The Impact of Oil Prices on Economic Activity in Cameroon

Tchantchou Wague Johan Landry, Xie Zhong, Flavia Darcy Ferreira Cabral

Abstract—**The severity of the global economic recession that followed the oil shocks of the years 1970, prompted many studies that focused on the relationship between oil prices and economic activity. Thus, several researchers came to the conclusion that the sharp increases in oil prices are sources of economic recession. Following the same logic, this study based on annual data from the Brent price for the period 1970-2014, aims to measure the adverse or rather beneficial effects of a sharp increase in oil prices on economic growth and inflation in Cameroon. Hence, based on the VAR model (Vector Autoregressive) through impulse response functions, it helped to highlight the finding that, though the country is a net exporter of oil, increases of the oil prices have a negative impact on the economic activity. The modeling VECM (Vector Error Correction Model) through the technical co-integration has established the existence of a long- run stable relationship between oil prices, GDP (Gross Domestic Product) and ICP (Index of Consumer Prices).**

Index Terms— **Cameroon, oil shocks, VAR model, impulse response function, VECM model, cointegration**

I. INTRODUCTION

For centuries, oil has been one of the fundamental engines of world economic growth. Every day exchanges in very large quantities around the world. Also, whether by land, air or sea, oil is essential not only for the movement of people but also for the transport of products from one city, from one country to another or from one continent to another. other. It is therefore obvious that it occupies an important and even strategic place in international trade.

Most of the proven reserves of this raw material are located in the least developed countries (LDC), particularly in the Middle East. This geographical data has greatly influenced international relations. This raw material has such a great influence at the international level that more or less significant variations in its price have a marked impact on the economic situation. The impact turns out to be all the more important since there is no short-term substitute for oil. Rising oil prices generally make oil-related final consumer goods more expensive and reduce demand for those products, changing the composition of trade for many countries. The volatility of oil prices tends to reduce trade flows, as it increases the risks faced by importers. Uncertainty about the future evolution of oil prices leads households to postpone their purchases of durable consumer goods and companies to postpone their investment decisions. This results in a decline in global demand and total imports as can be seen now since the beginning of the war in Ukraine.

With regard to the specific case of Cameroon, oil revenues have contributed to the state budget at around 13% (Cameroon Statistical Yearbook, 2021). Despite the slight drop of 2.82% recorded in the country's national oil production, Cameroon recorded hydrocarbon revenues amounting to 1.36 billion dollars according to the national hydrocarbon company for commercialization on the international market on behalf of the State with 15.233 million barrels. It emerges from the foregoing that oil occupies a very important place within the Cameroonian economy. The will of the government to increase suggests that the country would benefit in all and for all and without any doubt from the rises in the price of the barrel. But indeed, although this country is a net exporter of oil which would immediately find itself in a favorable situation in the event of an increase in the price of the barrel, it remains no less true that sharp increases in the price of this material premiere may be detrimental to him. The most striking case is that of 2008 when, following the surge in oil prices, the state decided to increase the price of fuel at the pump. There then followed a wave of popular demonstrations which were virulent enough to undermine the stability and integrity of the country.

In view of all that has been above, this study is justified for several reasons: firstly, by the fact that oil, which is one of the most popular raw materials in the world, occupies a prominent place in the economy of Cameroon. Secondly, the observation that oil has a central and strategic position in international trade leads world economies to be quite vulnerable to the oil shock. Thirdly, the current rise suggests adverse effects on the economy of this country. To this end, it is appropriate to look into the subject in order to understand the mechanisms and to measure the impact of oil price increases on the Cameroonian economy. The general objective of this study is to assess the consequences of the rise in world oil prices on Cameroon's economic indicators. inflation, and then to study the impact of rising prices on economic growth in Cameroon.

II. LITERATURE REVIEWS

There are many studies in the theoretical literature on the impact of fluctuations in world oil prices on economic activity. Having been made for the most part in the context of developed countries, and more abundantly in the United States, it generally emerges that the effects of variations in the price of "crude" differ according to whether one is a net exporter or a net importer of oil. Nevertheless, after the shocks of the 1970s, a weakening of the relationship between oil prices and economic activity was observed. Three main conclusions were adopted: First, the existence of an

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asymmetric relationship between oil price fluctuations and activity. then, many authors have concluded that there is a total breakdown in the relationship between oil prices and economic growth; finally, others have commented on the fact that this relationship depends on the economic cycle. This section therefore proposes to take stock of these different aspects. Also, following these shocks, several empirical studies based on a variety of models have been carried out. Despite the fact that most of them concern Western economies, we will mention a few carried out on behalf of Africa.

A. Transmission mechanism of an oil shock to the economy

Studies carried out since the first oil shock have explained a set of "standard" effects, on which there is no real consensus. Nonetheless, oil price spikes can impact economic activity through a variety of transmission channels:

