrease in household final consumption. A 5% increase in the civil servants' wages would not be enough to mitigate the effects of a price rise that would follow the 50% reduction in petroleum product subsidies envisaged in scenario 1.

The results of scenario 2 and scenario 3 reveal that in the case of an oil price liberalization on the domestic market, it would be preferable to re-allocate a significant proportion of the economies made on subsidies to cash transfer projects in favour of the poor. In both scenarios, there is a strong increase in household final consumption, particularly that by poor rural households. Conversely, a decline in the level of consumption by non-poor households means that mechanisms should be put in place to protect their purchasing power, particularly that of the middle class, which is the new engine of growth in Africa (Juma, 2011). The results of scenario 4, which is based on a 40% increase in the international price of a barrel of oil, point to the same observation. Scenario 5, for its part, indicates that if the international price of a barrel of oil were relatively low (below US\$ 50), the liberalization of pump prices would benefit all the household strata.

Table 13: Variation in household final consumption according to the different scenarios

Final consumption	Scenario 1 (%)	Scenario 2 (%)	Scenario 3 (%)	Scenario 4 (%)	Scenario 5 (%)
Poor urban households	-0.2	3.3	7.5	9.5	0.8
Poor rural households	-0.6	4.3	9.7	12.7	0.7
Non-poor urban households	-0.6	-0.2	-0.4	-1.6	0.6
Non-poor rural households	-0.6	-0.2	-0.4	-1.8	0.5
Overall	-0.6	0.4	0.9	0.2	0.6

Source: Authors' computations based on the model and data used by the National Institute of Statistics

State of poverty

First, if petroleum product price subsidies were removed and there were no social cash transfer schemes (scenario 1), there would be an increase in poverty incidence of about 1.1%. This result is similar to that found by Cooke et al. (2014), whose study showed that removal of oil price subsidies in Ghana would lead to a 1.5% increase in poverty incidence in that country.

Scenarios 2 and 3 show that transfer payments to poor households would mitigate the negative effects of rising petroleum product prices on people's living standards, particularly those living in rural areas. In addition, they would also reduce the distance between the poor and the poverty line as they would lead to 11.8% decrease in the depth of poverty.

The results obtained from scenario 4 indicate that in the case of a sharp rise in oil prices on the international market, a generalized increase in prices would ensue on the domestic market, a situation which would not enable transfer payments to mitigate its negative effects on people's living standards. Scenario 4 envisages a 15% increase in the poverty incidence. In such a case, it would be up to the government, first and foremost, to find solutions to inflationary pressures. The solutions could include subsidizing petroleum products or reducing taxes on them (by e.g. removing the special tax on petroleum products, which accounts for almost 35% of the total taxes on petroleum products), or lessening the tax burden in the transport sector. However, in the medium term, structural responses must be envisaged that are aimed at limiting crude oil imports, given that Cameroon is an oil producer.

Scenario 5 envisages a situation of sharp fall in oil prices on the international market but with flexible prices on the domestic market. In such a situation, there would be gains for households, which would translate into a slight decrease in the incidence and depth of poverty. Nevertheless, social cash transfer schemes would need to be maintained for the most disadvantaged populations in order to render growth inclusive.

Table 14: Variation in the poverty incidence in relation to the reference situation (2007)

Area of residence	Poverty incidence rate (%)					
	Reference situation	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Urban	12.2	12.4	11.4	10.4	17.3	11.1
Rural	55.0	55.5	52.2	48.6	61.4	52.3
Overall	39.9	40.3	37.8	35.2	45.9	37.8
Depth of poverty (%)						
Cameroon	12.3	12.5	11.2	10.0	10.9	11.4

Source: Authors' computations based on the model and data used in the ECAM 3 Survey (2007)

8. Conclusion and recommendations

The aim of this study was to analyse the possible effects of liberalization of domestic prices of petroleum products on the Cameroonian economy. The study first described the Cameroonian economy in general, the weight of the petroleum sector in this economy, and the country's policy of subsidizing petroleum product prices. It then presented a simulation model and how it would be implemented by estimating the effects of fluctuations in the international prices of a barrel of oil on macroeconomic aggregates and household living standards. The results that emerged from this simulation model are summarized below.

Main results

The structure of the economy: Since 2010, the Cameroonian economy has been performing well, with an average growth rate of 4.2% after a spell during which this rate was around 3% due, in particular, to the world economic crisis. This growth is driven by the tertiary sector, which accounts for almost 42% of the country's total value added. For its part, the country's oil and gas sector accounts for close to 9%. The main factor of production in the economy is capital, which contributes more than three-quarters of the value added of most activity sectors. The main provider of employment is the agriculture sector (29.9%). It is followed by the real estate sector, which provides 19.7% of employment, and the water supply and sanitation sector, which provides 12.9%. Cameroon's exports are dominated by crude oil (nearly 40%). Its main imports are chemical, mineral and metal products (18%), light crude oil (14.3%), and basic commodities (meat, fish, cereal products, other foodstuffs, beverages, etc), which accounted for 14% of the total imports in 2014.

The petroleum industry: Petroleum products are an important production input in Cameroon. They account for 5% of total intermediate consumption in the country. The sectors that are most dependent on petroleum products in their production function are fishing and fish farming (58.6%); transport, storage and communication (33.4%); and forestry and forest product exploitation (19%). Between 2005 and 2014, in terms of their value, imports of petroleum products rose at an average annual rate of 20.6% and exports at 11.0%. The petroleum trade balance is generally positive but is very sensitive to fluctuations in crude oil prices.

Cameroon's petroleum revenues come from two sources: The licence fees paid by the National Oil and Gas Company (SNH) and the taxes paid by petroleum companies. Between 2010 and 2013, petroleum revenues accounted for about 28% of the government's internal revenues. However, since 2014, there has been a significant drop in the former, with their share falling to 23.5%. This downward trend is expected to continue, with their share being projected to be only around 12% in 2018. An analysis of the relationship between the government's total internal revenues and crude oil prices on the international market shows that a 1% change in the price of a barrel leads to a 0.3% change in the government's internal revenues in the same direction. A 50% drop in the price of a barrel of oil will lead to a 13.5% drop in these revenues.

The petroleum product subsidy policy: The Cameroonian government launched this policy in 2004. Because of this policy, petroleum products have been supplied at fixed prices since 2008. The average rate of subsidies was 30% until June 2014 when it was lowered, which led to an increase of 14% for a litre of super petrol, 15% for diesel, and 8% for domestic gas. An assessment of this subsidy policy reveals that it cost the country nearly CFAF 1,900 billion between 2005 and 2014 and that, on average, it represented 13% of the national budget between 2011 and 2014. Since 2011, the differential between taxes and subsidies has become negative, reaching CFAF 161.8 billion in 2013. Moreover, research has shown that subsidies benefit the wealthy households than they do the poor ones.

