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Petroleum Products Price Fluctuations and Economic Growth in Cameroon

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Abstract

Commodity exports have over the years been the main source of foreign exchange earnings to most developing countries. This is especially the case with crude oil producing countries such as Cameroon since the discovery of oil in the late 1970s. However, as evident in the economic crises era of the mid 1980s, this exposes the commodity dependent country to heavy external shocks such as price fluctuations which affect the level of growth of the country. It is in this light that this study was conducted to examine the effect of petroleum products (crude oil) price fluctuations on the economic growth of Cameroon. Secondary data from1980 to 2013 were used to estimate the coefficients of the ordinary least square technique used to analyse the dependency between the dependent and independent variables of the phenomenon. The results obtained reveal that petroleum product prices have a positive significant effect on the economic growth of Cameroon, while the volume of trade to GDP (openness) and real interest rate have a negative significant effect on the economic growth of the country. Human factors (demand and supply imbalances, and interest rates) and natural factors (geographical location and resource endowment) are the principal causes of variations in the prices of petroleum products among different regions. From these, it is suggested that for Cameroon to benefit from the global trade process by opening up to the rest of the world, the revenue generated from crude oil exploitation should be re-directed towards investment in both human and physical capital so as to enhance the productive capacity of the nation, especially in the manufacturing and transport sectors.

Keywords: Petroleum products, Economic growth, Trade openness, GDP, Price fluctuations, External shocks, Resources.

Contents

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1. Introduction

The role crude oil plays today in the global economy cannot be underestimated. In the early days, finding oil during a drill was considered less important since the intended treasures were normally water or salt. It was only in 1857 that the first commercial oil well was drilled in Romania (Painter, 1986). Two years later, following the Romanian invention, was the creation of the US petroleum industry. The early demands for oil were for kerosene and oil lamps until 1901 when the first commercial well capable of mass production was drilled in south eastern Texas. According to Painter (1986) the invention of the internal combustion engine mainly influenced the importance of oil. Hethaway (2009) noted that the importance of oil has risen to the extent that a sudden situation of a world without oil may halt economic transactions on a more than local basis and lead to the collapse of the world economy. Crude oil is one of the few production inputs that can positively and negatively affect economic growth (Aarón and Sherzod, 2009). Oil price volatility dampens growth through different channels, from an increase in production cost to inflation expectations.

In recent times, crude oil prices are not just rising, but the volatility is also worsening; fluctuations are more pronounced than they were in the 1990s, creating unpredictable consequences. However, according to Aarón and Sherzod (2009) the Organization of Petroleum Exporting Countries (OPEC's)'s production capacity in the 2000's was not enough to satisfy the world demand. As a result, the price of oil skyrocketed from $11 a barrel in 1999 to all time high in history of $147 a barrel in August 2008. Thus, Hamilton and Herrera (2004) assert that inexpensive oil is crucial for the world's demand for energy but its availability is scarce, therefore volatility in supply will have substantial economic impact. According to the EIA (Energy Information Administration) (2006) Global economic performance re- mains highly correlated with oil prices. Overall, an oil-price increase leads to a transfer of wealth from importing to exporting countries through a shift in the terms of trade. The magnitude of the direct effect of a given price increase depends on the share of the cost of oil in national income, the degree of dependence on imported oil and the ability of end-users to reduce their consumption and switch away from oil (EIA, 2006).

The oil-gross domestic product (GDP) relationship became a popular research topic in the 1980s. Hamilton (1982) found a negative correlation between oil prices and GDP growth, which proved that recessions in the United States (U.S) economy were greatly influenced by the oil shock during the sample period. The empirical evidence from a growing body of academic literature and reports from government institutions clearly suggest that oil price increases dull macroeconomic growth by increasing inflation and unemployment and depressing the value of financial and other assets, at least in oil importing nations (Awerbuch and Sauter, 2003).

For most developing countries, oil accounts for a large proportion of GDP expenditures in energy production. According to the EIA (2006) oil accounted for 40% of the global energy needed in the year 2000. Significant increases in energy prices will lead to a considerable rise in production and transportation cost for many industries and hence drives wages and inflation upwards, which at the same time will dampen economic growth (O'Neill *et al*., 2008). Increases and decreases in oil prices have different effects on economic activities. The IMF (2008) estimates indicate that highly-indebted oil-intensive and fragile sub-Saharan African countries would suffer the most from higher oil prices. Based on these estimates, IEA (International Energy Agency) (2004) explains that they would lose more than 3% of their GDP following a $5 increase in the price of crude oil.

The impact of higher oil prices on economic growth in OPEC countries would depend on a variety of factors, particularly how the windfall revenues are spent. In the long term, however, OPEC oil revenues and GDP are likely to be lower, as higher prices would not compensate fully for lower production. The adverse economic impact of higher oil prices on oil-importing developing countries is generally even more severe than for the Organisation for Economic Cooperation and Development (OECD) countries. This is because their economies are more dependent on imported oil and more energy-intensive, and because energy is used less efficiently. On average, oil-importing developing countries use more than twice as much oil to produce a unit of economic output as do OECD countries. Developing countries are also less able to bear the financial turmoil wrought by higher oil-import costs. India spent $15 billion, equivalent to 3% of its GDP on oil imports in 2003. This is 16% higher than its 2001 oil-import bill. It is estimated that the loss of GDP averages 0.8% in Asia and 1.6% in very poor highly indebted countries in the year following a $10 oil-price increase (IEA, 2004). An increase in oil prices has a negative effect on oil-importing countries making their input costs greater. Meanwhile, it is commonly thought that oil prices will benefit oil exporters through improved terms of trade, at least in the short run. However, if we take into account the decrease in world GDP induced by higher oil prices and the competitiveness (production costs) of non- oil sectors in oil-exporting countries, higher oil prices may eventually lower incomes in all developing countries. It is estimated that, in terms of real GDP, African countries may suffer up to a 3% loss from a doubling of oil prices (Nicholas and Payne, 2009).Crude oil price shocks also have important distributional impacts within each country. This is because of the effects of petroleum products prices on employment and on food and transport prices. Evidence shows that recent energy price shocks have increased food insecurity and poverty levels in developing countries. Some population segments face a higher degree of vulnerability, including the poor, the landless and informal sector workers. Evidence from household surveys in several countries shows that oil price shocks tend to produce a stronger effect on poorer households, as a higher proportion of their income is spent on petroleum products (IEA, 2004).

