MACROECONOMIC EFFECTS OF COMMODITY PRICE SHOCKS IN ECOWAS

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ABSTRACT

The current global commodity price shocks have affected many commodity dependent countries and also raised serious concerns on the viability of regional blocks whose member countries are predominantly commodity-based economies. ECOWAS sub-region typifies evidence of primary export as the main source of income and foreign exchange, thereby making them susceptible to commodity price shocks. This paper, therefore, examines the effect of commodity price shocks on 13 ECOWAS member countries using both static and dynamic panel data analysis for the period 2000 - 2015. The results clearly show that there is a positive and statistically significant relationship between commodity prices (energy and precious metals) and per capita income in the sub-region. However, a negative relationship was observed between non-energy prices and per capita income. The result implies that declining commodity prices (energy and precious metals) has the tendency of deteriorating per capita income and thus the standard of living of the populace in the ECOWAS sub-region.

Key Word: Energy Prices, Panel Analysis, ECOWAS

JEL Classification: Q43, O13 and C23

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1. INTRODUCTION

Extensive studies have focused on identifying the macroeconomic effects of commodity prices for commodity importing and exporting countries. The literature suggests that commodity exporting economies will earn more foreign exchange during periods of high commodity prices while importing economies will pay more. Invariably, commodity price hikes will have adverse negative effects on commodity importing countries and positive effects on exporting countries (Kose and Riezman, 2001; Allegret, Mignon and Sallenave, 2015; An, Jin and Ren, 2014). Several studies provide valuable insights into the sources of the adverse effect on commodity importing economies including: depletion of external reserves, recession effect, higher input cost, slowdown in economic activities, decline in potential output, income shift, current account and fiscal imbalances, among others (Ftiti et al.,2014; Ayres and Voudouris, 2014; and Global Economic Prospects, 2015).

In contrast, some studies provide extensive evidence to validate the argument that fluctuations in commodity prices have adverse effects on commodity producing and commodity importing countries which causes global imbalance. Specifically, the studies agree with Ftitit et al., (2014) that hike in commodity prices "will transmit to a higher input cost for firms, reducing aggregate supply… labour decline and potential output fall". However, since most oil-exporting countries depend on developed economies for their final products (consumption), increase in prices of final output could negatively affect the potential gains of commodity price hikes for the commodity exporting countries. Similarly, declining commodity prices could "support economic activity and reduce inflationary, external, and fiscal pressures in oil-importing countries, but weaken fiscal and external positions of commodity exporting countries". The slowdown in economic activities in commodity exporting countries could adversely affect aggregate demand, business cycle fluctuations, global imbalances and economic slowdown (Global Economic prospects, 2015; and Kilian and Lewis, 2011).

In this paper, we examine the macroeconomic effects of commodity prices on ECOWAS member countries. The justification for the study is threefold. First, previous studies along this line concentrated on developed economies, with much emphasis on commodity importing countries. Little is known on the macroeconomic effects of commodity price swings on commodity importing developing countries. Second, the ECOWAS region is targeting monetary integration by 2020. Importantly, the process of monetary integration in ECOWAS started in 1987 with the objective of a single monetary zone envisaged by 2003. The continuous extension of the timeline to the current target of 2020 has been blamed on the inability of member countries to meet the primary and secondary convergence criteria. It would be important to determine the degree and direction of commodity shocks to the region, and whether

that would explicitly or implicitly explain the inability of the region to meet the convergence criteria. Third, most studies on commodity exporting economies concentrate on oil-exporting countries and mostly at an individual country level. The ECOWAS sub-region presents a good case for studying the macroeconomic effects of commodity prices because of certain peculiarities of the region. For instance, ECOWAS member countries are commodity-exporting economies and import-dependent on Western and Asian countries for their manufactures consumption. The region presents a good case for estimating the two conflicting theories on commodity price shocks and macroeconomic nexus.

The rest of the paper is organized as follows. Section 2 presents the stylized facts of commodity prices movement between 1999 and 2016 and the macroeconomic environment of ECOWAS member countries. Section 3 deals with the review of related literature. In section 4, we present the data and outline our methodology. Results and policy implications are presented in section 5, while section 6 concludes the paper.