The impact of crude oil price fluctuations on the Cameroonian economy: What was taken as the reference scenario in this study corresponds to the situation of the Cameroonian economy in 2010 when the average price of a barrel of crude oil was around US\$ 80. Five alternative scenarios have been simulated. The first three of them simulated economic policy options that assume a liberalization of the petroleum product prices on the domestic market, while the other two simulated situations highlighting the effects of strong fluctuations in international oil prices on a domestic economy in which petroleum product prices have been completely liberalized (i.e. with an automatic adjustment of pump prices to crude oil prices).

The results of the different scenarios revealed that in the case of price increases, the sectors that would be most affected are those that depend most on petroleum products in their production function. Thus, fluctuations in crude oil prices would principally affect the oil refining sector. The main relay sectors that serve as channels for disseminating the effects of those fluctuations to any economy are (i) water supply and sanitation; (ii) professional, scientific and technical services; (ii) financial activities; (iv) construction; and (v) the wood industry.

The study further found that in the case of high petroleum product prices, it would be preferable, both on the economic level (growth, employment and public revenues) and the social level, to maintain a low level of subsidies below 15% and then as a matter of priority to re-allocate the economies made on subsidies to social cash transfer

schemes and to measures aimed at sustaining the middle class's purchasing power. On the other hand, if there were an automatic adjustment of domestic oil prices to those on the international market, transfer payments would not be able to mitigate the negative effects of a sharp rise in the latter prices on people's living standards. In such a situation, it would be up to the government to find, as a matter of priority, solutions to inflationary pressures.

The results also show that, in a situation of sharp fall in crude oil prices (below US\$ 50 per barrel), the liberalization of petroleum product prices on the domestic market could have positive effects on economic growth, labour supply, and poverty reduction. However, for all this to happen, the country would need to diversify its exports to generate more foreign exchange to finance its imports of machinery and equipment needed for the realization of major projects.

Recommendations

This study recommends that the Government of Cameroon should do the following:

- Diversify its exports to reduce the country's dependence on fluctuations in crude oil prices that significantly affect the pace of domestic economic activity and public finances. This would be all the more important since, according to specialists, the price of a barrel should remain relatively low (below US\$ 50) in the medium term. It is therefore necessary to have a strategy for integrating the Cameroonian economy into the world economy by strengthening trade with member countries of the Central African Economic and Monetary Community (CEEAC) and Nigeria.
- Establish a strategic intelligence structure to monitor the trends in and forecasts of the international prices of Cameroon's main export products (crude oil, cocoa, coffee, cotton, timber, bananas, etc) to better anticipate the shocks on these products by taking proactive measures.
- Reduce the country's dependence on imports of crude oil, since it is this dependence that constitutes the main channel through which the negative effects of increases in crude oil prices on the international market affect the national economy. Reducing this dependence requires a restructuring of the National Oil Refining Company (SONARA) so that it is capable of refining the Cameroon's crude oil and supply the refined oil to the domestic market.
- Restructure the policy of subsidizing the retail petroleum product prices so that these are more flexible than those of a barrel of crude oil on the international market. This would require introducing a pricing formula that allows domestic petroleum product prices to adjust to sudden fluctuations in oil prices on the international market. To carry out this restructuring, an inclusive, structured and progressive approach must be adopted with the aim of encouraging the population (through consultations, information and awareness campaigns, etc) to embrace the proposed reforms.

- Set up a fund for re-allocating the economies made on petroleum product subsidies, a fund which could be called Oil Subsidy Economies Allocation Fund (OSEAF) to the funding of social safety net schemes. This fund would also need to be funded with the Special Tax on Petroleum Products (STPP). To manage the fund, a board should be set up, composed of an equal number of representatives from the government and civil society organizations.
- Put in place a national social protection system funded by the proposed OSEAF. This system would need to design and implement social safety net schemes that are responsive to the needs of the poor and to propose measures aimed at sustaining the middle class's purchasing power to strengthen its resilience to macroeconomic shocks.

Nevertheless, it should be noted that a social policy focusing on targeted cash transfer schemes might lead to an increase in the import of basic commodities (rice, maize, frozen fish, wheat, etc.) and, as a result, if appropriate measures are not taken, deteriorate the country's trade balance, as was the case in Ghana.

Notes

1. The Cameroon Ministry of Economy and Planning: Email ngugetse_pierre@yahoo.fr
2. The Cameroon National Institute of Statistics: Email sikubs@yahoo.fr
3. The Cameroon Ministry of Economy and Planning: Email neneric@yahoo.fr
4. Wodon et al. (2008), in their study of 12 countries (of West and Central Africa), found that a 50% rise in the price of staple foodstuffs (rice, wheat, sugar, flour, vegetable oil, etc) would lead to an increase in the poverty incidence of between 2.5% and 4.4%.
5. A distribution of resources is said to be efficient if there is no other distribution that is preferred to it by all the economic agents.
6. In the short term, a fuel price increase has little effect on the wealthy people's budgetary constraints. Their demand for fuel could thus be inelastic to prices, unlike the demand from the less wealthy households, which is bound to be somewhat elastic.
7. SURE-P: Subsidy Reinvestment and Empowerment Programme.
8. Cameroon's tax burden rate was relatively low compared to that of other African countries such as Senegal, Côte d'Ivoire, Zambia, and Ghana, where it was between 15% and 17%, according to the World Development Indicators.
9. In Ghana, the share of oil in exports was 22% in 2012 (AfDB, OECD, UNDP, 2014) while in Nigeria it was 71% in 2011 (AfDB, 2013).
10. According to the Extractive Industries Transparency Initiative (EITI), the four private companies concerned are: Total Exploration and Production Cameroon, Perenco Cameroon, Pecten Cameroon Company (currently Addax Petroleum Cameroon Company), and Mobil Producing Cameroon Inc.
11. VAT on distribution = 19.25% of overheads plus interest charges plus pilferage.
12. The former sub-sector was liberalized through the decree instituting the implementation of the oil code (Decree No. 2000/465 of 30 June 2000), while the latter was liberalized through the decree No. 2000/935 / PM of 13 November 2000.
13. This matrix is in the form of an inputs-outputs table in which, for each given year, production flows by activity sector, the returns on production factors by institutional sector, and income sources are recorded.