Cameroon began oil exploitation in 1977, and in 1980 the state of Cameroon founded the National Hydrocarbons Corporation (SNH), which was tasked with managing its interests in the oil sector. Cameroonian authorities have also negotiated advantageous oil contracts. Indeed, the state in Cameroon controls 65% of oil production (Cosse, 2006). Following this discovery of oil, the country experienced significant economic growth, with an annual average of 9.4% during the crude oil boom between 1977 and 1986. This growth rate is the highest ever recorded in the country: In comparison, growth over the previous decade (1967–1976) averaged 3.1% annually (World Bank, 2008). However, this period of prosperity came to an abrupt halt at the end of the 1980s. The period of bust coincided with a drop in oil prices and the beginning of a decline in Cameroon's crude oil production. As a consequence, the country experienced an economic crisis. The average growth of 2.3% in the crisis period of 1987–1996 remains the lowest

recorded in the country during these decades since independence. Since the end of the 1990s, the country has regained positive growth, estimated at 4% during the period of 1997–2006 (World Bank, 2008).

However, during the boom period Cameroon was viewed as a good example of how to manage oil resources (Devarajan and De, 1987; World Bank, 1987; Cuddington, 1989). For example, Devarajan and De (1987) thought Cameroon had managed to avoid Dutch disease. The World Bank (1987) also found that, because it transferred oil revenue to farmers, Cameroon's government maintained continuity of production in the agricultural sector, which is the main pillar of Cameroon's economy. The slump in the country's economy in the late 1980s, however, changed opinions about the macro-impacts of oil resources in Cameroon. Under the scenario, scholars suggested that Cameroon at the time of the oil boom had in fact suffered from Dutch disease, and mismanagement of oil revenue was responsible for the collapse of Cameroon's growth, mainly as a result of the destruction of the non-oil sector (the Dutch disease effect) and the destruction of the institutional environment (Benjamin *et al.*, 1989; World Bank, 2006).

Since the discovery of oil and exploitation of petroleum products, there has been a consistent fluctuation in their prices. The petroleum products price increase in the 1980s and between 2007- 2008 led to a drastic drop in the growth rates of many economies. This is because oil price fluctuations affect all countries, either directly or indirectly. Most European countries including OECD economies have equally been affected by rising petroleum products prices due to an estimated loss of 0.4% of GDP in the first and second years of higher prices, following a 10% rise in prices (IEA, 2004). Growth rates in the USA also witnessed a drop in GDP of about 0.3%, due to a 10% rise in petroleum products prices (IEA, 2004). In sub-Saharan Africa as in most developing economies, the growth rate seems to be greatly affected by the increase in petroleum products prices. Cameroon being a developing economy has equally been affected by fluctuations in the prices of petroleum products over the years. Nevertheless, Cameroon being an oil producer is highly dependent on oil exports, making the country vulnerable to swings in oil prices and production. Receipts from oil exports are the country's predominant source for foreign exchange earnings, as well as a substantial source of its revenue. On average, between 2000 and 2010, oil accounted for 46% of total exported goods and accounted for 30% of total government revenue. Cameroon has over the years witnessed fluctuations in growth following varying prices of petroleum products. Increased petroleum products prices have thus led to increased input prices leading to high production cost and consequently high rates of unemployment. Also, household spending on petroleum products has increased leading to low household consumption of basic necessities, thus rising cost of living. In the early 1990s, a barrel of crude oil was trading for about $23, and in the last quarter of 1998, economic growth decreased and pushed down the demand for oil and therefore reduced oil price to $20 per barrel. While the world economy continued its recovery in 2003 and through the year 2004 and 2005 GDP growth rates increasing in many regions, the world oil market was characterized by strong oil demand growth and the oil price increased from $27 to $35 per barrel. In the first quarter of 2005, the oil price increased to $50 per barrel approximately $15 per barrel higher than in the first quarter of 2004, and remained above this level for the rest of 2005 and 2006. Crude oil prices increased dramatically during 2007, with oil prices climbing from an average of nearly $55 per barrel in the first quarter of 2007 to over $95 per barrel in the last quarter of 2007. The decline in the value of the dollar against other currencies supports continued oil consumption growth in foreign countries because oil is traded globally in dollars, and a declining dollar has made the increase in oil prices less severe in foreign currencies. Furthermore, during the last quarter of 2008, there was a remarkable drop in oil price from highest $147 per barrel to about $45 a barrel in world markets, mainly due to global economic crisis and forecasts of very low demand for 2009.