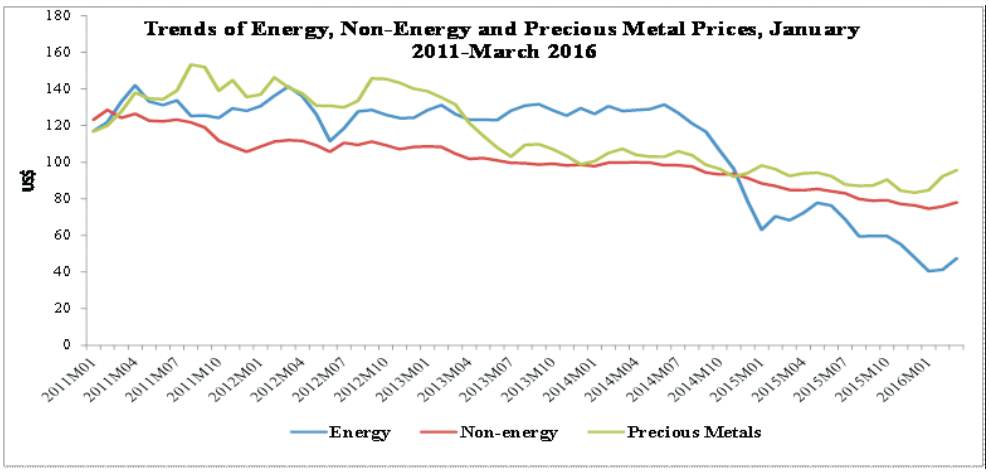
2. STYLISED FACTS

The economies of ECOWAS member countries are generally underdeveloped, except for Nigeria which could be classified as developing economy. These economies are commodity-based since the major source of export earnings is commodities. For instance, energy (coal, crude oil and gas) is the major source of foreign exchange earnings for countries such as Nigeria, Ghana, Cote d'Ivoire and Niger. Countries like Ghana, Guinea, Liberia and Sierra Leone export precious metals such as gold, platinum and silver. Additionally, all ECOWAS member countries export agricultural products. The volatility of commodity prices, therefore, is expected to impact either negatively or positively on member countries, with implications on government revenue, and especially on macroeconomic management like in any typical commodity-exporting economy.

Upswings and declines in international commodity prices, particularly crude oil between 1973 and 2013 have been attributed to major episodes that coincide with changes in the oil market and global economy. The earliest episodes of commodity price shocks was the Yom Kippur War of October 6, 1973 – when the Organisation of Arab Petroleum Exporting Countries (OAPEC) issued a warning of its intention to cut crude oil production by 5 per cent on October 16 until Israeli soldiers were "completely evacuated from all the Arab territories occupied since the June 1967 war and the legitimate rights of the Palestinian people restored" (Hamilton, 2009). Others are the Iranian revolution in the fall of 1978; Iraq and Iran crisis of September 1980; change in OPEC policy (1985-86); and Iraq and Kuwait crisis (1990); recession in U.S. (1990–91 and 2001); the 1997 – 98 Asian crisis; and the 2007,2008 global

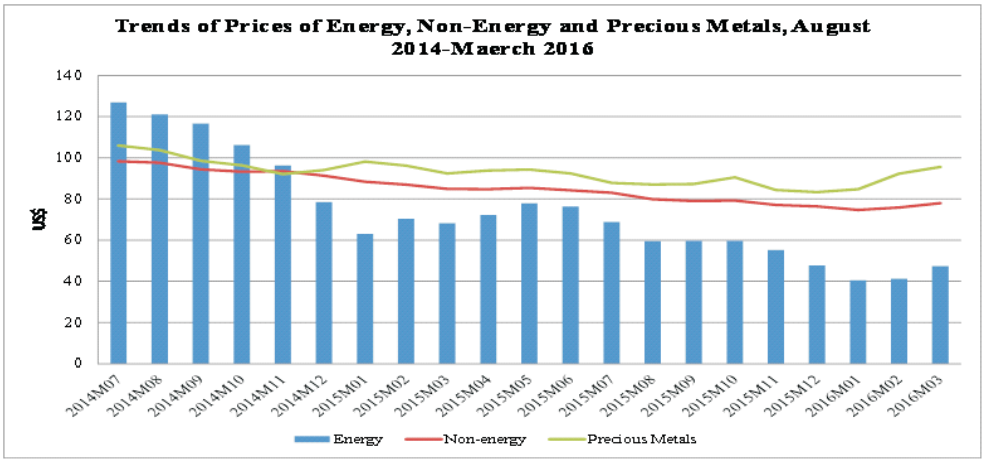
financial crisis (see Hamilton, 2009 and Global Economic Prospects, 2015). However, from 2011 to the later part of 2014, commodity prices maintained an upswing (see figure 1 below for details). For instance, between January 2011 and June 2014, the average monthly oil price was between $93 and $118 per barrel. These upswings have been attributed to sustained steady growth in Asia and other emerging economies.

Figure 1: Trends on Energy, Non-Energy and Precious Metal Prices (January 2011 – March 2016)



Since July 2014, commodity prices have declined sharply following four years of relative stability which saw the price hover around $105.23 per barrel (bbl) until it bottomed out at $29. 78 per barrel in January 2016. For the same period, overall energy prices have declined sharply from $126.93 to $40.50. The non-energy component of commodity prices also dropped from a high of $ 98.28 to $74.64. The precious metal also fell from $103.02 to $84.73. Several reasons have been adduced for the decline in commodity prices from their peak and these include weaker demand and increased supply from improved technology and massive investment by developed economies especially the U.S. What is clear is that recent weaknesses of commodity prices have dampened growth forecasts for commodity-exporting countries, with the sharpest impact among energy exporters (see figure 2).

Figure 2: Trends of Prices of Energy, Non-Energy and Precious Metals (August 2014 – March 2016)



Sudden declines in commodity prices have inspired a considerable literature on the macroeconomic implications of oil and other commodity price fluctuations on macroeconomic variables. As expected, the decline in commodity prices is synonymous with a stark slowdown in growth in emerging markets' commodity exports that enjoyed prolonged growth during a hike in commodity prices. In most cases, these commodity-exporting countries have, beside declines in growth, seen downgrades in their medium-term growth prospects. However, it is crucial to diagnose how actual and potential growth is influenced by commodity price fluctuations in order to enhance the formulation of macroeconomic policies in commodity exporting economies.