14. See the format of the matrix in Annex Table A10.
15. NPIs have a final consumption, but since this is actually consumed by households, it is considered as a transfer from the NPIs to the latter.
16. Data from the 2010 National Accounting indicate that corporate tax was CFAF 96 billion.
17. In reality, according to the World Bank, administrative costs often absorb 10 to 20% of the budget allocated to direct cash transfer schemes (World Bank, 2011).
18. If we restrict ourselves to the chronically poor households, and if we consider an amount equivalent to 20% of the administrative costs, this amounts to giving each one of those households about CFAF 15,000 each month. It is this amount that was adopted by the Cameroonian government within the framework of its Pilot Project on Social Transfer payments launched in 2012.
19. Zamo's (2012) study showed that subsidies on imported food products represented 0.53% of GDP over the 2008-2010 period.
20. Since 1 January 1999, the CFA franc has been pegged to the euro, at a fixed exchange rate of 1 euro = 655.957 CFA francs.

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Annex 1

Table A1: Factors of production in the Cameroonian economy by activity sector

Activity sector	Value Added (V.A.)	Employee salaries	Number of employees	Share (%) of the factor 'labour' in the sector's V.A.	Share (%) of the factor 'capital' in the sector's V.A.	The sector's weight (%) in the total V.A.
1. Agriculture	1,293,177	178,195	5,122,634	13.8	86.2	10.7
2. Livestock farming and hunting	183,021	14,642	222,917	8.0	92.0	1.5
3. Forestry and forest product exploitation	299,119	20,507	86,693	6.9	93.1	2.5
4. Fishing and fish farming	46,224	706	35,105	1.5	98.5	0.4
5. Energy-product extraction	910,907	44,232	2,678	4.9	95.1	7.6
6. Other extractive-industry activities	14,033	1,257	19,153	9.0	91.0	0.1
7. Meat and fish industry	132,766	3,082	76,896	2.3	97.7	1.1
8. Grain processing industry	107,505	3,721	182,452	3.5	96.5	0.9
9. Cocoa, coffee, tea and sugar industry	100,266	41,355	36,651	41.2	58.8	0.8
10. Fats and animal feed industry	138,504	28,254	252,898	20.4	79.6	1.1
11. Cereal product industry	96,715	12,096	257,216	12.5	87.5	0.8
12. Milk, fruit and vegetable industry	56,450	12,711	121,871	22.5	77.5	0.5
13. Beverage industry	196,552	31,811	203,083	16.2	83.8	1.6
14. Tobacco industries	1,539	119	3,147	7.7	92.3	0.0
15. Textile and clothing industries	205,495	6,242	392,435	3.0	97.0	1.7
16. Leather and footwear industries	12,700	2,687	4,999	21.2	78.8	0.1
17. Wood industry, excluding furniture manufacturing	314,598	42,880	273,193	13.6	86.4	2.6
18. Manufacturing of paper and paper products	49,661	23,657	11,342	47.6	52.4	0.4
19. Oil refining and coking industry	50,047	6,500	648	13.0	87.0	0.4
20. Chemical industries	38,937	7,515	31,544	19.3	80.7	0.3
21. Production of rubber and rubber articles	72,484	29,614	22,079	40.9	59.1	0.6
22. Manufacturing of other non-metallic mineral products	33,310	5,857	24,070	17.6	82.4	0.3
23. Manufacturing of basic metallurgical products	84,814	21,398	56,600	25.2	74.8	0.7

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Table A1 Continued

	Activity sector	Value Added (V.A.)	Employee salaries	Number of employees	Share (%) of the factor 'labour' in the sector's V.A.	Share (%) of the factor 'capital' in the sector's V.A.	The sector's weight (%) in the total V.A.
24.	Manufacturing of machinery and electrical appliances	7,182	2,369	12,032	33.0	67.0	0.1
25.	Manufacturing of audio-visual equipment	2,582	752	1,157	29.1	70.9	0.0
26.	Manufacturing of transport equipment	21,611	8,538	1,585	39.5	60.5	0.2
27.	Manufacturing of furniture	137,518	5,176	68,897	3.8	96.2	1.1
28.	Repair and installation of machinery and equipment	11,953	4,871	14,070	40.8	59.229	0.1
29.	Electricity production and distribution	72,970	28,649	7,247	39.3	60.7	0.6
30.	Water supply and sanitation	86,420	16,076	2,172,126	18.6	81.4	0.7
31.	Construction	561,600	250,251	475,173	44.6	55.4	4.7
32.	Wholesale and retail trade	2,085,794	266,510	1,507,036	12.8	87.2	17.3
33.	Vehicle repairs	45,525	2,885	143,783	6.3	93.7	0.4
34.	Restaurants and hotels	438,114	40,522	540,228	9.2	90.8	3.6
35.	Transport, storage and communication	734,542	106,381	331,072	14.5	85.5	6.1
36.	Information and communication	269,509	61,221	74,074	22.7	77.3	2.2
37.	Financial activities	290,687	93,775	12,789	32.3	67.7	2.4
38.	Real estate activities	652,071	35,573	3,380,405	5.5	94.5	5.4
39.	Professional and scientific services	649,442	319,134	132,790	49.1	50.9	5.4
40.	Public administration and social security	578,466	459,329	127,873	79.4	20.6	4.8
41.	Education	395,779	292,381	202,338	73.9	26.1	3.3
42.	Health and social work	286,279	190,331	88,495	66.5	33.5	2.4
43.	Other services	297,487	82,020	397,480	27.6	72.4	2.5
	Total	12,064,355	2,805,782	17,130,954			100

Source: Authors' computations based on data from the National Institute of Statistics