The Cameroon government, like many national governments has reacted in varied ways to the oil price shocks, through the implementation of fiscal policy either to stimulate the economy or shield consumers from price increases, monetary policies and social policies. In 1994, following the World Bank and IMF sponsored adjustment programmes, the Cameroon government devalued the African financial community (CFA) franc and privatised most of the formerly state controlled enterprises, and employed other independent export bias policies in a bit to curb the economic crises of the late 1980s. Also, the Cameroon government has for the past decades been subsidising the hydrocarbon industry to a greater extent as a measure of curbing the adverse effects of rising oil prices. This subsidisation process has however hindered development in other sectors of the economy. However, following a drop in the global crude oil prices in 2014, the Cameroon government uplifted the fuel subsidies. This reduction in subsidies on petroleum products is expected to serve as a source of income for other profitable investment projects which are intended to boast economic growth in Cameroon. Nevertheless, despite the measures employed by the Cameroon government, the consequences of petroleum products price shocks are still been felt in the economy of Cameroon. This study intends to find answers to the following research questions: What are the causes of fluctuations in petroleum prices? To what extent do petroleum Products price fluctuations affect economic growth? Therefore, this study envisages identifying the causes of fluctuations in the prices of petroleum products, and examining the effects of petroleum products price fluctuation on economic growth in Cameroon. This is carried out under the null hypothesis that petroleum products price fluctuation does not have a significant effect on economic growth. This study is organised into five sections. Following the introduction in section one, section two looks at the conceptual, empirical and theoretical literatures, section three deals with the methodology, followed by the discussion of empirical results in section four, and finally the summary, policy recommendations and conclusion in section five.

2. Literature Review

To many authors, increased petroleum products prices tend to be more beneficial to net-exporting developing economies than the net-importing developing economies, while on the other hand, many researchers believe that net-exporting developing economies tend to lose more than the net-importing developing economies following a decrease in petroleum prices. There are equally great controversies among authors concerning the actual determinants of variations in petroleum prices. This section thus addresses some of these issues based on some theoretical considerations.

2.1. Conceptualisation of Economic Growth

Economic growth has been defined differently by different economists in different eras. McConnell and Bruce (1993) defined economic growth as either the increase in real GDP or real GNP per capita that occurs over time. According to them, growth lessens the burden of scarcity and provides increases in the domestic output which can be used to resolve domestic and international socioeconomic problems. Angaye (1995) defined economic growth as an increase in GNP, GDP, and net national product (NNP) of a country over a given period of time usually one year. However, Njimanted (2008) defines economic growth as a change in the per capita income of a country over foreseeable periods of time. It thus implies that economic growth could be positive or negative. Mathematically, economic growth can be calculated in terms of annual percentage rates of growth. That is, $EG = \frac{Yn - Yn-1}{Yn-1} X \frac{100}{1}$ Where, EG represents economic growth, Y_n and Y_{n-1} representing GDP during the current year and previous year respectively. GDP which is used as a proxy to measure economic growth can be defined as the market value of all final goods and services produced within the economy in a specific year (McConnell and Bruce, 1993).

Graphically, growth is shown as an outward shift of the production possibilities curve (PPC). This can be illustrated as follows:

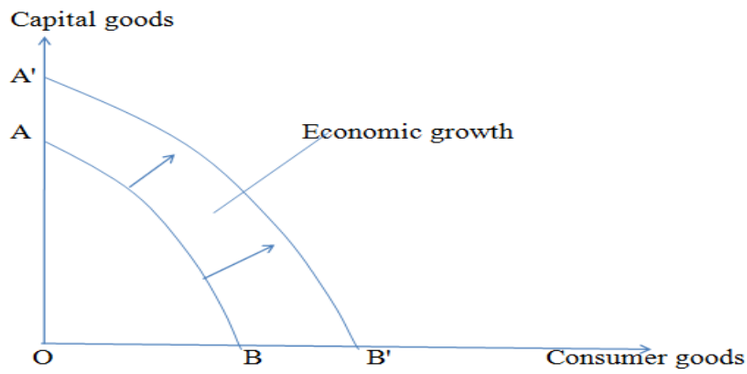

Figure-1. Economic growth and the PPC
Source: Computations by authors using STATA 12

Figure 1 indicates that economic growth is the outward shift of the PPC from AB to A'B'. This outward shift is accounted for by increases in supply, demand and allocative factors such as the quantity and quality of natural and human resources, the supply or stock of capital goods, technology, full employment as well as allocative efficiency.

2.2. Conceptualisation of Petroleum Price Fluctuations

Following the discovery and exploitation of petroleum products, there have been remarkable price fluctuations in the world market. It is evident that the real price of oil repeatedly has undergone large and persistent fluctuations that must have put stress on the global economy. Large sustained oil price increases occurred particularly in 1973-1974, in 1979-1980, in 1990, after 1999, between 2003 and mid-2008, and starting in 2009. Major sustained oil price declines occurred, for example, in the early and mid-1980s, in 1991, after the Asian financial crisis, and in late 2008 (Kilian and Hicks, 2009).

The price of about $20 per barrel in the last quarter of 1998 remains the lowest ever recorded while the price of about $147 per barrel in 2008 remains the highest (Omgba, 2011). Over the years, many researchers have shown interest in investigating the factors responsible for the variations in the prices of petroleum products. Even though many factors have been identified by different researchers to be responsible for these variations in petroleum prices, in this work, we focus on the main determinants which include natural factors (geographical location and resource endowment) as well as human factors (demand and supply, and interest rates).

2.2.1. Human Factors

Demand and supply factors: One of the most common explanations offered for the frequent variations in crude oil prices is the disequilibrium between global crude oil supply and demand. Hamilton (1988) opines that "large fluctuations in output can be generated by small disruptions in the supply of primary commodities such as energy". According to Kilian and Hicks (2009) the sharp oil price increase in 2007–2008 can be explained by the combination of increased demand and stagnant supply. The strength of economic growth in large emerging economies was to some extent unexpected and surprised the markets, leading to the 2008 crude oil price shock. These hypotheses also apply to the steep decline in oil prices that followed the 2008 peak, which is linked to a substantial and an unexpected decrease in demand following the global recession, and the decline in economic growth in China and other emerging countries (Kilian and Hicks, 2009; Smith, 2009). The relevance of changes in demand is thus particular to the 2007–2008 shock, as previous oil shocks were caused mainly by physical disruptions of oil supply (Hamilton, 2009; Kesicki, 2010).