Although more considerable attention has been focused on crude oil because of its importance in the global economy, many other commodities which are equally essential have been affected by the recent slump in global commodity prices. Some of these commodities which constitute the mainstay of the economies of West African countries can be categorized into energy (crude oil), non-energy (agriculture, fertilizers, metals/minerals) and precious metals. The fall in prices for these commodities has macroeconomic implications for the sub-region. For oil-exporting countries like Nigeria, Ghana, Cote d'Ivoire and Niger, which depend on oil for their foreign exchange earnings, the consequences of a persistent fall in prices can be devastating. For instance, the robust economic growth of the last decade in these countries is under threat and the same impact goes for other countries which are depending on one commodity or the other such as cocoa, groundnut, diamond, etc. The case for the sub-region in the face of this downward prices worsened by the fact

that these prices are internationally determined as the region remains a price taker with no capacity to influence global prices for their exports.

As observed in the introduction of chapter 2 Article 3 of its Revised Treaty, ECOWAS objective is to achieve the integration of the sub-regional economy based on trade liberalization among member states, ensure free mobility of factors of production by removing all impediments, as well as harmonizing national economic and fiscal policies of member states. However, the mainstay of the economies of the sub-region is agriculture and its related activities, thereby making the region vulnerable to adverse natural environmental conditions. Notably, the sub-region depends on primary commodities which are the products of agriculture and its related activities. For instance, Petroleum is found in large quantities in Nigeria and other precious metals such as diamond, gold are commercially exploited in countries such as Ghana, Guinea, and Sierra Leone.

Thus, the export of primary raw materials, mainly agricultural commodities for foreign exchange earnings, is still the dominant aspect of domestic and international trade. Also, the sub-region constitutes a small open economy, and therefore, a price taker, with no influence in determining the price of its products at the international market. It exports predominantly primary products to developed/ industrial countries in exchange for consumer goods, equipment and raw materials for industrial development. Indeed, member countries of ECOWAS depend on this narrow range of primary commodities for export earnings. Table 1 below shows the various products apart from the fuel that could be found within the sub-region. The table shows that most of the products are homogenous, thereby giving credence to the fact that almost all the countries in the sub-region are likely to face similar shocks in the event of global commodity price shock.

Thus, for a period of the global decline in commodity prices, the associated fluctuations in prices and terms of trade are likely to have great repercussions for the sub-region. Additionally, other development options available to the sub-region for this period are constrained by the small size and poor economic base of the sub-region. For any balanced development to take place under these conditions there is the need for structural transformation and diversification of economic base to increase the production of additional products that would attract new export locations as well as increase value addition.

Table 1: Primary commodities (less fuel) by Countries in ECOWAS Sub-region

Country	Product
Burkina Faso	Cotton, sesame, peanuts, shea nuts, sorghum, millet, corn, rice, livestock, hides and skins
Benin	Cotton, corn, cassava, yams, beans, palm oil, peanuts, livestock (lint and seed)
Cote d'Ivoire	Cocoa beans, coffee, bananas, palm kernels, corn, rice, manioc, sweet potatoes, sugar, cotton, rubber, timber
Cape Verde	Bananas, corn, beans, sweet potatoes, sugarcane, coffee, peanuts, fish
Ghana	Cocoa, rice, cassava, peanuts, corn, shea nuts, bananas, timber
Gambia	Rice, millet, sorghum, peanuts, corn, sesame, cassava, palm kernels, cattle, sheep, goats
Guinea	Bauxite, alumina, coffee, rice, pineapples, palm kernels, cassava, bananas, sweet potatoes, cattle, sheep, goats, timber
Guinea-Bissau	Cashew nuts, wood, cotton, fish, cassava, rice, palm kernels, corn, peanuts, beans, timber
Mali	Cotton, millet, riœ, corn, vegetables, peanuts, cattle, sheep, goats
Liberia	Rubber, coffee, cocoa, rice, cassava, palm oil, sugarcane, bananas, sheep, goats, timber
Niger	Cowpeas, cotton, peanuts, millet, sorghum, cassava, rice, cattle, sheep, goats, camels, donkeys, horses, poultry, tobacco, onions, beans
Nigeria	Cocoa, peanuts, palm oil, corn, rice, sorghum, millet, cassava, yams, rubber, cattle, sheep, goats, pigs, timber, fish.
Sierra-Leone	Coffee, cocoa tobacco, rice, palm kernels, palm oil, peanuts, poultry, cattle, sheep, pigs, fish
Senegal	Groundnuts, phosphate, cotton, peanuts, millet, corn, sorghum, rice, tomatoes, green vegetables, cattle, poultry, pigs, fish
Togo	Coffee, cocoa, cotton, yams, cassava, corn, beans, rice, millet, sorghum, livestock, fish
Niger	Cowpeas, cotton, peanuts, millet, sorghum, cassava, rice, cattle, sheep, goats, camels, donkeys, horses, poultry, tobacco, onions, beans