First, we can mention the classic supply effect, which states that the rise in oil prices is an indication of the drying up of a basic element of production. The other costs (and in particular wages) not falling immediately, the overall cost of production increases. Production is thus reduced (Brown and Yucel, 1999; Abel and Bernanke, 2001), which results in a slowdown in the growth of production and productivity. Secondly, the rise in oil prices deteriorates the trade balance of net importing countries facing the net exporters of black corn (Dohner, 1981). In net oil-importing countries, companies and households see their purchasing power dwindle. Thus, on a global scale, we are witnessing a transfer of wealth in favor of net exporting countries. However, this mechanism has been questioned by a number of authors. Indeed, high oil prices affect open economies both directly and indirectly. The indirect effect spreads through the country's trading partners. The example given by Abeysinghe (2001) is that of Malaysia, Indonesia and Singapore. Malaysia and Indonesia are net oil exporters and major trading partners of Singapore, itself an importer of black gold. While high oil prices are dampening Singapore's GDP growth, Malaysia and Indonesia, with rising export earnings, are reaping the rewards. Their imports from Singapore are therefore favoured. Thus, the balance sheet of the oil price increase on the latter depends on the extent of these direct and indirect effects. Specifically, it depends on how oil-exporting economies decide to use their extra income. Thirdly, the rise in the price of petroleum products systematically generates so-called first-round inflation, in the sense that the prices of final consumption of petroleum products and the price of intermediate consumption increase. Second-round effects on prices are linked to the behavior of agents. Theoretically, to keep their profits rising, producers can compensate for rising production costs by increasing selling prices. Similarly, employees can ask for wage increases to limit, at least in part, their loss of purchasing power. This mechanism leads to a further rise in production costs and then consumer prices. This effect is all the more marked the higher the indexation of wages to prices. The second-round effects are attenuated by the evolution of unemployment. If the unemployment rate rises, wage pressures are lessened (Barlet and Crusson 2009). The credibility of monetary policy can also curb these second-round effects. By conducting a monetary tightening policy following a shock, central banks attempt to limit the spread of inflation. On the other hand, the decline in activity caused by the oil shock should direct the authorities towards a policy of monetary stimulus. The work of Bemanke, Gertler and Waston (1997) attempts to show that the reaction of the monetary authorities to an exogenous oil shock is more harmful for growth than the oil shock itself. In this reading framework, monetary policy is a channel that amplifies the effects of oil shocks.Fourth, an increase in oil prices leads to an increase in monetary demand (Pierce and Enzler, 1974; Mork, 1994). The inability of monetary authorities to meet the growing demand for liquidity by increasing the money supply leads to higher interest rates and slower economic growth (Brown and Yücel, 2002). Fifth, the sectoral reallocation model provides a different explanatory mechanism for the impact of oil shocks. If the oil price increase is prolonged, it can lead to a change in the structure of production and thus affect the unemployment rate. develop new production methods that consume less black gold. In the end, some sectors emerge as winners and others as losers. This redistribution of the cards leads to a reallocation of capital and labor between sectors, which can ultimately affect the unemployment rate (Loungani, 1986).

B. Weakening of the relationship between oil prices and economic activity

Since the oil counter-choice, several researchers have oriented themselves on the trail of a weakening relationship between oil prices and economic activity. In addition to the reduction in the energy intensity of industrialized countries, many reasons have been mentioned in the literature to explain this instability in the relationship between oil prices and economic activity and to understand its relaxation since the end of the 1980s. that three main competing explanations have been offered to explain this weakening:

-The instability of the relationship between the price of oil and economic activity lies in the asymmetrical nature of the impact of the price of "crude oil" on said activity, according to which the negative effect of an increase is greater than the impact positive related to the decline (Hamilton, 1983 and 2005). This asymmetry effect would be important since some authors (Mork, 1989 and Lee, Ni and Ratti, 1995) even show that the drop in the price of "crude" has no impact on economic activity. Several explanations have been proposed for this phenomenon of asymmetry: the existence of necessary delays linked to the setting up of additional production capacities (investment is not immediate, whereas the fall in the profitability of oil-consuming companies is rapid), the presence of adjustment costs (Hamilton, 1988), or even the difference in reaction of the monetary authorities faced with a rise (restrictive policy to fight against inflation) and a fall (no reaction) in the "crude" price (Bernanke et al., idem).

- The alternative proposed in the literature to this hypothesis of asymmetric effects is the presence of a break in the relationship between GDP and the price of oil. In particular, for Hooker (1999), this asymmetry hypothesis is not convincing over the recent period. According to this author, the relationship between oil prices and the economy changes qualitatively around 1980. This break could reflect an evolution in the mechanisms of price and wage formation, the reduction in energy dependence or a structural change in economic (Hooker, 2002 and Blanchard and Gali, 2007).

-Another theory proposed in the literature to explain the loss of significance of the relationship between variations in the price of oil and the growth rate of GDP is that of Raymond and Rich (1997). These authors propose to study the influence of variations in the price of oil as a function of the economic cycle. For this they use models with changes of regimes. In these models, the average GDP growth rate differs depending on whether we are in the high state or in the low state. The state is determined by a hidden variable which follows a Markov process (Barlet and Crusson, idem).

C. *Review of empirical literature*

A major effort was deployed from the first oil shock with the aim of integrating energy into large macroeconomic models and simulating them in order to analyze the effects of fluctuations in the price of crude oil on growth and production. unemployment. Some researchers have focused on modifying pre-existing models while others have created specific models.

The study by Pierce and Enzler (1974) is a pioneer in this field. This is a simulation based on an adaptation of the MIT-Penn-SSRC(MPS) model of the American economy. It emerged from this simulation that the rise in "crude" prices caused a significant reduction in income and employment. This conclusion reinforced the conviction that the oil shock had caused the recession. Then we followed an important investigation of the researchers in this field.

Hamilton (1983) published what many consider to be the seminal study of oil shocks. He observed how oil prices affected the U.S. economy using a vector auto-regressive (VAR) system employing quarterly growth data for Gross National Product, the unemployment rate, and the like. themselves: with one exception, all the recessions experienced by the United States after the Second World War were preceded by a rise in oil prices. Several other studies dealing with the impacts of oil shocks on the macroeconomic situation of the United States have seemed to corroborate Hamilton's conclusions. and macroeconomics in countries other than the United States (Burbidge and Harison (1984), Bruno and Sachs (1985).

The simulations carried out today indicate a much less marked impact of the price of oil than that estimated in the years 1970-1980. International Monetary Fund), INTERLINK of the O.E.C.D. and F.R.B./ Global of the F.R.B. (Federal Reserve Board), are between -0.01 and -0.002 depending on the evolution of monetary policy (CFE-IDEI-IFP).

Some researchers have focused exclusively on the consequences of an oil shock on the supply side by trying to assess the losses of Gross National Product (GNP) following a permanent increase in the price of "crude" using production functions of the Cobb-Douglas type in which energy had been introduced in addition to the classic labor and capital factors. The main authors of this current are Rasche and Tatom, of the Federal Reserve Bank (Rasche and Tatom, 1977). This current is in fact based on an essentially microeconomic analysis of a macroeconomic problem.

1. *Oil Prices and the Macroeconomics: Key Findings for Western countries*

Many empirical studies have been carried out to study the impact of crude oil price variations on economic activity. These works are mainly focused on short-term interactions between the price of oil and GDP and mainly concern United States.