Interest rates: Another explanation for the recent crude oil shocks stresses the role of macroeconomic factors, such as interest rates and the value of money. Analysing the period 1990–2007, Akram (2009) found that shocks in crude oil prices relate to decreases in interest rates and in the value of the US dollar. This is based on the assumption that prices in commodity markets (such as oil) tend to be efficient. A decline in the nominal interest rate would increase the attractiveness of investments in the crude oil market, comparing with the financial market, and then increase demand. At the same time, it would lower supply as it becomes less profitable to extract exhaustible resources and invest the proceeds in financial markets. As crude oil is mainly priced in US dollars, a depreciation of this currency leads to lower prices in other currencies, increasing demand and decreasing supply. These hypotheses are consistent with the results of Krichene (2008) who argues that there was no specific crude oil shocks in the period

2003–2007, but instead a simultaneous increase in all commodities prices, including crude oil. This is linked to an expansionary monetary policy in key developed countries and the depreciation of the US dollar.

2.2.2. Natural Factors

Natural factors such as geographical location and resource endowment tend to greatly influence the prices of petroleum products the world over. In Cameroon for example, petroleum products are charged differently in different regions. This disparity in price within the same country can be accounted for by the variation in distance between the different regions and the oil refinery (SONARA). Distance therefore increases the cost of transportation of petroleum products from the refinery to the different markets. In order to compensate for the increased cost of transportation, prices are bound to be raised in function of distance. Furthermore, crude oil rich countries tend to enjoy low prices of petroleum products than counties which rely on oil imports.

2.3. Empirical Literature

Hamilton (1983) in a study titled 'oil and the macro economy since World War II', found a negative relationship between crude oil prices and real output. However, a robust link between the crude oil crisis of the 1970s and the US recession was reported. Mork (1989) confirms Hamilton (1983) results by finding a strong negative correlation between crude oil price increases and growth. The relation based on oil price increases persist in a sample extended beyond the 1985–1986 crude oil price decline. Hooker (1996) demonstrated that neither Hamilton (1983) nor Mork (1989) linear relation between crude oil prices and output is consistent with observed economic performance between 1986– 1996. Hooker (1996) thus found an unstable relationship over time between oil prices and GDP growth. However, Hamilton (1996) stated that "Hooker (1996) evidence is overwhelming and his conclusion is unassailable." Hamilton (1996) thus concluded that crude oil price changes are clearly an unreliable instrument for macroeconomic analysis of data subsequent to 1986.

Backus and Crucini (2000) carried out a study on crude oil prices and the terms of trade from multivariate analysis and demonstrated that crude oil shocks are a major force driving changes in international trade and have been attributed to the transfer of wealth between crude oil importers and oil exporters. Hamilton (1988) further asserts that large fluctuations in output can be generated by small disruptions in the supply of primary commodities such as energy. Hence the benefits of a price decline on crude oil price would be smaller than the damages caused by an increase of similar size.

In another study, Abeysinghe (2001) revealed that open economies experience both direct and indirect impacts of crude oil prices on GDP growth whose magnitude depends on whether the economy is a net crude oil importer or exporter. However the effects on output growth in small open economies were greater than in a large economy like the US. The study further asserts that "the actual working of a new shock depends on how it interacts with the consumer and investor confidence".

Cantore *et al.* (2012) carried out a study titled 'Energy prices, sweet and sour consequences for developing countries' and employed the Computable General Equilibrium (CGE) model. They analysed policy responses to crude oil shocks in three African countries; Nigeria, Malawi and Ghana. This study revealed that supply and demand factors, speculation and geopolitical concerns are the major determinants of energy prices. The authors assert that the consequences of energy price shocks are particularly negative for energy importers, as they may suffer losses because of the higher price of inputs, and that energy exporters may experience some gains and budget revenue increases but also suffer inflation. In the case of Nigeria, the authors found that crude oil price increases can harm countries with abundant oil but low refinery capacity. In such cases, an increase in crude oil prices will lead to fuel price stabilisation policies such as fossil fuel subsidies, which affect the national budget negatively and generate adverse environmental effects. Countries with crude oil reserves like Ghana may suffer 'Dutch disease', which may reduce long-term growth by making the national currency stronger and diverting resources from other exportable production to national consumption. Yet in Malawi, physical fuel scarcity generated by a lack of foreign reserves has been exacerbated by economic scarcity deriving from fuel price increases. Furthermore, their analysis revealed that even though African countries are particularly vulnerable to energy price shocks, some countries may capture welfare benefits from improved terms of trade. As a consequence of an crude oil price doubling, almost all African countries will experience a reduction in real GDP because of higher input costs to the economy and lower crude oil demand (as world GDP decreases as well), which could hamper growth of energy exporters in the medium term. The study concludes that, in terms of real GDP, African countries may suffer up to a 3% loss from a doubling of oil prices.

Aarón and Sherzod (2009) examines the relationship between natural resource abundance and economic growth in Cameroon, using time series data from 1980 to 2013. Using the Generalized Method of Moments (GMM) technique, they found that natural resource rents have a negative correlation with Cameroon's GDP. Their findings revealed that the natural resource curse hypothesis holds true in the Cameroon context. However, these results are contrary to the findings of Adu (2011) that reject the natural resource curse hypothesis in a study carried out in Ghana using the Phillips-Hansen Fully Modified Least Squares estimator with time series data from 1962 to 2008.

World Bank (2006) in a study of Cameroon's sources of growth, points out that Cameroon experienced intensive resource-based growth instead of productivity-based growth. Furthermore, before crude oil production (1960–1976), Cameroon's growth was based on the agricultural sector. During this pre-boom period, agriculture (mainly coffee and cocoa production) accounted for 34% of GDP and represented 20% of exports. The study further reveals that the discovery of crude oil, and the boom that followed, dramatically changed the position of agriculture in Cameroon's economy, and that the crude oil boom led to an increase in domestic prices that hampered non- crude oil exports, including most agricultural exports. The agricultural sector experienced 2% average annual growth during the period 1979–1985, which is half the rate during the period 1970–1978.