Source: Extracted from Nationmaster Statistics, 2012

In table 2, the performance of key macroeconomic indicators is highlighted. The GDP growth rate and per capita growth rate decline from the peak of 7.1 and 4.2 per cent respectively in 2010 to 5.79 and 2.94 per cent respectively in 2014. The net foreign direct investment peaked in 2011 with 18,956 million US dollars and subsequently declined to 12,763 million US dollars in 2014. Trade balance for the sub-region recorded a deficit for the period 2009 to 2013; the same was observed for the UEMOA group of countries for the same period. The balance of payment was declining from 7825 in 2009 to negative 940 in 2014. Trade balance for all the years under review was negative. Although the export of goods and services was rising from 2009-2011, it started declining in 2013 and 2014. Import of goods and services, on the other hand, was rising except in 2012 when it recorded a decline. Accordingly, total merchandize trade growth experienced both positive and negative growth for the period.

Table 2: ECOWAS: Key Macroeconomic indicators and their performance (2009–2014) in US Dollars at Current Prices in Millions

Key Indicators	2009	2010	2011	2012	2013	2014
Gross domestic product (GDP)	383 748	489 472	549 425	604 512	675 406	725 243
GDP Growth Rate (%)	5.93	7.1	4.85	5.05	5.64	5.79
GDP Growth Rate per capita (%)	3.07	4.2	2.02	2.2	2.79	2.94
Net Foreign Direct Investment (Inward Flows)	14 725	12 008	18 956	16 322	14 208	12 763
Total Trade in goods and services	-1 429	466	-1 035	4 843	6 160	-10 547
Trade Balance	-22 777	-25 655	-28 877	-29 307	-30 451	
Trade Balance UEMOA	-3 662	-4 060	-4 262	-4 516	-5 965	
Balance of Payment	7 825	6 453	2 950	6 976	3 623	-940
Consumer Price Index (All Item) base year = 2005	138.8	154.4	169.2	186.7	201	215.5
Gross fixed capital formation	68 492	88 031	95 888	101 235	110 691	123 189
Export ofgoods and services	87 864	131 905	180 271	200 098	151 215	162 278
Import of goods and services	94 585	115 075	148 974	127 806	140 000	140 345
Total Merchandise Trade growth rate (%)	-25.46	37.9	35.08	0.31	-5.89	-6.18

Source: Authors calculations from UNCTADSTAT (2016) Online Database

3. REVIEW OF LITERATURE

Several theoretical frameworks have been used to examine the effect of shocks on macroeconomic variables. Some of the theories are the structuralist theory, the

classical theory and Keynesian theory. The structural theorists, for instance, argue that structural shocks such as sudden changes in the prices of food and oil could be attributed to macroeconomic fluctuations (Summer, 2002). However, there is a sharp disagreement among the structuralist theorists on the amplitude effect of structural shocks. One school argues that supply shocks are in the short-run and have a transitory effect on the macroeconomy (Ball and Mankiw, 1995). They further argue that since the role of policymakers is to ensure a favourable macroeconomic environment in the long term, policymakers should not respond to adverse pressures from food and oil prices that are highly volatile in the short-run, in order to save the economy from recession (Armando, 2009). They opine that policymakers should instead focus on mitigating "the second-round effect", which is likely to be more prolonged and could result in an economic recession (Inflation Report, 2006). Fischer (1985) argues that as long as there is no real wage resistance by workers, supply shock by themselves do not require a policy response.

Another school documented extensive evidence from Latin America and developing countries to show that structural shocks could be persistent, and are rooted in bottlenecks of inelastic supply in the agricultural and oil sectors (Watcher, 1979). In their view, agriculture, oil, foreign trade, and government sectors suffer from institutional rigidities that cause prices to rise with economic developments. They advocated for the elimination of such institutional rigidities by the fiscal authorities as a measure for curbing the adverse effects of structural shocks.

The above views have been counteracted by some scholars using the rational expectation theory. They argue that the amplitude of supply-side is contingent on the behaviour of expectation (Sommer, 2002). For instance, when agents believe that the effects of shocks will be permanent, shocks feed into their expectations, and the persistence of shock is thus large. In the same vein, when agents believe that the effects of shocks are only temporary, macroeconomic fundamentals quickly return to their initial position. They, therefore, argue that knowing whether shocks are permanent or transitory, and what determines the magnitude of the effects is important in formulating policy. This theory essentially influenced the theoretical framework for this study.

On the empirical side of the literature, commodity shocks are usually exogenously determined and shift the economy temporarily or permanently from its equilibrium position through multiple transmission mechanisms such as trade channel, financial channel, integration of international market channel, and investment channel, among others. Commodity shocks have been exacerbated due to the effects of globalization and improvements in information communication technology, which eliminated some trade barriers, increased economic interconnectedness, and accelerated the spread of economic risk across national boundaries (Cunado and Perez de Gracia, 2005, 2003).