As we mentioned earlier, most of the work aimed at estimating the elasticity between macroeconomic aggregates and the price of oil relate to American data. Based on autoregressive log-linear specifications of GDP, Mory (1993) and Mork et al. (1994) arrive at estimates of the elasticity of GDP to price increases equal, respectively, to -6 .7 and -5.4%. These values are close to those presented during the seventh edition of the Energy Modeling Forum (EMF-7) and documented by Hickman et al. (1987): the median of the cumulative elasticity over two years was -5.8%. Dotsey and Reid (1992) arrive at a cumulative elasticity of -9.4% when the reaction is greatest, after seven quarters. Jones, Leiby and Paik (2004) also report that the US Department of Energy has used over the last fifteen years, in its energy policy analyses, a value of the elasticity comprised between-2.5 ct-5.5%.

With regard to the other countries, in particular the European countries, the studies are much less numerous. The work of Mork et al. (1994) reports estimates of the elasticity of GDP with respect to price increases equal to -2.3% for Japan, -8.1% for Germany from I West, -9.8% for France, -6.4% for Canada, -3.8% for the United Kingdom and 5.1% for Norway. By analyzing the influence of the consumer price index of petroleum products on the Greek economy over the period 1989-1999, Papapetrou (2001) estimates elasticity of industrial production and employment of -2.7 and -0.8%. We should also mention the work of Jimenez-Rodriguez and Sanchez (2005) on the main industrialized countries, which show that a 100% increase in the price of crude oil translates into GDP losses of 3.9% in the United States. , 1.3% for the Euro zone (- 1.8% for Germany, - 1.5% for France, -2.2% for Italy) and 1.9% for the United Kingdom, while Norway's GDP gains amount to 1.8%.

Adopting a multi-country framework, the models of the IMF (2006) and the OECD (2004) treat variations in the price of oil as random shocks on the supply. The OECD arrives after two years at a cumulative elasticity close to -2.1% for the United States when the monetary policy is not expansionary (-1% after one year). Using the OECD model, the IEA (2004) estimates that a rise in the price of a barrel from 25 to 35 dollars in the first year causes a drop in GDP of 0.3% in the United States, from 0.4% in Japan and 0.5% for all Euro zone countries.

In general, in the short term, empirical work tends to highlight the existence of a causality exerted from the price of “crude” towards economic activity.

2. *Works done in Africa*

There are not many studies on this subject for the African case. Nevertheless, Benabdallah et al (2005) studying the sensitivity of 24 African economies to changes in oil prices using cointegration and causality techniques, concluded that African economies are significantly influenced by fluctuations in oil prices either long term for some countries or short term for others. The analysis also went on to explore the responses of the increase in Gross Domestic Product and the Consumer Price Index following an oil price shock. From the results obtained, it appears that in many cases, oil price increases are highly disruptive to economic activity. A study conducted in Tunisia by Farhani using a VAR model shows a weakening of the relationship between the increase in the price of oil and economic growth in Tunisia, in the sense that it is a significant effect. direct but very weak. In 2007 in

Senegal, the Department of Forecasting and Economic Studies (DPEE) showed that a 30% rise in the price of a barrel of oil causes an instantaneous loss of GDP of 0.4%. In addition, this shock causes a respective worsening of inflation, of the current account deficit excluding official transfers and of net exports by around 1.5%, 4.4% and 6% instantly.

III. Oil and Economic Activity in Cameroon

A. The Cameroonian oil market

1. The main actors on the Cameroonian market

Among the various players on the Cameroonian oil market, we first cite the State, which owns all the reserves and which sets the rules and conditions for exploitation. Law No. 99/013 of December 22, 1999, establishing the Petroleum Code aims to promote and regulate all petroleum operations on Cameroonian territory. In addition to the country, there are also end consumers (motorists, households, farmers, industries, etc.), operating, regulatory, distribution and marketing companies, both national and international. With regard to local distribution companies, there are service stations belonging either to locals (for example: Tradex, Soacepe, Camoco and Bocom) or to foreigners (Oilibya, Total and Corlay Cameroon). There are mainly four companies, with complementary activities, dealing with production, distribution, price regulation and marketing, which are at the forefront of the management of petroleum resources. They are:

i. The National Hydrocarbons Company (NHC) which manages the interests of the State in the upstream sector of the oil and gas industry. It sells on the international market, the share of the national production of crude oil going to the State as well as its own, which goes to it as an investor. The sale prices of Cameroonian crude are fixed in relation to Brent Date, the benchmark crude from the North Sea and the London market (Intercontinental Exchange). Depending on market conditions, these prices have a discount or a premium that reflects the difference in quality compared to Brent, the cost of transport to the target markets, the temporary demand for this type of crude oil, etc. Revenues from sales are transferred to the Public Treasury after deduction of production costs. It has many international partners such as: Kosmos Energy, Yang Chang, Perenco and Gaz du Cameroon (subsidiary of Victoria Oil & Gas) ... Its clients include Total Oil Trading S.A., Glencore International AG, Repsol Trading, ExxonMobil Refining & Supply and Sahara Energy Resource.

ii. National Refining Company (SONARA), which is the only refining company in Cameroon, has the mission of operating a crude oil refinery to meet the needs of the Cameroonian market for finished products, such as butane, gasoline, petrol, jet fuel (aviation fuel), diesel, distillate and fuel oil. It also serves some foreign countries.

iii. The Hydrocarbon Price Stabilization Fund (HPSF) whose main objective is to regulate the price of hydrocarbons throughout the national territory through the partial or total support of price increases for the said products to the extent of its availability Otherwise, its role is to contain the negative effects of the rise in international prices.

iv. The Cameroonian Company of Petroleum Depots (CCPD), Its mission is the storage of petroleum products necessary for national consumption, the establishment of security stocks, property of the State and the coverage of all the national territory by its deposits network.

B. Oil production and consumption in Cameroon

Essential product to Cameroon's economy, Petrol is at the center of the country's commercial exchanges. Despite the fact that the latter is considered to be a small producer or to a certain extent an average producer, both in Central Africa and in the world in general, it is nonetheless true that his production is not negligible taking into account national and global oil needs.

Cameroon's oil production, which has continued to decline since the second half of the 2000s, experienced quite recently (at the beginning of 2022) a slight improvement due to the entry into activity of four new oil fields. During the first four months of 2015, oil production in Cameroon crossed the bar of 100,000 barrels per day against an average of 60,000 barrels per day in the past. This had never happened again since 2002. This situation thus augurs a rather better future not only for production, which was declining quite rapidly, but also for State revenue. The following table shows this situation.