Aarón and Sherzod (2009) looked at the effects of oil price fluctuations on the GDP growth of Sweden and USA, and found that an increase or decrease in crude oil price seems to have a negative impact on the Swedish real GDP,

while a price decrease in the commodity has a positive but insignificant effect on US economy. Furthermore, they assert that growth is explained to a lesser extent by crude oil price volatility due to government attention on energy efficiency in the economy and the development of alternative energy sources and fuels. These findings for Sweden are however in conformity with studies carried out by O'Neill *et al.* (2008).

Villafuerte and Lopez-Murphy (2010) in a study titled 'fiscal Policy in crude oil-producing countries during the recent oil price cycle', found that, in a group of net crude oil-exporting countries, government revenue and expenditure increased in 2003–2008 and decreased when crude oil prices started declining in 2009. On average, government budgets in these countries improved significantly in the first period. However, low-income countries continued to run deficits. This result is not explained by different degrees of crude oil revenue dependency, but by differences in expenditure patterns, with low-income countries responding to crude oil price increases by increasing expenditure as a percentage of non-crude oil GDP. These trends were reversed during the 2009 downturn, with government budgets generally deteriorating, but much less dramatically in low-income countries. Fiscal policy has therefore been pro-cyclical, intensifying the fluctuations in economic activity brought about by changes in oil prices. Furthermore, the degree of pro-cyclicality is related negatively to countries' income levels. Pro-cyclicality also seems to be a feature of net crude oil-exporting countries' economies when analyzing longer periods of time, as confirmed by Sturm *et al.* (2009).

2.4. Theoretical Literature

Researchers in the field of crude oil like George (1994); Aarón and Sherzod (2009) draw inspiration from the real business cycles (RBC) theory. Business cycles refer to the recurrent ups and downs in the level of economic activity which extend over several years (McConnell and Bruce, 1993). Individual business cycles vary substantially in duration and intensity. Yet all display common phases which are variously labelled by different authors. The four phases of the business cycle commonly distinguished by economists include peak, recession, trough and recovery. The RBC theory sustains that business cycle fluctuations to a large extent are subject to real shocks which affect market dynamics (Aarón and Sherzod, 2009). Previous research found that many cyclical events cannot be explained by a model driven by technology shocks only. This led to models where additional disturbances are included such as periods of bad weather, natural disasters, crude oil shocks, stricter environmental and safety policies, among others (George, 1994). To George (1994) RBC models can be classified by differentiating the strongest impulses driving the cycle to understand whether they arise from a demand shock or a supply shock in the economy. RBC theory principally holds that if an external shock occurs that directly changes the effectiveness of capital and/or labour, and this will have an effect on workers and the firms' decisions which in turn change their consumption and production patterns and thus eventually affect output negatively.

Prescott and Kidland (1982)'s RBC model showed that the neoclassical growth model is capable of replicating many of the features of modern business cycles. Unlike other leading business cycle theories, RBC theory sees business cycle fluctuations as the efficient response to exogenous changes in the real economic environment, that is, the level of national output necessarily maximises expected utility, and government should therefore concentrate on long-run structural policy changes and not intervene through discretionary fiscal or monetary policy designed to actively overcome economic short-term fluctuations.

According to RBC theory, business cycles are therefore "real" in that they do not represent a failure of markets to clear but rather reflect the most efficient possible operation of the economy, given the structure of the economy. RBC theory categorically rejects Keynesian Economics and the real effectiveness of monetary policy as promoted by monetarism and New Keynesian Economics, which are the pillars of mainstream macroeconomic policy. RBC theory in this way differs from other theories of business cycle such as Keynesian Economics and monetarism. Over the years, RBC model of Prescott and Kidland (1982) has been manipulated by different authors including different variables targeting several directions.

However, the extension by Kim and Loungani (1992) considers in particular the role of energy price shocks as well as productivity shocks or supply constraints in analysing business cycles. This model serves as reference to establish the macroeconomic model which will be used in our study. Furthermore, given the fact that RBC theory explains fluctuations in real GDP as a result of external shocks, and Cameroon being an exporter of petroleum products whose prices are exogenously determined, it is therefore a good base for our model since the study is out to examine the effects of petroleum products price fluctuations on the economic growth of Cameroon.

3. Methodology

This study is limited to the effects of fluctuations in the prices of petroleum products on the economic growth of Cameroon. In this study, we try to incorporate variations in petroleum prices in the economic growth model. GDP is used as a proxy to measure economic growth. The present study covers a period of 34 years (1980 to 2013). This period is appropriate because it captures the period of crude oil discovery and exploitation in Cameroon during which the country experienced fluctuations in prices of petroleum. Also, the choice of this period is justified by the availability and reliability of major data to the researchers.

The ex-post facto research design is used in this study. This is because this study seeks to establish a relationship between Cameroon's economic growth by observing already existed variations in petroleum products prices. This research design is very appropriate for this study given the fact that petroleum products price fluctuations had already occurred prior to our study and that we cannot physically or ethically control or manipulate the independent variables.

The basis of our analysis is on time series data. The data used in this study was collected from secondary sources. Secondary data was preferred over primary data for this study because of the time scope, over which the study is carried out and also due to the large nature of the population size of the area of study. The data used for this study was thus obtained from official published documents, articles and web publications. However, the data

collected from these sources overlapped and a comparison and contrast of the various sourced data was combined to harmonise the entire data set.