Table A2: Household salary structure by activity sector

Activity sector		Employment structure (%)	Household salary structure (%)	Household final consumption structure (%)
1.	Agriculture	29.9	6.5	14.8
2.	Livestock farming and hunting	1.3	0.5	1.8
3.	Forestry and forest product exploitation	0.5	0.7	1.7
4.	Fishing and fish farming	0.2	0.0	0.8
5.	Energy-product extraction	0.0	1.6	0.0
6.	Other extractive industry activities	0.1	0.0	0.3
7.	Meat and fish industry	0.4	0.1	4.4
8.	Grain processing industry	1.1	0.1	3.4
9.	Cocoa, coffee, tea and sugar industry	0.2	1.4	1.3
10.	Fats and animal feed industry	1.5	1.0	3.4
11.	Cereal product industry	1.5	0.4	3.0
12.	Milk, fruit and vegetable industry	0.7	0.4	2.5
13.	Beverage industry	1.2	1.1	4.4
14.	Tobacco industries	0.0	0.0	0.3
15.	Textile and clothing industries	2.3	0.2	6.0
16.	Leather and footwear industries	0.0	0.1	1.0
17.	Wood industry, excluding furniture manufacturing	1.6	1.5	0.2
18.	Manufacturing of paper and paper products	0.1	0.8	1.5
19.	Oil refining and cooking industry	0.0	0.2	2.6
20.	Chemical industries	0.2	0.3	3.9
21.	Production of rubber and rubber articles	0.1	1.0	0.5
22.	Manufacturing of other non-metallic mineral products	0.1	0.2	0.1
23.	Manufacturing of basic metallurgical products	0.3	0.8	0.3
24.	Manufacturing of machinery and electrical appliances	0.1	0.1	0.4
25.	Manufacturing of audio-visual equipment	0.0	0.0	1.3
26.	Manufacturing of transport equipment	0.0	0.3	0.6
27.	Manufacturing of furniture	0.4	0.2	1.5
28.	Repair and installation of machinery and equipment	0.1	0.2	0.0
29.	Electricity production and distribution	0.0	1.0	0.9
30.	Water supply and sanitation	12.7	0.6	0.9
31.	Construction	2.8	9.3	0.0
32.	Wholesale and retail trade	8.8	9.4	0.0
33.	Vehicle repairs	0.8	0.1	0.2
34.	Restaurants and hotels	3.2	1.4	10.8
35.	Transport, storage and communication	1.9	3.8	5.6
36.	Information and communication	0.4	2.1	3.0
37.	Financial activities	0.1	3.3	0.9
38.	Real estate activities	19.7	1.3	7.6
39.	Professional and scientific services	0.8	11.3	0.4
40.	Public administration and social security	0.7	16.4	0.0
41.	Education	1.2	10.5	2.4
42.	Health and social work	0.5	6.5	2.0
43.	Other services	2.3	3.0	3.3
Total		100.0	100.0	100.0

Source: Authors' computations based on data from the National Institute of Statistics

Table A3: Trends in sector contribution to GDP

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Primary sector	22.6	22.9	25.0	25.8	26.0	25.8	26.0	25.6	25.3	20.3
Foodstuff farming	15.3	15.3	15.8	16.2	17.0	16.7	17.3	17.3	17.2	13.3
Industrial and export farming	1.8	1.6	1.3	1.7	1.7	1.9	1.7	1.5	1.5	1.9
Livestock farming and hunting	2.6	2.8	3.3	3.2	3.4	3.4	3.3	3.3	3.3	2.4
Fishing	1.3	1.7	3.3	3.3	2.3	2.4	2.3	2.2	2.1	1.2
Forestry and forest-product exploitation	1.5	1.6	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.4
Secondary sector	35.2	36.2	32.5	31.9	33.1	33.0	32.6	33.4	33.0	29.0
Extractive industries	10.2	12.2	11.6	10.6	8.8	7.9	9.2	9.7	8.9	7.3
including oil and gas	10.0	12.0	11.4	10.4	8.6	7.7	9.0	9.5	8.7	7.2
Food-processing industries	7.3	7.1	7.1	6.7	6.9	7.4	7.5	7.2	6.9	6.5
Other manufacturing industries	13.2	12.2	9.1	9.8	11.1	10.4	8.5	9.1	9.0	11.8
Electricity and water	1.1	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	0.7
Public building and works sector	3.4	3.5	3.6	3.6	5.3	6.1	6.3	6.3	7.1	2.6
Tertiary sector	42.2	40.9	42.4	42.3	41.0	41.2	41.4	41.0	41.7	44.0
Trade, restaurants and hotels	24.4	23.4	23.9	23.5	22.4	21.5	21.5	21.6	22.0	20.0
Transport, warehouses, telecommunications	6.5	6.8	7.2	7.3	7.2	7.7	7.8	7.6	7.9	6.7
Banks and financial institutions	1.4	1.0	0.9	1.1	1.0	1.0	1.2	1.2	1.2	1.2
Other market and non-market services	10.6	10.5	11.0	11.1	11.1	11.6	11.5	11.3	11.2	16.8
FISIM	-0.8	-0.7	-0.6	-0.7	-0.6	-0.7	-0.7	-0.7	-0.7	-0.7
Total market value-added	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors' computations based on data from the National Institute of Statistics

Table A4: Weight (in %) of the intermediate consumption (IC) of refined petroleum products in the total intermediate consumption by activity sector

Activity sector	2005	2006	2007	2008	2009	2010
1. Agriculture	2.2	2.2	2.7	1.8	0.8	1.4
2. Livestock farming and hunting	1.4	2.0	2.5	1.6	0.8	1.4
3. Forestry and forest product exploitation	39.1	39.9	38.7	29.6	18.7	18.9
4. Fishing and fish farming	57.8	64.2	69.3	66.1	50.7	58.6
5. Energy-product extraction	6.0	6.6	8.7	7.9	5.6	8.9
6. Other extractive-industry activities	2.5	3.0	3.7	2.8	1.8	1.8
7. Meat and fish industry	0.9	1.7	4.3	3.0	0.9	1.2
8. Grain processing industry	0.9	1.4	2.0	1.9	1.0	3.2
9. Cocoa, coffee, tea and sugar industry	1.7	2.0	2.6	1.9	0.9	2.0
10. Fats and animal feed industry	1.4	1.9	2.5	1.9	1.3	1.8
11. Cereal product industry	1.0	1.5	2.1	1.9	0.9	2.6
12. Milk, fruit and vegetable industry	0.6	0.9	1.3	1.0	0.6	1.4
13. Beverage industry	0.9	1.4	1.7	1.7	0.8	2.3
14. Tobacco industries	0.4	0.6	0.7	0.4	0.3	0.3
15. Textile and clothing industries	1.5	2.2	2.7	2.3	0.9	1.3
16. Leather and footwear industries	0.2	0.3	0.3	0.2	0.1	0.2
17. Wood industry, excluding furniture manufacturing	1.7	2.0	2.5	2.5	1.2	3.1
18. Manufacturing of paper and paper products	3.2	3.5	4.6	4.2	3.3	4.0
19. Oil refining and cooking industry	0.1	0.1	0.0	0.0	0.6	0.0
20. Chemical industries	0.7	0.8	0.7	0.7	0.4	0.9
21. Production of rubber and rubber articles	1.0	1.3	1.8	1.3	0.9	1.0
22. Manufacturing of other non-metallic mineral products	0.2	0.2	0.2	0.2	0.1	0.2
23. Manufacturing of basic metallurgical products	0.5	0.7	1.1	1.1	0.4	0.6
24. Manufacturing of machinery and electrical appliances	0.3	0.4	0.4	0.4	0.3	0.4
25. Manufacturing of audio-visual equipment	0.0	0.0	0.0	0.0	0.0	0.0
26. Manufacturing of transport equipment	0.0	0.0	0.0	0.0	0.0	0.0
27. Manufacturing of furniture	0.1	0.1	0.1	0.1	0.0	0.1
28. Repair and installation of machinery and equipment	19.7	19.4	25.3	18.7	10.6	13.2
29. Electricity production and distribution	4.8	5.5	6.7	5.4	3.1	5.4