Table 1: Evolution of oil production (in millions of barrels)

Year	Government	Associates	Total
2015	21.585	13.389	34.974
2016	20.034	13.657	33.691
2017	16.385	11.341	27.726
2018	15.478	9.655	25.133
2019	16.092	9.904	25.996
2020	15.820	10.736	26.556
2021	14.897	10.711	25.608
2022	15.233	9.718	24.951

Source: NHC

In 2021, imports were dominated by food products, products of mineral origin (especially hydrocarbons), industrial equipment and semi-finished products, while exports are dominated by raw products such as cocoa and coffee products, tea and sugar (20.1%), forestry and forestry products (10.2%) and petroleum products (43.2%). However, unlike other oil-producing neighbors, Cameroon's oil revenues do not constitute a very large share of total revenues. Indeed, Cameroon, not having a very large production, has been able to diversify its sources of income, which makes it less dependent on these receipts. However, they are bound to be negligible and even constitute a rather remarkable advantage in that they generally serve to increase the state budget. In 2022, oil revenues contributed about 12.72% to the budget (National Institute of Statistics, 2022).

With regard to consumption, oil is used in Cameroon for various reasons. It is used as an intermediate consumer good used in the production of plastic materials (household utensils, bottles, plastic bags, etc.), it is also used for the production of electricity through generators and its by-products (medicines, agrochemical and food products, plastics, cosmetics, construction materials, paints, clothing, shoes, detergents, etc.) are widely used by the general

population. However, its greatest use is in the field of transport. It is mainly used for the movement of transport vehicles such as planes, trains, automobiles and ships. To this end, the refining company SONARA mainly puts on the market three types of petroleum products, the most used by users: kerosene, diesel and super. Their price being fixed by the authorities, generally benefits from subsidies whose aim is to spare the populations from the harmful effects of increases in world oil prices and thereby preserve their purchasing power.

C. Rise on the price of oil and fuel subsidies to the pump in Cameroon

In general, increases in the world price of oil have a destabilizing power for most of the economies of the globe and therefore have an impact on the economic activity of Cameroon. Indeed, they have sometimes been at the origin of demonstrations and civil claims. Their impacts are all the more harmful since the State has undertaken to subsidize the price of fuel at the pump in order to limit these perverse effects. But the problem here is that, these subsidies do not report unanimously with regard to their optimal character or beneficial for the company in general.

1. Possible pathways for the transmission of adverse effects due to increases in world oil price to the Cameroonian economy

a. *On the national level*

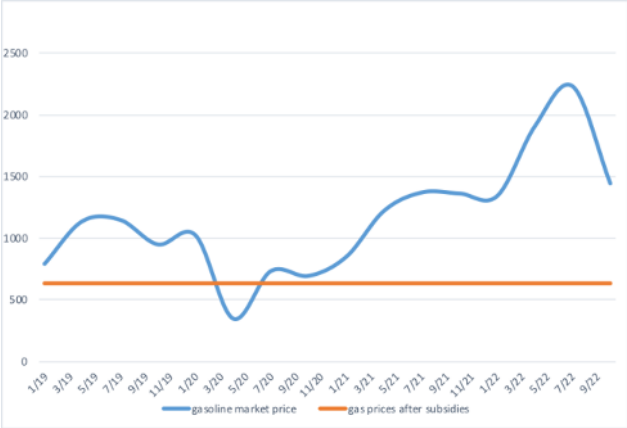
The harmful effects of the rise in the world price of oil can have repercussions on Cameroonian economic activity through several channels, one of the main of which is the price of fuel at the pump. Indeed, since oil is necessary for transporting products and moving people from one geographical area to another, the rise in world oil prices is likely to lead to an increase in fuel prices at the pump and induce hence inflation particularly affecting the prices of tradable goods (agriculture and industry): Increases in transaction costs will then have repercussions on the prices of goods. To this end, the suppliers of goods and services (linked to transport) find themselves obliged to compensate for their losses due to their additional expenditure, which results in a general increase in prices. To illustrate this situation, let us take the case of a farmer in a rural area. This denier, to sell his products taken from the earth, must go to town. He then borrows a means of transport (the bus for example). The international price of oil having increased, causes an increase in the transport tariff (in the very specific case where Cameroon decides to reflect this increase on the price of fuel at the pump) which will undoubtedly be reflected on the prices of products sold by the cultivator. Indeed, the latter, in order to compensate for his additional expense, will sell his products at a higher price. Another situation which may arise from the above is that the cultivator is also a trader in his place of residence. So, he will buy the products in town and resell them at a higher price than in the past in order to once again compensate for his additional expense. This aspect of things could be observed during the year 2014 (from July 1, 2014) when the State decided to no longer subsidize prices at the pump or more precisely to reduce its subsidies. It was then that the price of the super pass from 569 CFA to 630 CFA and the price of diesel from 520 CFA to 600 CFA led to an increase in urban transport tariffs which rose from 200 CFA to 250 CFA, thus degrading the power of This increase has also had repercussions on the prices of food products because of the increase in transport costs from rural to urban areas and conversely.

b. Through external exchanges

At the level of exchanges with the outside world, oil is one, if not the most consumed raw material in the world, due to the fact that it is involved in several production processes. induces a sensitivity of the economies to fluctuations in its price. Cameroon, being a net exporter of oil, will a priori be in a good position during a significant rise in oil prices. State revenues will increase as a result and most certainly its budget. However, this must be affirmed with reserve because indeed, Cameroon, even if it is an exporter, is also one of the largest importers in Africa (the fifth in 2010 after South Africa, Morocco, Ivory Coast and Egypt[26]), which can make it all the more vulnerable to oil shocks. In addition, the fact that Cameroon benefits from global increases in "crude" prices is only valid to the extent that Cameroon only trades oil with foreign countries: which is totally impossible at the present time. The financial globalization marked by free trade is increasingly operational and implies that the economies of the whole world mutually exchange several types of goods in more or less abundant proportions. So, taking the example of Cameroon and one of its trading partners (China for example), the following diagram can be established: When the price of crude oil rises, Cameroon, benefiting from this situation, will sell even more expensive the quantities of oil purchased by China. Nevertheless, the oil expensively purchased by China and used in the production process of goods exported to Cameroon will induce an increase in production costs and therefore an increase in selling prices in order to compensate for these losses. Cameroon in turn will import final consumer goods at even higher prices than in the past. This could lead to an imbalance in the trade balance or even to an aggravation of inflation, which are destabilizing for economies in general.