A multivariate model was used in this study. This is because it allows us to estimate relations where two or more independent variables affect the dependent variable. We thus specify a multiple regression with five variables in our study as follows:

Real Gross Domestic Product is used as our dependent or endogenous or explained variable, which is used as a proxy to measure the economic growth of Cameroon. Modern theories of economic growth and development use GDP, GNP, real GDP, real GNP and other indexes to measure economic growth. It is thus on this basis that we use real GDP as a proxy to economic growth in Cameroon. Aarón and Sherzod (2009) used GDP as a measure of the US economic growth against the energy price variable as an explanatory variable for growth.

The first independent, or exogenous or explanatory variable for our study is petroleum price. Petroleum products have been an indicator for economic stability in modern times, much due to the world's high dependence on oil products. Furthermore, the price of petroleum is of critical importance to today's world economy, given that oil is the largest internationally traded good, both in volume and value terms. For these reasons, abrupt changes in the price of oil have wide-ranging implications for both oil producing and consuming countries. Thus, the prevailing view among economists is that there is a strong relationship between the growth rate of the world and crude oil-price changes. Petroleum products price is however a measure of the spot price of a barrel of oil at the world market. In our model, we consider the yearly average price per barrel expressed in US dollars.

Trade openness which is a measure of economic policies that restrict or invite trade between countries is our second explanatory variable. The absolute cost advantage theory stipulates that countries should specialize and trade in the goods in which they have an absolute advantage in their production. Given the fact that no country can operate as an island due to the scarcity or uneven distribution of resources, Cameroon is therefore oblige to involve in international trade with other countries in order to acquire what it cannot produce. However, Cameroon being a major oil exporter should open up its frontiers to international trade in order to benefit from trading with other nations. We therefore include openness in our model to verify its impact on Cameroon's GDP following Cameroon's involvement in international trade.

Real interest rate is our third explanatory variable. Interest rate is closely related to the money supply whose value is very vital for the smooth functioning of an economy. Interest rate is however the price at which money is demanded and supplied within an economy. It is thus obvious that variations in interest rates must partly affect Cameroon's GDP. Ayadi *et al*. (2000) in studying the effects of oil production shocks in Nigeria, uses interest rates as an explanatory variable for Nigeria's GDP. We thus incorporate the rate of interest into our model and examine how it influences Cameroon's GDP.

Our fourth explanatory variable is government expenditure. Villafuerte and Lopez-Murphy (2010) carried out a study on fiscal policy in oil-producing countries during the recent oil price cycle, and included government expenditure in his model. However, given the important role played by the Cameroon government in influencing economic activities in the country, it is thus important to include government expenditure in our model. The selection of government expenditure as an explanatory variable for our model is also due to the fact that government spending constitutes one of the major tools of fiscal policy commonly used by most governments to influence economic activities.

Gross domestic investment is our fifth explanatory variable. Investment plays an important role in determining economic growth. This is demonstrated by the importance played by investment in the Harrod-Domar model of economic growth. Investment is a more important determinant of aggregate demand in the short run, such that variations in it can produce magnified changes in aggregate demand and the level of employment (Ohale and Onyema, 2002). In identifying the effects of low/medium/high technological advances in the crude oil mining, petroleum and chemical and transportation sectors in terms of addressing the risks of crude oil price shocks, we are expected to use variables like GDP, investment, consumption, import and export, among a range of economic indices. It is thus on this basis that we include the investment variable in our model.

Following the analysis of the above variables, we thus incorporate them into our model which depicts a relationship between Cameroon GDP and the prices of petroleum products, openness, interest rates, government expenditure, and gross domestic investment. Hence, the general form of the function can be expressed as:

$$GDP = f(PP, OPEN, RIR, GOVEX, GDI)$$

The functional form of the above relationship can be written as:

$$\log GDP = \beta_0 + \beta_1 \log PP + \beta_2 \log OPEN + \beta_3 RIR + \beta_4 \log GOVEX + \beta_5 \log GDI + \varepsilon$$

Where; β_0 is the constant term (the value of GDP if all independent variables are equal to zero).

β_1, β_2, β_3, β_4 and β_5, are the coefficients of PP, OPEN, RIR, GOVEX and GDI respectively. They show the percentages by which GDP (the dependent variable) will change given a 1% change in the respective independent variables, assuming other variables are held constant.

$\boldsymbol{\varepsilon}$ is the stochastic term or the error term. It is assumed to follow a normal distribution with expected value equal to zero that is, $E(\boldsymbol{\varepsilon}_i) = 0$ and a constant and finite variance, $Var(\boldsymbol{\varepsilon}_i) = \boldsymbol{\sigma}^2$, $\forall_i$. Of all the explanatory variables in our model, only petroleum price is of prime importance while the rest are control variables. The a priori theoretical expectations of the study are; $\beta_0>0$, $\beta_1>0$, $\beta_2>0$, $\beta_3<0$, $\beta_4>0$ and $\beta_5>0$.

The OLS technique was used in analyzing our model. This is because it possesses the best linear unbiased estimator (BLUE) property. Unbiased means that the estimated coefficients are a true representation of the population parameters and it is also said to have the minimum variance amongst all other estimators rendering it efficient.

Before analysing the model using the OLS, the stationarity test was carried out to ascertain the level of stationarity of the variables. In this regard, the Augmented Dickey-Fuller test was carried out to test whether our time series data was stationary (existence of unit root), and also to verify the level at which non stationary variables attain stationarity. Our results obtained were validated based on the economic, statistical and econometric tests. To ensure

the reliability if our results, we tested for multicollinearity using the variance inflation factor. Furthermore, the Breusch-Pargan test was used to verify for heteroscedasticity. Finally, Durbin Watson (DW) test was used to verify for autocorrelation.

4. Discussion of Results

Having tested for the stationarity of variables, we realised that all our variables were stationary after the first difference, except real interest rate which was stationary at levels (see Appendix 2) and as such to ensure the reliability and predictability using our result, the difference regression was run using the OLS technique.