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Table A4 Continued

Activity sector	2005	2006	2007	2008	2009	2010
30. Water supply and sanitation	18.2	18.6	16.3	13.6	8.7	13.5
31. Construction	5.4	5.4	5.2	5.7	2.3	3.6
32. Wholesale and retail trade	1.8	2.2	2.5	2.3	1.6	2.5
33. Vehicle repairs	5.0	6.6	7.5	7.4	4.4	9.0
34. Restaurants and hotels	0.5	0.8	1.0	0.9	0.4	1.2
35. Transport, storage and communication	34.4	37.1	33.2	28.9	26.7	33.4
36. Information and communication	1.1	1.5	1.7	1.6	0.7	1.0
37. Financial activities	6.3	7.9	12.5	8.8	5.2	6.3
38. Real estate activities	0.0	0.0	0.0	0.0	0.0	0.1
39. Professional and scientific services	2.9	4.0	4.5	4.7	2.8	6.7
40. Public administration and social security	12.4	13.2	13.8	8.3	4.9	6.2
41. Education	4.3	4.7	7.3	5.6	2.7	6.1
42. Health and social work	6.1	7.0	7.5	5.6	3.3	4.5
43. Other services	2.4	3.3	3.7	2.7	2.0	4.3
Total	5.5	6.1	6.3	5.2	3.7	5.1

Source: Authors' computations based on data from the National Institute of Statistics

Table A5: Relationship between the oil trade balance and international crude oil prices

Dependent variable: The logarithm of the oil trade balance	
Explanatory variables	Coefficient
Log of oil imports	-1.151**
Log of oil exports	2.282***
Log of international crude oil prices	0.932***
Log of GDP	0.417*
Constant	-14.204***

Source: Authors' computations based on data from the National Institute of Statistics and the Ministry of Finance

Table A6: Relationship between internal revenues and international crude oil prices

Dependent variable: The logarithm of the total internal revenues	
Explanatory variables	Coefficient
Log of oil imports	0.202**
Log of oil exports	0.466***
Log of international crude oil prices	0.274***
Log of GDP	1.017***
Constant	-19.64***

Source: Authors' computations based on data from the National Institute of Statistics and the Ministry of Finance

Table A7: Trends in petroleum product subsidies and the petroleum trade balance (in CFAF billion)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Exports	661.2	928.0	877.9	1,115.1	686.4	698.4	761.2	1,097.1	1,088.4	1,303.8
Imports	424.4	482.3	687.3	670.6	306.8	607.2	764.4	664.0	605.9	708.3
Trade balance	236.7	445.7	190.6	444.4	379.6	91.1	-3.2	433.1	482.5	595.5
Subsidies	19.8	19.1	30.3	138.0	23.0	145.0	309.0	400.0	420.0	339.0
National budget	1,721	1,861	2,251	2,276	2,301.4	2,570	2,571	2,800	3,236	
Weight of subsidies in the national budget (%)	1.2	1.0	1.3	6.1	1.0	5.6	12.0	14.3	13.0	

Source: Authors' computations based on data from the Ministry of Finance

Table A8: Variation in the value added of activity sectors according to the different scenarios

Activity sector	Scen. 1 (%)	Scen. 2 (%)	Scen. 3 (%)	Scen. 4 (%)	Scen. 5 (%)
1. Agriculture	0.0	0.0	0.0	0.0	0.0
2. Livestock farming and hunting	0.0	0.0	-0.1	-0.1	0.2
3. Forestry and forest product exploitation	-1.1	-1.1	-2.2	-3.3	1.4
4. Fishing and fish farming	-1.1	-1.1	-2.2	-3.3	1.4
5. Energy-product extraction	0.0	0.0	-0.1	-0.1	0.0
6. Other extractive industry activities	-0.1	-0.1	-0.3	-0.4	0.2
7. Meat and fish industry	-0.1	-0.1	-0.2	-0.2	0.1
8. Grain processing industry	-0.2	-0.2	-0.4	-0.5	0.2
9. Cocoa, coffee, tea and sugar industry	-0.2	-0.2	-0.4	-0.6	0.2
10. Fats and animal feed industry	-0.1	-0.1	-0.2	-0.4	0.1
11. Cereal product industry	-0.2	-0.2	-0.3	-0.5	0.2
12. Milk, fruit and vegetable industry	-0.1	-0.1	-0.2	-0.4	0.1
13. Beverage industry	-0.2	-0.2	-0.3	-0.5	0.2
14. Tobacco industries	0.0	0.0	0.0	0.0	0.0
15. Textile and clothing industries	0.0	0.0	-0.1	-0.2	0.2
16. Leather and footwear industries	0.0	0.0	0.0	-0.1	0.1
17. Wood industry, excluding furniture manufacturing	-0.2	-0.2	-0.4	-0.6	0.2
18. Manufacturing of paper and paper products	-0.4	-0.4	-0.8	-1.4	0.3
19. Oil refining and cooking industry	0.0	0.0	0.0	-28.9	24.3
20. Chemical industries	-0.1	-0.1	-0.2	-0.3	0.2
21. Production of rubber and rubber articles	-0.2	-0.1	-0.3	-0.7	0.1
22. Manufacturing of other non-metallic mineral products	0.0	0.0	0.0	-0.1	0.0
23. Manufacturing of basic metallurgical products	-0.1	-0.1	-0.1	-0.2	0.0
24. Manufacturing of machinery and electrical appliances	0.0	0.0	0.0	-0.7	0.9
25. Manufacturing of audio-visual equipment	0.0	0.0	0.0	0.0	0.0
26. Manufacturing of transport equipment	-0.1	0.0	0.0	-3.1	3.9
27. Manufacturing of furniture	0.0	0.0	0.0	0.0	0.0
28. Repair and installation of machinery and equipment	-1.2	-1.2	-2.7	-4.0	1.6
29. Electricity production and distribution	-0.5	-0.5	-1.1	-1.7	0.6
30. Water supply and sanitation	-0.2	-0.1	-0.3	-0.5	0.2
31. Construction	-0.2	-0.2	-0.5	-0.8	0.3
32. Wholesale and retail trade	-0.1	-0.1	-0.2	-0.3	0.1
33. Vehicle repairs	-0.4	-0.4	-0.9	-1.5	-0.4
34. Restaurants and hotels	-0.1	-0.1	-0.2	-0.4	0.1
35. Transport, storage and communication	-1.5	-1.5	-3.2	-5.1	1.7
36. Information and communication	-0.1	-0.1	-0.2	-0.3	0.1
37. Financial activities	-0.3	-0.3	-0.7	-1.1	0.2
38. Real estate activities	0.0	0.0	0.0	0.0	0.0
39. Professional and scientific services	-0.4	-0.4	-0.9	-2.4	0.7
40. Public administration and social security	-2.3	-2.0	-2.5	-3.2	0.5
41. Education	-0.7	0.1	0.2	-0.2	0.2
42. Health and social work	-0.4	0.1	0.1	-0.4	0.2
43. Other services	-0.2	-0.2	-0.4	-0.8	0.0