2. *The rise in the world price of oil leads to a subsidy of the fuel at the pump*

In 2022 the market price increased by 59% to reach 1131 FCFA for the super. However, in 2008, the Cameroonian government decided, following the rise in world crude oil prices, to increase the price of fuel at the pump. But the populations do not hear it that way. Added to other factors" which we will describe as catalysts, there followed a series of popular demonstrations which were given the name of "food riots". the price of a barrel of oil on the Cameroonian economy Since this date of 2008, until July 2016, despite the fact that the price of a barrel was at a fairly high level, the government did not adjust in relation to the market price the price of fuel at the pump. It took until 2016 to see a slight increase in the price, which remained the same until 2022. All this thanks to subsidies for the consumer price of petroleum products.



Source: IMF

Figure 1: No price adjustment at the pump from 2019 to 2022 in CFA Francs

a. Oil price subsidies

Energy subsidies are one of the instruments used by governments to achieve political, social and environmental objectives in: energy independence, industrial policy, social equity, environmental and climate protection. Governments can subsidize or support the production or consumption of such or such energy by direct transfers from the State budget, or by assuming part of the risks, by fiscal instruments (tax relief, differentiated taxation, tariffs of import, summer.) and by regulatory instruments (control of consumer prices, import quotas, obligation to purchase renewable energies or energy efficiency, summer). (Finnon, 2010). In many oil-exporting countries, subsidies represent an important item of expenditure in the government budget. These direct transfers make it possible on the one hand to redistribute part of the oil windfall to the population, and on the other hand to promote the private industrial sector (Aoun, 2006).

Increases in the price of oil, constituting a serious threat to the stability of world economies, are generally contained through mechanisms of subsidies on the prices of petroleum products. Energy subsidies include both consumption and production subsidies. Consumption is subsidized when the price paid by consumers, including businesses (intermediate consumption) and households (final consumption) is lower than the reference price, while production is subsidized when the price paid to suppliers is higher than this reference. Most economies have both production and consumption subsidies, although in practice it can be difficult to distinguish between them. This is the case of Cameroon, which subsidizes fuel prices at the pump by setting a price lower than the market price, by paying shares to SONARA.

Consumer subsidies include two components; a price subsidy before a tax is added (if the price paid by firms and households is lower than the costs of supply and distribution) and a price subsidy after a tax has been added (if taxes are below their efficiency level). When an energy product such as oil is traded internationally, the reference price for subsidy calculation purposes is based on the international price. Most economies impose a consumption tax to raise revenue to finance government spending. Effective taxation requires that all consumption, including that of energy products, be subject to this taxation, but this is not the case in Cameroon and in certain countries of the world. We realize from the table below that the consumer of gasoline in Cameroon pays an amount not only lower than the untaxed price but also well below the imposed price. This means that the government subsidizes a total amount of approximately 400 FCFA per litter of gasoline consumed. But this is in fact only a general overview of the extent of the subsidies because indeed, if we take into account all the aspects, they are even more consistent as presented in the following table:

Table 2. Subsidies for oil products in Cameroon between 2020 and 2022

		Type of oil		
	Years	Gasoline	Petrol	Diesel
Import prices	2020	410	440	431
	2021	265	259	260
	2022	458	524	496
SONARA margins	2020	48	48	48
	2021	48	48	48
	2022	48	48	48
Taxation	2020	230	115	120
	2021	214	63	167
	2022	278	74	247
Customs duties	2020	89	115	180
	2021	104	63	102
	2022	168	74	182
Special taxes	2020	110	0	65
	2021	110	0	65
	2022	110	0	65
Others fees	2020	132	105	120
	2021	185	151	176
	2022	209	185	209
Theorical prices at the pump	2020	795	569	625
	2021	712	522	651
	2022	993	831	1000
Subsidies	2020	165	219	50
	2021	82	172	76
	2022	363	481	425
Prices at the pump	2020	630	350	575
	2021	630	350	575
	2022	630	350	575

Source: IMF

We can see that the total amount of subsidies on petroleum products in 2022 amounts to 363 CFA Francs ($0.60) for the litter of gasoline, 481 FCFA for the litter of kerosene and 425 CFA Francs ($0.71) for the litter of diesel. We realize that the State of Cameroon, by subsidizing the prices of petroleum products, spends enormous amounts of money that could be allocated for other purposes. The 2022 budget did not provide the necessary resources for social policies. Fuel subsidies remained substantial, at 3% of GDP, at the expense of more useful expenses. Public spending on health and education has been significantly lower than in comparable countries (IMF, 2022).

b. Economic and environmental consequences of subsidies

The consequences of energy subsidies are numerous, the first of which is that they generally do not benefit the poor. Indeed, a study carried out by Coady et al in 2010, focusing

on the fuel and electricity consumption of households in Sub-Saharan African countries, came to the conclusion that subsidies mainly benefit only the wealthiest segment. of the population (the fifth quintile: the richest 20%). In addition, the bottom 40% only benefit from 20% of the benefits of the fuel price subsidy. That is, to get 1 CFA Francs to the poor, the government spends 5 CFA Francs. These subsidies are therefore ultimately poorly targeted and their economic and environmental consequences are not the least.

Economically, the effects of subsidies on growth go beyond their negative impact on fiscal balances and public debt. Indeed, subsidies can crowd out public spending that promotes growth. Some countries spend more on subsidizing energy than on public health and education. Subsidies create incentives for smuggling. If domestic prices are significantly lower than those in neighboring countries, there are strong incentives to smuggle products to destinations where prices are higher. Illegal trade increases the fiscal cost to the subsidizing country, while limiting the ability of the country receiving the smuggled items to tax domestic energy consumption. Eliminating energy subsidies helps to secure the availability of non-renewable energy resources over the long term and strengthens incentives to study and develop new, less energy-intensive technologies (Rogoff and Reinhart, 2010; Kumar and Woo, 2010).

From an environmental point of view, the negative externalities of energy subsidies are not negligible. Subsidies can cause over-consumption of petroleum, coal and natural gas products and reduce incentives for investments in energy efficiency and renewable energy. Over-consumption, in turn, exacerbates global warming and local pollution. Eliminating these subsidies could result in a 13% drop in CO2 emissions and generate positive spillovers by reducing global energy demand.