From the OLS results obtained (see Appendix 1), the coefficient of petroleum price is positive (0.089464) which is in conformity with the economic a priori expectations, indicating that petroleum prices have a positive effect on the real GDP of Cameroon and as such an increase in petroleum price increases the real GDP of Cameroon. Hence, a 1% increase in petroleum price will lead to about 0.089 percent increase in GDP. Going by the t-statistics we observe that the t-calculated (2.27) is greater than the t-critical (2.052) implying the coefficient is statistically significant at 5% level of significance. The positive significant effect of petroleum prices on the economic growth of Cameroon is attributed to the fact that oil constitutes over 40 percent of Cameroon's GDP. Therefore, an increase in petroleum prices will lead to an increase in foreign exchange earnings which in turn serve as a source of government income which can be used to boast investment in other sectors of the economy. The increase in investment will thus lead to an increase in the gross domestic product of Cameroon and hence an increase in economic growth. This result is, however, in conformity with the works of Burbidge and Harrison (1984). On the other hand, the results are contrary to the works of Hamilton (1983) who concluded that there is a negative relationship between oil prices and real GDP. Furthermore, the results are contrary to the findings of Aarón and Sherzod (2009) who concluded that growth is explained to a lesser extent by oil price volatility, due to government attention on energy efficiency in the economy and the development of alternative energy sources.

The coefficient of openness is negative (-0.2067891) which is contrary to the economic a priori expectations. This implies that openness has a negative effect on the real GDP of Cameroon and as such the more the economy opens to the rest of the world for trade, its real GDP falls. Hence, a 1% increase in the volume of trade to GDP (openness) will result to about 0.206 percent decrease in the real GDP. To verify for the statistical significance it was realized that the t-calculated value (2.46) is greater than the t-critical value (2.052) at 5% level of significance. Thus, openness has a negative significant effect on the economic growth of Cameroon. The negative significant effect of openness on Cameroon's economic growth is due to the fact that Cameroon's exports are comprised mainly of primary products which fetch fewer amounts of foreign exchange earnings compared to expenditures on costly imported manufactured goods following an increase in trade volume (openness).

The coefficient of real interest rate is negative (-0.0009842) which conforms to our a priori expectations, thereby implying that real interest rate affects GDP negatively, thus an increase in the real interest rate will result to a decrease in real GDP. Hence, a unit increase in the real interest rate will lead to about 0.098 percent fall in real GDP. The t-statistics shows that the calculated t-value (1.86) is greater than the critical t-value (1.703) at the 10% level of significance. Therefore, real interest rate has a negative significant effect on the economic growth of Cameroon. The negative significant effect of real interest rates on the economic growth of Cameroon is accounted for by the fact that an increase in interest rate leads to an increase in the cost of borrowing which discourages investment and consequently a fall in output, thus a fall in economic growth.

Government final consumption expenditure is in conformity with our economic a priori expectations since its coefficient is positive (0.4514051) indicating the existence of a positive effect of government consumption expenditure on GDP. Thus an increase in government consumption expenditure will lead to an increase in real GDP. Therefore, an increase in government consumption expenditure by 1% will lead to about 0.451 percent increase in real GDP. Following the t-statistics, the calculated t-value (5.84) is greater than the critical t-value (2.771) at 1% level of significance. Thus there exists a significant positive effect of government consumption expenditure on the real GDP of Cameroon. The positive significant effect of government final consumption expenditure on Cameroon's economic growth is due to the fact that the Cameroon government plays a dominant rule in the country's economic life given the fact that even though Cameroon is a mixed economy, economic activity is dominated by the public sector.

The OLS results equally show that the coefficient of gross domestic investment (GDI) is 0.0920026 implying that GDI has a positive effect on the real GDP of Cameroon, thus an increase in GDI will lead to an increase in Cameroon's real GDP. Hence a 1% increase in GDI will result to about 0.092% increase in Cameroon's economic growth. The t-statistics reveal that the calculated t-value (1.52) is less than the critical t-value (1.703). Thus GDI has a positive but insignificant effect on the economic growth of Cameroon.

To verify for heteroscedasticity, the Breucsh-Pargan test was used to test the null hypothesis of constant variance. The results reveal that, the probability value of the chi square (0.1733) is statistically insignificant at 10% level of significance and as such, we fail to reject H_0 indicating that the variance is constant hence, homoskedasticity.

To verify for the presence of multicollinearity the variance inflation factor (VIF) was used. According to Gujarati (2004) if the mean VIF is greater than 2.5 or the variables with VIF of 10 and above are said to be correlated. Based on our results, the mean VIF of 2.36 is less than the 2.5 critical value indicating the absence of multicollinearity in model our.

To further verify for the goodness of fit that is to determine how much variation in the independent variable is accounted for by the variables specified in our model, the adjusted R-square was used. The coefficient of the adjusted R-square is 0.8774 implying about 87.74% changes in real GDP is accounted for by changes in the independent variables and 12.26% is accounted for by variables not specified in the model captured by the error term.

To verify for autocorrelation we made use of Durbin Watson (D-W) statistics. However given that we had made our variables stationary by taking the first difference and employing a difference regression the D-W statistics indicate the absence of autocorrelation at the 1% level of significance, since 1.747563 lies between d_U and 4-d_U (that

is, 1.59<1.75<2.41). Also, normality tests like mean median, standard deviation, kurtosis, and Jacque Bera were conducted (see appendix 3), which justify the normality of our variables.

Haven tested for multicollinearity, heteroscedaticity, and autocorrelation, the Fischer F-statistics was used to verify for the joint significance of the variables and the probability value of F-statistics is significant at 1% level of significance. This implies that despite the insignificant impact of gross domestic investment on GDP, all the variables put together significantly affect the growth rate of Cameroon. Our results can thus be used for policy recommendations.