Commodity shocks could be positive – economic boom and improved welfare – or negative – distressed economy and declined welfare (Canova, 2005). Since commodity prices are exogenously determined, the study assumes that declining commodity prices will adversely affect countries in West Africa. Though, empirical findings whether external shocks accounts for higher variability in output or macroeconomic fundamentals than internal shocks are inconclusive. For instance, Raddatz (2007) used the VAR approach to estimate the impact of external shocks on output volatility. The result showed that exogenous shocks could partly explain a minute fraction of output variance, while internal shocks are the major sources of fluctuations. The external shocks considered in the study are natural disasters, changes in international interest rates, terms-of-trade shocks, volatility in commodity prices, changes in the state of the international economy, and fluctuations in aid flows.

In contrast, Jimenez-Rodriguez and Sanchez (2005) and Lilien (1982) used the dispersion hypothesis to demonstrate the negative impact of external shocks on macroeconomic variables. In their view, external shocks such as aid volatility, international conditions, natural disaster and terms-of-trade fluctuations are responsible for macroeconomic fluctuations. Similarly, multilateral institutions such as the World Bank (2004), UNCTAD (2002) and IMF (2003) noted that exogenous shocks stymie economic growth. Specifically, they argued that exogenous "shocks… can have a significant negative impact on developing countries' growth, macroeconomic stability, debt sustainability and poverty", and "low-income countries are particularly vulnerable to natural disasters, terms-of-trade shocks, and other adverse shocks", and that the level of volatility in world commodity prices are importantinfluence on economic growth and the incidence of poverty in less developed countries".

In the opinion of 'exogenous shocks causing negative growth" theorists, since the events are unpredictable, it could threaten large-scale private sector defaults, trigger distressed assets sales, high bank insolvency, depletion of external reserve, currency crisis and loss of market confidence. A classic example was the 2007/2008 global financial crises that originated in UnitedStates but ravaged the entire architecture of the global financial system.

There is a consensus on the sources of external shock which include natural disasters, energy costs, commodity prices, geopolitical crisis, famine, war, economic policies and market dynamics, fluctuations in aid flows, among others. The severe external shocks hitting the world economies could be traced to financial and productive integrations between various countries and regions following the formation of blocs since the 1970s. The increase in economic interrelatedness across in the form of cross-border movement capital, technology and goods and service a result of globalization is

associated with risks broadly classified into economic risk, social risk, environmental risk, technological risk, geopolitical risk and regional risk (Kilian, 2008; Jimenez-Rodriguez and Sanchez, 2005; and Mehara, 2006).

The effects of external shocks at regional and country-level have been extensively documented in the empirical literature. These studies focus predominantly on the effect of increasing commodity prices on developed economies and the transmission channels. The literature on the impact of declining commodities prices on commodity-exporting countries, especially, developing economies appears scant. Literature that clarifies our understanding of the impact of declining commodity prices on commodity-exporting countries such as the West African Sub-Region is very important since empirical studies that reconcile theory with practical reality is lacking.

Similarly, the bulk of the studies also focus only on oil shocks. According to Blanchard (2009), the 1970s oil shocks resulted in an increase in inflation and a decrease in output. However, the 2000 and 2007 larger increases in the oil price resulted in milder movements in inflation and output. Blanchard argued that "the milder movements in the 2000s and 2007 were attributed to two changes in the structure of the economy that moderated or modified the transmission mechanism of the oil shock such as vanishing wage indexation and an improvement in the credibility of monetary policy". Jimenez-Rodriguez and Sanchez (2005) used Vector autoregressive (VAR) analysis to empirically investigate the effect of oil shocks on the economic activity of industrialized OECD countries. They found a significant interaction between oil prices and macroeconomic variables. The results showed an asymmetric effect of oil price on real GDP. Oil price hike had larger impact on real GDP growth than the decline in oil price. Increase in oil price was largely found to have a negative impact on economic activity among oil-importing countries.

Dibooglu and Aleisa (2004) employed structural vector autoregression methods to investigate the sources of macroeconomic fluctuations in Saudi Arabia. The study focused on oil prices and changes in terms of trade while controlling for supply, the balance of payments, aggregate demand, and monetary shocks. Their findings are twofold. First, the result showed the vulnerabilities of the real exchange rate, price level and to a lesser extent output to trade shocks. Second, the drivers of terms of trade are aggregate demand shocks, trade balance and output.

Bhattachary and Kar (2009) developed a "macro-modelling framework that allows for evaluating the impact of two domestic shocks (rainfall shortfall and fiscal profligacy) and three external shocks (oil price hike, world trade shock and capital flow shock) that affect Indian economy through various channels". Their results revealed that

"capital flow shock and fiscal profligacy show strong pervasiveness, the rainfall shock is moderately pervasive, while the economy is much more resilient to the world trade shock in the long run".

Kose and Riezman (2001) constructed a calibrated stochastic, dynamic multi-sector equilibrium model to investigate the effect of external shocks on the African economy. The study modelled trade shocks modelled as "fluctuations in the prices of imported capital goods, exported primary commodities and intermediate inputs; and financial shock, modelled as fluctuations in the world real interest rate". Sectoral productivity was used to capture domestic factors in generating macroeconomic fluctuations. Their results indicated that the role of financial shocks is minor, while trade shocks is responsible for 45 per cent of fluctuations in aggregate output. Additionally, they found that prolonged recession could be induced by adverse trade shocks since they induce a significant decrease in aggregate investment.