IV. Methodology, Data and Results

A. *Methodology and model specification*

The choice of the econometric model used is function of the fixed objectives, the availability and reliability of the data and also the simplicity of the econometric tests. Then the econometric model used for the study of the impact of oil price increases on cameroon's macroeconomic indicators is the Var approach using Eviews 10. And to ensure that the variation is not spurious we used VECM model. Therefore, the VAR model is specified as:

$$\Delta LnGDP_t = \beta_0 + \beta_1 \Delta LnGDP_{t-1} + \beta_2 \Delta LnCPI_{t-1} + \beta_2 \Delta LnOP_{t-1} + \varepsilon_t \quad (1)$$

Where β_1 , β_2 ...., β_3 are coefficients of elasticity; Ln represents the natural logarithm of variables, Δ the variable and **Ɛ** is the error of term,
GDP= Cameroon Gross Domestic Product
CPI= Consumer Price Index
OP= Oil Price

B. *Data*

The study is based on the annual series dataset in Cameroon from 1970 to 2021 obtained and calculated from Word bank, Word development indicators for the GDP and CPI, and BP statistical review of world energy for the oil price.

C. *Empirical results*

1. Analysis by VAR modeling

The first two variables are oil price increases and net increases, respectively. They make it possible to materialize increases in oil prices. It is easy to see the magnitude of the various oil spills. Thus, the first shock of 1973 is unequaled in amplitude to the others, and the rise in 2008 was not as significant as one would think. This is in fact verified to the extent that it was not a one-time increase, like the previous ones, but rather a constant increase that led to this peak. The third representation alludes to interannual variations in oil prices.

a. Stationarity test

We use here the ADF test or KPSS to our variables:
$LnCPI_t$, $GDPDR_t$, ΔOP_t^+, OP_t and $NIOP_t$
with ΔOP_t^+ = Increase of oil prices
GDPGR= GDP grow rate
NIOP= Net increase in oil prices

Table 2: ADF test on the LnCPI series

Hypothesis H0:$LnCPI_t$ has a unit root Number of delays (according to the Akaike criterion) retained: 2, for a maximum of 5		
ADF test	**t-statistic**	**Critical probability**
Model[3]	-0.98	0.94
Model[2]	-3.96	0.00
Model[1]	2.15	0.99

Source: authors from Eviews 10 results

The third model indicates that the $LnCPI_t$ process is DS because the associated critical probability (94%) is well above 5%. This means in fact that the trend is not significant and that this process affected by a trend is not stationary: We cannot admit the existence of this series. The first model indicates that the series without trend and without drift is not stationary because the critical probability is greater than 5%. But it is the opposite for the second. Indeed, there is a doubt on the stationary character or not of this series. In order to decide, we perform the KPSS test.

Table 3: KPSS on the LnCPI

Hypothesis H0:$LnCPI_t$ has a unit root truncation l= 5		
PP test	**LM statistic**	**Critical value at 5%**
Model[3]	0.21	0.15
Model[2]	0.81	0.46

Source: authors from Eviews 10 results

The LM statistics being in all superior to the critical values at the scull of 5%, we conclude that the LnCPI series has a unit root. She is therefore not a staff member. In order to make it stationary, we carry out a filtering in first differences (DLnCPI) of which we test the stationarity. The results indicate that the series is stationary.

Table 4: ADF test on GDPGR

Hypothesis H0: **GDPGR** has a unit root Number of delays (according to the Akaike criterion) retained: 2, for a maximum of 5		
ADF test	**t-statistic**	**Critical probability**
Model [3]	-1.93	0.62
Model [2]	-1.87	0.34
Model [1]	-1.27	0.18

Source: authors from Eviews 10 results

All the critical probabilities being greater than 5%, we conclude that this series has a unit root. The application of a filter in first differences ($GDPDR_t$) allows to make it stationary.

Table 5: Test on DOP_plus

Hypothesis H0:OP_t^+ has a unit root Number of delays (according to the Akaike criterion) retained: 4, for a maximum of 5		
PP test	**t-statistic**	**Critical value at 5%**
Model [3]	-2.65	0.26
Model [2]	-2.89	0.06
Model [1]	-2.28	0.02

Source: authors from Eviews 10 results

The table indicates that this series is non-stationary for models three and two. The KPSS test will enable us to decide definitively.

Table 6: Test KPSS on DOP_plus

Hypothesis H0:OP_t^+ has a unit root truncation l= 7		
PP test	**t-statistic**	**Critical value at 5%**
Model [3]	0.09	0.15
Model [2]	0.11	0.46

Source: author from Eviews 10 results

The LM statistic being all lower than their critical value, we reject H0. The series is stationary in level.

Table 7: ADF test on DOP

Hypothesis H0:ΔOP_t has a unit root Number of delays (according to the Akaike criterion) = 5		
ADF test	**t-statistic**	**Critical probability**
Model [3]	-6.98	0.0000
Model [2]	-7.04	0.0000
Model [1]	-7	0.0000

Source: author from Eviews 10 results

Since the critical probabilities are all null, we conclude that the series is stationary.

Table 8: ADF test on NIOP

Hypothesis H0:ΔCPI_t has a unit root Number of delays (according to the Akaike criterion) = 5		
ADF test	**t-statistic**	**Critical probability**
Model [3]	-3.36	0.07
Model [2]	-3.76	0.00
Model [1]	-3.06	0.00

Source: authors from Eviews 10 results

The test shows that the series is stationary for the first two models but not for the third. Then, we perform the KPSS test to conclude.

Table 9: KPSS on NIOP

Hypothesis H0:$NIOP_t$ has a unit root truncation l= 7		
PP test	**t-statistic**	**Critical value at 5%**
Model [3]	0.10	0.15
Model [2]	0.16	0.46

Source: authors from Eviews 10 results

The critical values being lower than the associated LM statistics, we conclude that the series are stationary.Our series being stationary (in level on the substitution variables and in differences first on $LnCPI_t$ and $GDPDR_t$) we can therefore move on the next steps.

b. Determination of the number of delays

We determine the optimal number of lags for p ranging from I to 3, according to the AIC and SC criteria. We will retain the one which minimizes these criteria.