5. Conclusion and Recommendations

Based on the objectives of our study which were to examine the effects of petroleum price fluctuations on Cameroon's economic growth, and to identify the causes of fluctuations in the prices of petroleum products, the study has revealed a number of results.

The OLS results reveal the existence of a positive relation between petroleum prices and government final consumption expenditure and Cameroon's real GDP, with β_1 and β_4 coefficients equal to 0.089464 and 0.4514051 respectively. On the other hand, the study found a negative relation between real GDP of Cameroon and openness and real interest rate with β_2 and β_3 coefficients equal to -0.2067891 and -0.0009842 respectively. As a result, an increase in trade volume (openness) with Cameroon relying on oil exports (primary products) which yield little foreign exchange earnings to the government, will contribute less to the country's GDP. Finally, the study equally found out that human factors (demand and supply imbalances, and interest rates) and natural factors (geographical location and resource endowment) are the major determinants of fluctuations in the prices of petroleum products.

On the basis of our findings, we therefore recommend that the Cameroon government should endeavour to develop the oil sector in order to take advantage of high prices. However, the development of the oil sector should be accompanied by the development of other sectors of the economy in order to avoid the "Dutch Disease" syndrome. More specifically, in order to cope with oil price crises, the Cameroon government should strengthen the refinery capacity of the country since it is highly endowed with oil deposits; intervene in promoting a structural change towards green sources of energy; and also create strategic petroleum reserves and implement hedging strategies. We equally recommend that the government should intervene in reducing the cost of borrowing (interest rate) since this will go a long way to encourage potential investors to borrow funds for investment and hence an increase in GDP. Finally, given the important role played by road transport in the distribution of petroleum products to the different regions in Cameroon, and given the bad nature of the roads – which greatly influences the prices of these products, we therefore recommend that the Cameroon government should increase her spending in the development of the road network in order to curb rising cost of transportation. Thus, government effectiveness, real independence of regulatory bodies and technical skills of decision makers need to be reinforced for the successful implementation of appropriate actions to reduce the country's vulnerability to oil price shocks.

As revealed by the literature review, net oil exporters tend to benefit from an oil price increase at the detriment of net oil importers who on their part tend to benefit from an oil price decrease (O'Neill *et al*., 2008). Our results thus confirmed previous research since Cameroon is a net oil exporter. However, they might not be relevant due to the fact that the Cameroon government pays little attention to energy efficiency and the development of alternative energy sources and fuels. Thus for Cameroon to benefit from the global trade process by opening up to the rest of the world, the revenue generated from oil exploitation should be re-directed towards investment in both human and physical capital so as to enhance the productive capacity of the nation especially in the manufacturing and transport sectors.

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Appendix-1. Summary of OLS regression results of the Cameroon real GDP equation

Dependent variable: DLOG (GDP)
Method: Ordinary Least Square (Mork and Olsen)
Observations: 33

Variables	Coefficient	Standard deviation	t-statistics	p-value
Log(PP)	0.089464	0.0394429	2.27	0.032
Log(OPEN)	-0.2067891	0.0840685	2.46	0.021
RIR	-0.0009842	0.0005292	1.86	0.074
Log(GOVEX)	0.4514051	0.0773459	5.84	0.000
Log(GDI)	0.0920026	0.0607237	1.52	0.141
C	0.0062674	0.006785	0.92	0.364
R-square	0.8966			
Adjusted R-square	0.8774			
F-statistics	46.81			
P-value of F-statistics	0.0000			
D-W stats	1.747563			

Source: Computed by authors using STATA 12
Note: * = significant at 1%, ** = significant at 5%, *** = significant at 10%,
Critical p-values: 1.703 at 10%, 2.052 at 5%, and 2.771 at 1% level of significance
Critical D-W stats: d_L=0.94, d_U=1.59 at the 1% level of significance

Appendix-2. Augmented Dicker Fuller test results

Variables	ADF-test		Critical values			
	Levels	First difference	1%	5%	10%	Decision
Log(GDP)	-0.931967	-5.425257*	-3.6496	-2.9558	-2.6164	I(1)
Log(GDI)	-0.922747	-6.192643*	-3.6496	-2.9558	-2.6164	I(1)
Log(GOVEX)	-0.564004	-5.199092*	-3.6496	-2.9558	-2.6164	I(1)
Log(OPEN)	-1.850559	-5.476016*	-3.6496	-2.9558	-2.6164	I(1)
RIR	-3.165515	**	-3.6422	-2.9527	-2.6148	I(0)
Log(PP)	-0.240411	-5.930035*	-3.6496	-2.9558	-2.6164	I(1)

Note: * = significant at 1%, ** = significant at 5%, *** = significant at 10%,
Source: Computed by authors using STATA 12

Appendix-3. Summary of descriptive statistics of variables

	LGDP	**LPP**	**LOPEN**	**RIR**	**LGOVEX**	**LGDI**
Mean	2.939409	1.498512	1.679620	11.29162	9.111178	9.333597
Median	2.950141	1.447562	1.703877	12.91964	9.103929	9.302399
Maximum	3.123407	2.047937	1.813078	19.29419	9.534279	9.689937
Minimum	2.765739	1.104487	1.501675	-3.773123	8.811025	9.059340
Std. Dev.	0.103724	0.284442	0.094292	6.600929	0.215075	0.184886
Skewness	0.003142	0.677296	-0.265568	-0.672112	0.385836	0.471118
Kurtosis	1.831203	2.239390	1.805043	2.349174	2.079473	2.166992
Jarque -Bera	1.935346	3.419048	2.422539	3.159892	2.044031	2.240757
Probability	0.379966	0.180952	0.297819	0.205986	0.359869	0.326156
Observations	34	34	34	34	34	34

Source: Computed by authors using STATA 12