Source: Authors' computations based on the model and data used by the National Institute of Statistics

Table A9: The model's equations, variables and parameters**The variables and the parameters****The endogenous variables***** Production technology**

X_j Production by sector j (43)

LD_j Labour demand within sector j (43)

VA_j Value added of sector j (43)

*** Intermediate consumption**

DI_i Total intermediate demand required for the production of product i (43)

CI_j Total intermediate consumption for sector j (43)

CJ_{ij} Intermediate consumption required for sector j to manufacture product i (43X43)

*** Prices**

PVA_j Price of the value added of sector j (43)

PM_{tr} Price of the domestic consumption of imported product tr (43)

PE_{tr} Price locally paid to the exporter for product tr (43)

PX_{tr} Producer price for product tr (43)

PC_i Consumer price for composite product tr (43)

PD_{tr} Consumer price for local product tr (43)

PPD_{tr} Producer price for product tr for its sale on the domestic market (43)

$PINDEX$ Consumer price index (1)

r_j Rate of return on capital within sector j (43)

*** Income and savings***** Household**

Y_M Total income for household cluster m (4)

YD_M Total available income for household cluster m (4)

S_M Household savings (1)

$REMSAL_{nG}$ Total amount of salaries paid by institutional sectors other than the govt. (incl. rest of the world) (1)

KD_M Amount of income from capital paid to households (1)

KD_E Amount of income from capital paid to companies (1)

KD_I Amount of income from capital paid to non-profit institutions (1)

KD_G Amount of income from capital paid to the government (1)

CT_M Household final consumption (1)

$C_{i,M}$ Household final consumption of product i (43)

Taxes and profit margins

TY_M Total amount of taxes on household income (1)

TY_E Total amount of taxes on companies' income (1)

$TAXM_i$ Total amount of taxes on imports of product i (43)

$TAXEX_i$ Total amount of taxes on exports of i (43)

$TAXIP_i$ Total amount of indirect taxes on product i (43)

$TAXPR_j$ Total amount of other net taxes on the production by sector j (43)

MCT_{tr} Trade and transport margin on product tr (43)

Companies

Y_E	Companies' total income	(1)
S_E	Companies' savings	(1)

Non-profit institutions

Y_I	Non-profit institutions' total income	(1)
S_I	Non-profit institutions' savings	(1)

*** The government**

Y_G	Total government revenue	(1)
S_G	National savings	(1)
$C_{i,G}$	Government consumption of product i	(43)

*** The rest of the world**

BC	Balance of the current account	(1)
BC_i	Trade balance for production	(43)

*** Investment**

INV_G	Public investment in product i	(43)
INV_P	Private investment in product i	(43)
$INV_{M,i}$	Households' private investment in product i	(43)
$INV_{I,i}$	Non-profit institutions' private investment in product i	(43)
$INV_{E,i}$	Companies' private investment in product i	(43)
IT_I	Non-profit institutions' total investment in product i	(43)
IT_M	Households' total investment in product i	(43)
IT_E	Companies' total investment in product i	(43)
INV_i	Total amount of investment for product i	(43)
INV	Total amount of investment	(1)

*** Domestic demand and supply**

XD_{tr}	Domestic demand for product tr	(43)
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*** International trade**

EX_{tr}	Exports of product tr	(43)
M_{tr}	Imports of product tr	(43)
Q_{tr}	Total quantity of the product tr sold on the domestic market	(43)
PIB	Real GDP	(1)
TC	Rate of economic growth	(1)
	257 endogenous variables	

The exogenous variables

LS	Total labour supply	(1)
K_j	Demand for capital in sector j	(43)
$REMSAL_{RdM}$	Amount of salaries paid by the rest of the world to the residents	(1)
$REMSAL_G$	Amount of salaries paid by the government	(1)
IT_M	Households' total investment	(1)
IT_E	Companies' total investment	(1)
IT_I	Non-profit institutions' total investment	(1)

IT_G	Total public investment	(1)
$SUBV_M$	Subsidies paid by the government to households	(1)
$SUBV_I$	Subsidies paid by the government to non-profit institutions	(1)
$SUBV_E$	Subsidies paid by the government to countries	(1)
$SUBV_G$	Subsidies paid by the government to public and semi-public structures	(1)
CT_G	Government consumption	(1)
er	Nominal exchange rate	(1)
PWE_{tr}	World price of exports of tr	(43)
PWM_{tr}	World price of imports of tr	(43)
$RT_r E_M$	Total amount of property income and transfer payments from companies to households	(1)
$RT_r M_M$	Total amount of property income and transfer payments from households to households	(1)
$RT_r G_M$	Total amount of property income and transfer payments from the government to households	(1)
$RT_r I_M$	Total amount of property income and transfer payments from non-profit institutions to households	(1)
$RT_r M_E$	Total amount of property income and transfer payments from households to companies	(1)
$RT_r M_G$	Total amount of property income and transfer payments from households to the government	(1)
$RT_r M_I$	Total amount of property income and transfer payments from households to non-profit institutions	(1)
$RT_r M_{RdM}$	Total amount of property income and transfer payments from households to the rest of the world	(1)
$RT_r G_E$	Total amount of property income and transfer payments from the government to companies	(1)
$RT_r E_E$	Total amount of property income and transfer payments from companies to companies	(1)
$RT_r I_E$	Total amount of property income and transfer payments from non-profit institutions to companies	(1)
$RT_r E_G$	Total amount of property income and transfer payments from companies to the government	(1)
$RT_r E_I$	Total amount of property income and transfer payments from companies to non-profit institutions	(1)
$RT_r E_{RdM}$	Total amount of property income and transfer payments from companies to the rest of the world	(1)
$RT_r G_I$	Total amount of property income and transfer payments from the government to NPIs	(1)
$RT_r I_{RdM}$	Total amount of property income and transfer payments from NPIs to the rest of the world	(1)
$RT_r G_{RdM}$	Total amount of property income and transfer payments from the government to the rest of the world	(1)
$RT_r G_G$	Total amount of property income and transfer payments from the government to the government.	(1)