Table 10: Determination of the optimal delay number from the AIC and SC criteria

Delays	**AIC**	**SC**
P=1	1.16	2.38
P=2	1.43	3.70
P=3	2.31	5.65
Decision	P=1	

Source: author from Eviews 10 results

According to the results of this table, we agree that we can estimate a VAR (1) because it minimizes the AIC and SC criteria.

c. shock analysis: decomposition of the error variable

This technique requires classifying the variables according to a very precise order which requires going from the most exogenous variable to the most endogenous. This is the order of Cholesky. So, we decided to classify them by admitting that oil prices are the most exogenous. Our order is: $NIOP_t$ - ΔOP_t - ΔOP_t^+ - $GDPDR_t$ - $LnCPI_t$.

Table 11: Decomposition of the error variable

	$DGDPGR_t$ Variance decomposition				
Period	$DGDPGR_t$	$LnCPI_t$	ΔOP_t^+	ΔOP_t	$NIOP_t$
10	85.69	0.17	3.72	9.46	0.96
	$LnCPI_t$ Variance decomposition				
Period	$DGDPGR_t$	$LnCPI_t$	ΔOP_t^+	ΔOP_t	$NIOP_t$
10	6.28	81.07	2.77	1.3	8.58
	ΔOP_t^+ Variance decomposition				
Period	$DGDPGR_t$	$LnCPI_t$	ΔOP_t^+	ΔOP_t	$NIOP_t$
10	1.06	0.03	15.04	6.26	77.62
	ΔOP_t Variance decomposition				
Period	$DGDPGR_t$	$LnCPI_t$	ΔOP_t^+	ΔOP_t	$NIOP_t$
10	0.05	0.35	6.95	40.71	51.94

	$NIOP_t$ Variance decomposition				
Period	$DGDPGR_t$	$LnCPI_t$	ΔOP_t^+	ΔOP_t	$NIOP_t$
10	1.13	0.09	5.27	10.14	83.37

Source: author from Eviews 10 results

The table above presents the variance decomposition of the forecast error on each of our variables after 10 years. We can see that the variance decomposition of $GDPDR_t$ is due to 85.69% to its own innovations and to 3.72%; 9.46% and 0.96% to the innovations of ΔOP_t^+,$\Delta OP_t$and $NIOP_t$ respectively. The own innovations of ΔOP_t^+, ΔOP_t and $NIOP_t$ are respectively 15.04%; 40.71% and 83.37%. They are due in the same order at 1.06%; 0.05% and 1.13% on $GDPDR_t$. It then emerges that a chock on the variations interannual and oil price increases has more effect on the growth rate than the opposite, but a shock on net oil price increases is almost inconsequential on economic growth. This finding indeed confirms the results of the impulse response functions that we have found. The results for inflation also confirm the impulse response functions. Thus, we were able to observe that a shock on interannual variations and increases in the price of oil was very weak on inflation, but that the latter was significant on net increases.

d. Granger causality test

This test is based on the null hypothesis of non-causality. The following table summarizes the results of the test on $GDPDR_t$ and ΔOP_t^+.

Table 12: Granger causality test between DGDPGR and DOP_ plus series

	Fisher statistic	**Critical probability**
$DGDPGR_t$ does not cause in the sense of Granger ΔOP_t^+	0.06	0.81
ΔOP_t^+ does not cause in the sense of Granger $DGDPGR_t$	0.11	0.74

Source: author from Eviews 10 results

Unfortunately, we realize that the null hypothesis of non-causality is accepted in both cases. Because the critical probabilities are all greater than 5%. Therefore, a causal link cannot be established between oil price increases and economic growth. We note that this result is the same for all the other variables. It then emerges that the proxies for the price of oil do not cause either the GDP or the CPI in the Granger sense. However, these results which seem very alarming were also those found by Benabdallah and al in 2005 for several African economies (precisely 22 including Cameroon) except Gabon and Madagascar.

e. Results interpretation

Although no result is negligible, we will dwell here on the results of the impulse response functions which largely constitute the objective of our study. Indeed, they allowed us to measure the impact of an oil shock on macroeconomic indicators. It turns out that the effect of these shocks is different depending on the variables used.

Thus, the increases in oil prices have a more destabilizing effect on Cameroon's economic growth than any other. A random change in the price of a barrel translates into a drop in economic growth of 4.17%. Nevertheless, it generates a slight drop in inflation of 0.43% in the second year. This result can be explained by the fact that a sharp rise in the price of oil is likely to lower the purchasing power of net oil importing countries, which has the effect of degrading total trade with Cameroon. This therefore creates a drop in GDP because there is a drop in exports.

Interannual variations in oil prices are favorable to economic growth. Indeed, a shock on these translates into a 4.32% increase in the growth rate and a 0.43% drop in inflation, this result is explained by the fact that these variations do not only materialize increases but also decreases. So, it appears that Cameroon is a winner when oil price increases are quite volatile over time. That said, when an increase is not spread over several periods, Cameroon benefits from it.

The net increases in oil prices over two years have almost no effect on economic growth but contribute to a 1.1% rise in inflation. This can be explained by the fact that this increase firstly creates a drop in activity among partners who import oil but produce tradable goods. Finding themselves in a situation where production is more expensive, they increase the selling price of goods, which creates a second-round effect on Cameroon, which sees inflation increase. Also, this increase can also positively affect the price of fuel at the pump, which generates inflation.

2. Analysis of the VECM model

As we have already pointed out, this model will allow us to know if there is a relation long-term stability between the price of oil and our macroeconomic indicators. The variables used to do this are: the logarithm of GDP ($LnGDP_t$), the logarithm of the real price of oil ($LnOP_t$) and the logarithm of the CPI ($LnCPI_t$).

a. Stationarity tests on series

The first step of this modeling consists in ensuring that our variables are non-stationary. For this, we apply the unit root tests to each of them in difference first ($DLnOP_t$, $DLnCPI_t$ and $DLnGDP_t$).