Ncube, Ndou and Gumata (2012) investigated the impact of the 2007/2008 global financial shock on the South African economy based on structural VAR models. Their results showed that the financial shock led to Rand appreciation, bond yield decline, weaker consumer inflation, and fall in monetary aggregates and real rate of interest in South Africa, despite weak trade channel evidence. Sosa and Adler (2012) examined the impact of shocks stemming from Brazil to other Latin America economies using Vector Auto Regression. They used descriptive statistics to show that trade linkages with Brazil are significant for Argentina, Bolivia, Chile, Paraguay, and Uruguay, but weak for the other countries. The econometric estimation also showed that countries with significant trade linkages are vulnerable to output shocks from Brazil compared to other countries with less trade linkages. Canova (2005) studied how external shocks from the United States are transmitted to eight Latin American countries, using individual country and average effects posterior estimates. Their results showed that United States monetary shocks are responsible for significant fluctuations in Latin America, while supply and demand shocks do not have such effects. Based on their findings, they argue that "financial channel plays a crucial role in the transmission and US disturbances explain important portions of the variability of Latin American macro-variables, producing continental cyclical fluctuations and, in two episodes, destabilizing nominal exchange rate effects".

Focusing on commodity supercycle, Gangelhoff (2015) sees it as occurring when prices of many significant primary commodities rise and then fall in concert over an extended period, around some slow-moving underlying trend. The paper links global economic fluctuations as playing critical roles in generating these correlated price movements, by exerting demand pressures to first ensurefirst boom, followed by bust, among a cross-section of countries for a variety of commodity prices. On the other

hand, supply-side shocks are less associated with super-cycles because they are so often commodity-specific. However, an exception on the supply side is energy which constitutes an important proportion in the production of goods and services with the capability to impact on the prices of other commodities through cost of production and consumer purchasing power. This is the reason why energy and non-energy are often analyzed separately. Within the last century, Erten and Ocampo (2012) detect four super-cycles in non-fuel commodities. The first three occurred in 1917, 1951, and 1973 while the last began in 2000 and appears to have peaked between 2008 and 2011(Gangelhoff, 2015).

Yuan et al. (2014) investigated the dynamics of frequent price shocks of crude oil markets. The price shocks were represented by inter-event times, and series of counts and the study focused on its price shocks' sequences to study temporal properties in markets for crude oil. Findings from the paper showed that time dynamics of price shock sequences represent a fractal process indicating a high degree of time-clusterization events. This outcome provides useful information in crude oil markets in terms of nature and dynamics.

An,et al. (2014) adopted a nonlinear Factor-Augmented Vector Autoregressive (FAVAR) model to investigate the asymmetric effects of oil price shocks on real activity in the United States. The paper simulated the effect of negative and positive oil price shocks on the United States macroeconomy using impulse response function (IRF). Their findings showed that higher oil price has a more negative effect than the positive effects of lower oil prices. Furthermore, more evidence of asymmetric effect is when oil price shocks are more significant.

Valadkhani (2014) focused on dynamic relationship, using Markov-regime switching model and Bai-Perron sequential method, between CPI energy price sub-index in the U.S and Canada and crude oil price. Although the paper does not dispute the previous findings that crude oil price does not currently affect the aggregate CPI as was the case in the 70s, the paper's sequentially-determined break date and time-varying regime-switching probabilities, brought about two new findings: a rise in speed of adjustment particularly in the U.S. and consistent and instantaneous increase in marginal effects on consumer energy prices due to changes in price of oil.

Cunado et al. (2015) used VAR model to discuss the macroeconomic effect of structural oil shocks in four major Asian oil-consuming economies. Three different structural oil shocks were identified based on sign restrictions, and they include an oil-specific demand shock, oil supply shock and a global economic activity driven oil demand shock. Key findings indicate different responses of prices and economic activity to oil price shocks conditional on the categories. It was observed that the

shock from oil supply had limited effect, but a shock associated with demand from global economic activity had a substantial positive effect on all the four Asian economies that were examined.

As the 1986 oil boom could not bring about the expected economic boom, many researchers became interested and developed a large literature on the asymmetric effects of oil price movement on economic activity. Uncertainty, costly factor allocation and asymmetric response by the monetary authority were identified as factors bringing about such asymmetry. For instance, the U.S. Federal Reserve often respond strongly to rise in inflation brought about by higher oil prices but less to unanticipated fall in inflation due to decline in the oil price (Kilian, 2014; Bernanke, Gertler, and Watson, 1997). Thus, significant increase in oil price is often linked with lower output in the U.S. and a fall in oil prices is reckoned to have a much smaller, and statistically insignificant, contribution to economic activity (Hamilton, 2003; Jimenez-Rodrýguez and Sanchez, 2005).

4. METHODOLOGY AND DATA

In estimating the macroeconomic impact of commodity price shocks in ECOWAS, we utilised gross domestic product per capita as the dependent variable. The shocks on the macro-economy are felt or measured in the sub-region through fluctuations in commodity prices such as energy, non-energy and precious metals, which are the major source of income for major economies in the sub-region. Theoretically, commodity price and some macroeconomic variables such as capital account (CA), consumer price index (CPI), dependency ratio (DEPR), foreign direct investment (FDI), openness (OPEN), real effective exchange rate (REER), real interest rate (RIR) and savings (SAV) are the significant determinants of output. This assumption justifies the inclusion of the above as control variables. We use standard deviations as the measure of commodity price fluctuation in the model.