$TrCRdM^{si}$	Capital transfers from the institutional sector si to the rest of the world	(4)
$RT_r RdM_M$	Total amount of property income and transfer payments from the rest of the world to households	(1)
$RT_r RdM_E$	Total amount of property income and transfer payments from the rest of the world to companies	(1)
$RT_r RdM_I$	Total amount of property income and transfer payments from the rest of the world to NPIs	(1)
$RT_r RdM_G$	Total amount of property income and transfer payments from the rest of the world to the govt.	(1)
$TrCRdM_{si}$	Capital transfers from the rest of the world to the institutional sectors i	(4)
TrC_{si}	Capital transfers received by the resident institutional sector si	(4)
W_j	Salary rates within sector j	(43)
AC_{RdM}	Net acquisition of asset disposal by the residents to the rest of the world	(1)
$ACact_{si}$	Net acquisition of asset disposal by the institutional sector si	(4)
$ACpas_{si}$	Net acquisition of disposal of liabilities to the institutional sector si	(4)
$ACRdM_R$	Net acquisition of asset disposal by the rest of the world to the residents	(1)
55 exogenous variables		

The model's parameters

Production functions

$A(j)$	Scale coefficient in the Cobb-Douglas function
io_j	Technical coefficient in the Leontief function
v_j	Technical coefficient in the Leontief function
α_j	Elasticity of the Cobb-Douglas function
$aij_{i,j}$	Input-output coefficient
$\beta_{i,M}$	Share of product i in household final consumption

Constant elasticity of substitution (CES) function

A_r^M	Scale coefficient
α_r^M	Distribution parameter
ρ_r^M	Substitution parameter
σ_r^M	Trade elasticity of substitution

Constant elasticity of transformation (CET) function

B_r^E	Scale elasticity
λ_{ν}^E	Distribution parameter
κ_{ν}^E	Transformation parameter
τ_r^E	Elasticity of transformation

Tax rates

te_i	Tax rate for the export of product i
tm_i	Tax rate for the import of product i
txi_j	Rate of indirect tax on product i
t_{yM}	Rate of tax on household income
ty_E	Rate of tax on corporate income
$txpr_j$	Rates of other taxes on production by sector j

Other parameters

δ_j^x	Share of sector j in the total value added
d	Capital depreciation rate
s_M	Household propensity to save
$\beta_{i,PM}$	Share (in value) of product i in households' total investment
$\beta_{i,PE}$	Share (in value) of product i in companies' total investment
$\beta_{i,PI}$	Share (in value) of product i in non-profit institutions' total investment
$\beta_{i,G}$	Share (in value) of product i in the government's final consumption
$\beta_{i,G}$	Share (in value) of product i in the government's total investment
txm_{ui}	Property income rate and transfer payments from households to the institutional sector ui
txe_{ui}	Property income rate and transfer payments from companies to the institutional sector ui
txg_{ui}	Property income rate and transfer payments from the government to the institutional sector ui
$txis_{ui}$	Property income rate and transfer payments from non-profit institutions to the institutional sector ui
$trmc_{tr}$	Profit margin ratio for trade and transport
y_j	Share of the salaries paid by the government to sector j
θ_M	Share of non-government salaries paid to households
k_M	Share of capital income paid to households
k_E	Share of capital income paid to companies
k_I	Share of capital income paid to non-profit institutions
k_G	Share of capital income paid to the government

The model's equations

$$VA_j = A_j \left[\alpha_j LD_j^{-\rho_j} + (1 - \alpha_j) K_j^{(-\rho_j)} \right]^{-\frac{1}{\rho_j}} \quad (1)$$

$$XS_j = \frac{VA_j}{a_j} = AX_j \left[\alpha_j LD_j^{-\rho_j} + (1 - \alpha_j) K_j^{(-\rho_j)} \right]^{-\frac{1}{\rho_j}} \quad (2)$$

$$QP_{ij} = rho_{ij} \cdot XS_j \quad (3)$$

$$VPB_j = \sum_{i=1}^{43} P_i \cdot QP_{ij} \quad (4)$$

$$QX_i = \sum_{j=1}^{43} QP_{ij} \quad (5)$$

$$LD_j = \frac{\alpha_j \cdot PVA_j \cdot VA_j}{w_j} \quad (6)$$

$$K_j = \frac{PVA_j VA_j - w_j LD_j}{r_j} \quad (7)$$

$$CI_j = io_j X_j \quad (8)$$

$$DI_i = \sum_j CI_{i,j} = \sum_j a_{ij} CI_j \quad (10)$$

$$REMSAL_{nG} = \sum_j w_j \cdot LD_j + REMSAL_{RdM} \quad (11)$$

$$Y_m = \theta_m REMSAL_{nG} + \tau_m REMSAL_G + KD_m + RT_r E_m + RT_r M_m + RT_r G_m + RT_r I_m + er \cdot RT_r RdM_m \quad (12)$$

$$KD_m = k_m \cdot \sum_j r_j \cdot K_j \quad (13)$$

$$YD_m = Y_m (1 - t_{y_m}) - RT_r M_{mE} - RT_r M_{mM} - RT_r M_{mG} - RT_r M_{mI} - RT_r M_{mRdM} \quad (14)$$

$$S_m = pms \cdot YD_m \quad (15)$$

$$CT_m = YD_m - S_m \quad (16)$$

$$C_{i,m} = \beta_{i,m} \cdot \frac{CT_m}{PA_i} \quad (17)$$

$$Y_E = KD_E + RT_r M_E + RT_r G_E + RT_r E_E + RT_r I_E + RT_r RdM_E \quad (18)$$

$$KD_E = k_E \cdot \sum_j r_j \cdot K_j \quad (19)$$

$$S_E = Y_E(1 - ty_E) - RT_r E_M - RT_r E_G - RT_r E_E - RT_r E_I - RT_r E_{RdM} \quad (20)$$