Table 13: Unit root test on series

Test	ADF		
Series	$DLnCPI_t$	$DLnOP_t$	$DLnGDP_t$
I(d)	I (0)	I (0)	I (0)

Source: author from Eviews 10 results

The results of these tests indicate that all these series are stationary. Therefore, we will say that our level series are I (1) and therefore not stationary: There is then a cointegration risk. You can move on to the next steps.

b. Determination of the number of lags p of the VAR model

Through VAR modeling applied to our non-stationary series here, we determine the optimal number of lags according to the AIC and SC criteria. The following table gives the results:

Table 14: Determination of the optimal delay number by the AIC and SC criteria

Delays	**AIC**	**SC**
P=1	-5.74	5.25
P=2	5.51	4.65
P=3	5.33	4.09
Decision	P=1	

Source: author from Eviews 10 results

c. Test of Johansen

In order to carry out the test of the trace, we retain the following specification: Presence of a linear tendency in the series and a constant in the relations of cointegration. The choice of this specification is justified by the fact that a visual examination of the graphs of our series leads us to believe that the GDP and the CPI are affected by a linear trend. The result is the following:

Table 15: trace test

Hypothesized number of cointegrated equation(s)	Eigenvalue	Trace statistics	5% Critical value	Prob.**
None*	0.406072	37.75229	29.79707	0.0049
At most 1	0.237131	15.34939	15.49471	0.0526
At most 2	0.082675	3.710601	3.841466	0.0541

Source: author from Eviews 10 results

We see that the first statistic of the trace (37.75) is greater than the first critical value (29.8) at the 5% threshold. We then reject the null hypothesis and conclude that there is cointegration between our series. The last two statistics are lower than the associated critical values: The null hypothesis of non-cointegration is accepted. This means that there is exactly a long-term relationship between our series. We can then estimate our model VECM.

d. Estimation of the VECM (1) model

We estimate here the VECM (1) with trend in the series and constant in the cointegration relation. The results are as follows:

$$\Delta LnGDP_t = \underset{(-4.29)}{-0.21}(LnGDP_{t-1} \underset{(-5.96)}{-0.27} LnCPI_{t-1} \underset{(-6.32)}{-0.36} LnOP_{t-1} - 24.75) + \underset{(0.62)}{0.09}\Delta LnGDP_{t-1} + \underset{(0.08)}{0.01}\Delta LnCPI_{t-1} \underset{(-1.34)}{-0.03} LnOP_{t-1} + \underset{(3.2)}{0.03} \quad (2)$$

$$\Delta LnGDP_t = \underset{(-3.01)}{-0.19}(LnGDP_{t-1} \underset{(-5.96)}{-0.27} LnCPI_{t-1} \underset{(-6.32)}{-0.36} LnOP_{t-1} - 24.75) \quad (3)$$
$$\underset{(-1.07)}{-0.19}\Delta LnGDP_{t-1} + \underset{(1.22)}{0.01}\Delta LnCPI_{t-1} \underset{(-1.6)}{-0.03} LnOP_{t-1} + \underset{(4.25)}{0.06}$$

Values in parentheses are Student (t) statistics.

When $|t| > t_{42}^{0.025} \approx 1.96$ we reject the null hypothesis of the nullity of coefficients.

These results call for several comments:

- The restoring forces towards the long-term equilibrium have the expected sign (negative) and are significant for these two equations (but that of the third one not being significant, we agree to don't present it);
- The coefficients of the long-term relationship are significant. Therefore, there is a stable relationship between our variables in the long run.
- The biggest limitation of this estimate is that almost all of the short-term coefficients are not significant. Only constants are significant. But this does not call into question the overall validity of the model.

These observations having been made; we can now move on to the last stage which is the

model validation.

e. Validation of the VECM (1) model

-First equation: Q(15)=17.08 (α=0.31) →We accept H0;(4)

-Second equation: Q(15)=10.82 (α=0.77) →We accept HO;(5)

-Third equation : Q(15)=12.41 (α=0.65) → We accept H0.(6)

The Q statistics all have critical probabilities (0.31; 0.77; 0.65) respectively for the first, second and third model) greater than 5%. We accept the null hypothesis and we deduce that the three residuals resulting from each equation are white noises. The VECM (1) specification is therefore validated. In the end, we will say that there is indeed a stable relationship between the price of oil and the indicators used.

V.CONCLUSION

Oil is a very important natural resource for the whole planet. Used mainly for the movement of people and goods, it also intervenes in several production processes as an intermediate good. As a result, the economies of the world are not insensitive to changes in its price. It then emerges that in general, large increases in the latter can be unfavorable to the economic activity of a country and even the rest of the world.

Along the same lines as other studies carried out on behalf of various countries, this study aimed to assess the consequences of the rise in world oil prices on Cameroon's macroeconomic indicators.

Thus, we first approached the place occupied by oil in the economic literature. We presented oil as a non-renewable natural resource and as an economic good. Subsequently, we mentioned the concept of "oil shock", which is in fact a sudden rise in the price of a barrel with unfavorable consequences for the economies, as we have been able to observe during the 1970s. this chapter ended with a review of the theoretical and empirical literature based on the one hand on the plausible explanations of the perverse effects of increases in the price of crude oil n, and on the other hand on the measurements of these effects. It then emerged that the sharp rise in the price of "crude" constituted a real threat to most economies, whether American, European or African.

Secondly, the relationship between the international price of oil and the economic activity of Cameroon was presented. This price, varying according to quality and origin, is established on several types of market and its volatility depends on several types of factors. We were able to realize that Cameroon, although less dependent on oil revenues like some countries, is still vulnerable to increases in the price of crude oil. Indeed, the sharp rise in 2008 was particularly unfavorable to it to the point to be the precursor of popular demonstrations. Thus, in order to limit these harmful effects, the Cameroonian government has resolved to subsidize the price of hydrocarbons at the pump. But it turns out that these subsidies are in fact poorly targeted and the expected effects do not follow, due to their decline in 2014 and also in 2021

Finally, we analysed the results from the EVIEWS 10 software. Thus, VAR modeling allowed us, through impulse response functions, to assess the impact of oil shocks on the growth rate and inflation. random shock on oil price increases

is unfavorable to the growth rate but not to inflation. 43% at the end of the following year. However, a shock on the interannual variations in the price of oil proves on the contrary to be beneficial for the growth rate which increases by 4.32%, and for inflation which drops by 0.43%, As for the impact on the net increases in the price of oil, they have no effect on the growth rate but remain unfavorable to inflation, which is growing by 1.1%. VECM modeling that there is indeed a stable long-term relationship between the price of oil and the macroeconomic indicators used.

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