In terms of apriori expectations, SAV, CA and FDI are expected to be positively related to gross domestic product per capita. Increase in savings tends to have the positive effect on the GDP per Capita to the extent that private savings complement public savings in improving investment and consequently output. On the other hands, CPI, RIR and DEPR are expected to be negatively related. These assumptions are premised on the reasoning that higher inflation, real interest rate and dependency ratio are likely to discourage investment and savings, thereby reducing output level in the economy.
Additionally, OPEN and REER can take diverse signs depending on the nature of the economies. This is because the higher the degree of openness of an economy, the more vulnerable it is to external shocks, although this depends on the ability of the economy to diversify its trade. On the influence of REER, the impact is not clear from the literature, as investors require some level of depreciation of domestic currency to

invest, which would likewise lead to higher cost of foreign goods for import dependent economies.

Our empirical study is based on panel dataset covering the thirteen (13) ECOWAS countries, excluding Cape Verde and Liberia due to paucity of data in the two countries. The period of the study is from 2000-2015 and data used for the study are from secondary sources such as World Development Indicators (WDI) online and World Bank Commodity price index. As T > N, we are dealing with macro-panel dataset and we adopted both the static panel as well as dynamic general method of moment (GMM) estimation procedure to account for the heterogeneous effects between countries, since most of these countries export similar primary products.

The general framework for panel study is shown in equation 1

$$Y_{it} + \alpha_i \quad \beta + X_{it} = \mu_{it} \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

Y_{it} the dependent variable and X_{it} a vector representing the explanatory variables. The cross-sectional and time series dimensions are represented respectively by i and t subscripts. The composite error term μ_{it} can be decomposed into specific effects and the remainder disturbance term. Hereafter i will be referred to as individual member countries of ECOWAS[5]. To capture the individual country specific effects, we decompose μ_{it} by re-writing equation 1 as follows:

$$Y_{it} + \alpha_i \quad \beta + X_{it} = \eta_i + \lambda_t + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where Y_{it} is defined as the macroeconomic variables; X_{it} is a vector of commodity prices. η_i is the country specific effects; λ_t is the time specific effect, and ε_{it} is the disturbance term that captures the effects of the omitted variables. With the exception of inflation that is not transformed, all other variables are in ratio and or natural logarithm forms. From equation 2, we can specify the empirical model depicting the effect of the three broad categories of commodity prices (Energy, Non-Energy and precious Metals) on macroeconomic variables (output and inflation).

Applying the baseline model in equation 2, we compare estimates from both panel fixed effects (FE) and random effects (RE) models. The Hausman test is used to

5 - These countries include Nigeria, Ghana, Benin, Togo, Niger, Mali, Burkina Faso, Cote d' Ivoire, Sierra Leone, Guinea, Guinea Bissau, the Gambia and Senegal excluding Cape Verde and Liberia.

compare estimates from the RE with that of the FE. Given the fact that most macroeconomic variables are endogenous by nature (see Ezeoha, 2013; Buch and Kuckulenz, 2009; Singh et al., 2011 and Adams, 2009), to address the probable endogeneity problems that might be present in equations 2, we apply an instrumental variable (IV) regression model, based on the Dynamic General Method of Movement (GMM) technique. We validate the instruments by adopting Rodman (2011) through the imposition of lags to reduce the proliferation of instruments. The lag of the dependent variable is used to indicate the dynamics in the model as shown in equation 3 below:

$$y_{it} = \alpha_{it} + y_{it-1} + \beta X_{it} + \mu_{it} \qquad (3)$$

The variables are as previously defined.

5. DISCUSSION OF EMPIRICAL RESULTS

As stated previously, two broad estimation techniques were employed, namely the static model, comprising pooled OLS, FE, OLS dummy variable and RE (see appendix 3), and dynamic model, consisting of difference GMM (see appendix 4) and System GMM (Table 3).

We opt to interpret the system generalized method of moment estimation technique based on the fact that it addresses most of the econometric issues that might arise due to endogeneity and other identified challenges highlighted above. A critical examination of the results in Table 3 reveals that column 5 appears as the most robust result. This is because, unlike other columns, the predictions of the Sargan and Hansen tests are relatively close, and the validity of our model is further reinforced by AR(1) test. Also, column 5 has the least number of instruments based on Roodman (2009b).