$$Y_I = KD_I + RT_r M_I + RT_r G_I + RT_r E_I + RT_r RdM_I \quad (21)$$

$$KD_I = k_I \cdot \sum_j r_j \cdot K_j \quad (22)$$

$$S_I = Y_I - RT_r I_M - RT_r I_E - RT_r I_{RdM} \quad (23)$$

$$TY_M = ty_M \cdot Y_M \quad (24)$$

$$TY_E = ty_E \cdot Y_E \quad (25)$$

$$TAXM_i = tm_i \cdot er \cdot PWM_i \cdot M_i \quad (26)$$

$$TAXEX_i = te_i \cdot er \cdot PWE_i \cdot EX_i \quad (27)$$

$$TAXIP_i = txi_i(PD_i \cdot XD_i + er \cdot PWM_i \cdot M_i + TAXM_i) \quad (28)$$

$$TAXPR_j = txpr_j \cdot X_j \quad (29)$$

$$Y_G = KD_G + RT_r M_G + RT_r G_G + RT_r E_G + er \cdot RT_r RdM_G + TAX \quad (30)$$

$$TAX = TY_M + TY_E + \sum_i TAXM_i + \sum_i TAXEX_i + \sum_i TAXIP_i + \sum_j TAXPR_j \quad (31)$$

$$KD_G = k_G \cdot \sum_j r_j \cdot K_j \quad (32)$$

$$S_G = Y_G - CT_G - RT_r G_M - RT_r G_E - RT_r G_{RdM} - RT_r G_I - RT_r G_G \quad (33)$$

$$C_{i,G} = \beta_{i,G} \cdot \frac{CT_G}{PA_i} \quad (34)$$

$$BC = er \sum_i PWM_i \cdot M_i + RTrR_{Rdm} + (1 - \theta_M)REMSAL_{nG} - er \sum_i PWE_i \cdot EX_i - RTrRdM_R \quad (35)$$

$$RTrR_{Rdm} = RTrM_{Rdm} + RTrE_{Rdm} + RTrG_{Rdm} + RTrI_{Rdm} \quad (36)$$

$$RTrRdM_R = RTrRdM_M + RTrRdM_G + RTrRdM_E + RTrRdM_I \quad (37)$$

$$BC_i = er(PWE_i \cdot EX_i - PWM_i \cdot M_i) \quad (38)$$

$$INVP_i = \beta_{i,P} \frac{IPT}{PA_i} \quad (39)$$

$$IPT = IT_M + IT_E + IT_I \quad (40)$$

$$IT_{SI} = \sum_i INV_{SI,i} \quad (41)$$

$$INVG_i = \beta_{i,G} \frac{IGT}{PA_i} \quad (42)$$

$$X_{tr} = B_{tr}^E \left[\lambda_{tr}^E EX_{tr}^{-\kappa_{tr}^E} + (1 - \lambda_{tr}^E) XD_{tr}^{-\kappa_{tr}^E} \right]^{\left(\frac{1}{\kappa_{tr}^E}\right)} \quad (43)$$

$$EX_{tr} = \left[\left(\frac{PE_{tr}}{PPD_{tr}} \right) \left(\frac{1 - \lambda_{tr}^E}{\lambda_{tr}^E} \right) \right]^{\tau_{tr}^E} XD_{tr} \quad (44)$$

$$Q_{tr} = A_{tr}^M \left[\alpha_{tr}^M M_{tr}^{-\rho_{tr}^M} + (1 - \alpha_{tr}^M) XD_{tr}^{-\rho_{tr}^M} \right]^{\frac{-1}{\rho_{tr}^M}} \quad (45)$$

$$M_{tr} = \left[\left(\frac{PD_{tr}}{PM_{tr}} \right) \left(\frac{\alpha_{tr}^M}{1 - \alpha_{tr}^M} \right) \right]^{\sigma_{tr}^M} XD_{tr} \quad (46)$$

$$PD_i = (1 + txi_i) PL_i \quad (47)$$

$$PM_{tr} = (1 + tm_{tr})(1 + txi_{tr}) \cdot er \cdot PWM_{tr} \quad (48)$$

$$(PE_{tr} \cdot EX_{tr} + MTE_{tr}) \cdot (1 + te_{tr}) = er \cdot PWE_{tr} \cdot EX_{tr} \quad (49)$$

$$P_i \cdot QX_i = PL_i \cdot D_i + PE_i \cdot EX_i \quad (50)$$

$$PA_i = \frac{PD_i \cdot D_i + PM_i \cdot M_i + MC_i + MT_i - SUBVEN_i}{Q_i} \quad (51)$$

$$PC_i = (1 + PECE_i) \cdot PA_i \quad (52)$$

$$SUBVEN_i = (PC_i - PA_i) \cdot Q_i \quad (53)$$

$$MC_i = tmc_i \cdot (PD_i \cdot D_i + PM_i \cdot M_i) \quad (54)$$

$$PINT_j = \sum_{i=1}^{43} aij_{ij} \cdot PA_i \quad (55)$$

$$PPB_j = \sum_{i=1}^{43} rho_{ij} \cdot P_i \quad (56)$$

$$PINDEX = \sum_i \delta_i^X PA_i \quad (57)$$

Equilibrium equations

In order to ensure an accounting consistency in our model, it is essential to introduce into it equations that ensure equilibrium on the different markets of the economy:

- On the labour market, the equilibrium between labour supply and demand is given by the equation:

$$LS = \sum_j LD_j \quad (1)$$

where LS indicates the total labour supply.

- On the market of goods and services, the equilibrium between the total resources available for each composite product i and its domestic uses by the different institutional sectors is given by the following equation:

$$Q_i = \sum_j CIJ_{ij} + C_{i,M} + C_{i,G} + INV_i \quad (2)$$

$$INV_i = INVP_i + INVG_i \quad (3)$$

The equilibrium between investment and savings is given by the following equation:

$$INV = S_M + S_I + S_E + S_G + er.BC \quad (4)$$

Annex 2: Format of the social accounting matrix

		Factors of production		Agents									Activity sectors	Products	Accumulation					Total
		Labour	Capital	Urban poor household	Rural poor household	Urban non-poor household	Rural non-poor household	Companies	NPISHs	Public Admin: salaries	Public Admin: subsidies	Public Admin: other	Rest of the world	43 activity sectors	43 products	Households	Companies	NPISH	Pub. Adm.	
Factors of production Agents																				
	Labour																			
	Capital																			
	Urban poor households																			
	Rural poor households																			
	Urban non-poor households																			
	Rural non-poor households																			
	Financial companies																			
	Non-financial companies																			
	NPISHs																			
	Public Admin: salaries																			
	Public Admin: subsidies																			
Public Admin: other																				
Rest of the world																				
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