Table 3: Dynamic Panel Data Analyses-System GMM

VARIABLES	SGMM1	SGMM1-CL-a	SGMM2	SGMM2-CL-a	SGMM2-END-CL-a	SGMM2-END-CL-b
L.GDPC	0.980***	0.995***	0.890***	1.334***	1.943***	1.523***
	(0.0264)	(0.0378)	(0.195)	(0.279)	(0.655)	(0.330)
PREMET	0.522***	0.665***	1.743	0.650*	1.298**	8.439**
	(0.0989)	(0.121)	(3.530)	(0.388)	(0.620)	(4.305)
ENEGY	0.203**	0.196**	2.226***	0.171**	9.659**	4.583**
	(0.045)	(0.029)	(0.045)	(0.050)	(0.093)	(0.002)
NOENEG	1.337***	1.723***	2.166	-0.197	-10.19	-42.43**
	(0.443)	(0.487)	(4.024)	(2.333)	(7.995)	(21.51)
CA	1.921**	1.104*	-95.44	-3.821	-61.57	1.546
	(0.756)	(0.601)	(119.5)	(4.292)	(39.79)	(11.54)
CPI	0.634**	0.663*	8.672*	-6.113	-55.72	-2.814
	(0.254)	(0.346)	(4.535)	(5.786)	(34.78)	(3.322)
DEPR	11.55*	9.395	1,754	-488.7	-976.7	272.6
	(6.915)	(8.224)	(3,166)	(404.8)	(716.1)	(171.7)
FDI	1.490	-0.219	-14.71	-2.909	-39.97*	33.02
	(1.779)	(2.167)	(46.29)	(3.289)	(23.52)	(24.34)
LNOPEN	-54.33***	-69.48**	691.5	-219.6	-1,614	369.4
	(16.01)	(28.20)	(1,277)	(253.2)	(1,002)	(417.0)
REER	0.000587	0.00114	-0.418	0.0378	0.805	0.0527
	(0.00514)	(0.00528)	(0.490)	(0.0327)	(0.493)	(0.0514)
RINT	-1.418***	-2.075**	-18.67	-3.192**	-1.022	-7.173**
	(0.457)	(0.906)	(15.72)	(1.430)	(4.131)	(3.272)
SAV	0.832	0.884	-15.67	-2.726	70.15	1.833
	(0.588)	(0.742)	(10.90)	(3.109)	(46.84)	(14.13)
Constant	-185.2***	-208.6***	-8,863	2,683	3,457	-805.9*
	(67.07)	(78.03)	(15,569)	(2,220)	(2,866)	(456.9)
Observations	442	442	442	442	442	442
Number of CRID	13	13	13	13	13	13
firm effect	YES	YES	YES	YES	YES	YES
AR(1)_test	-1.386	-1.472	-0.957	-0.955	0.229	-1.426
AR(1)_P-value	0.166	0.141	0.338	0.340	0.819	0.154
AR(2)_test	0.548	0.543	-0.668	0.378	-0.466	-1.151
AR(2)_P-value	0.584	0.587	0.504	0.706	0.641	0.250
No. of Instruments	396	18	396	15	68	35

Robust standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1. SGMM1 & SGMM2 denote One-Step & Two-Step GMM respectively. Also regressions with suffix "END" treat L.gdp & lagged premet1enegyl & noenegl as endogenous. Regressions with suffix "CL" follow Roodman (2009b and collapse the instrument matrix. a & b denote lag(1 5 & lag(2 4 respectively.

Accordingly, the result shows that precious metals are positively and significantly related to the dependent variable, per capita income in the sub-region. Thus, a per cent increase in precious metal prices will bring about 0.65 per cent rise in per capita income, a proxy for the standard of living of the people. Furthermore, energy is also positively and significantly related to per capita income. This implies that a per cent rise in the price of energy will bring about 0.17 per cent rise in per capita income. However, the non-energy shows a negative relationship with per capita income,

though insignificant in the model. This implies that a per cent increase will bring about 0.2 per cent fall in the per capita income. This is against a-priori expectation but could be explained by several reasons. First, is the well-known Dutch Disease or resource curse hypothesis which result in a negative impact on the economy as rent-seeking activities of economic agents results in the abandonment of other products because they have become less competitive due to currency appreciation brought about by inflow from the natural resource. Similarly, most ECOWAS countries are not major exporters of non-energy (agricultural) products because of agricultural re-engineering in developed economies. Also, ECOWAS countries largely depend on developed economies for genetically modified agricultural and refined products.

The implication of the result of precious metals and energy which have both confirmed the apriori expectation is that a period of declining commodity prices (which has been the trend since July 2014) is associated with a fall in per capita income and thus the standard of living of the populace in the ECOWAS sub-region. The recent downward trend of prices of commodities such as energy (oil) and precious metal is welfare-reducing in the sub-region. For instance, as shown by our results, a per cent fall in the price of precious metal will bring about a 0.65 per cent decline in standard of living, while the same per cent fall in energy price will bring about 0.17 per cent fall in the standard of living. However, the same one per cent fall in non-energy price will result in 0.2percent rise in welfare though not statistically significant. However, many of the control variables (capital account, consumer price index, real effective exchange rate, dependency ratio, foreign direct investment, openness and saving) were not statistically significant except for real interest rate which is statistically significant at 5 per cent level of significance.

6. CONCLUSION

The global slump in prices of commodities has serious macroeconomic implications for a typical commodity dependent region like ECOWAS. It is expected that varying degrees of impact across countries in the sub-region will require a macroeconomic response to ameliorate adverse consequences. Therefore, this study analysed the macroeconomic effects of commodity shocks in the ECOWAS sub-region. The paper utilised both the static and dynamic panel data analyses to address the objective of the study. The findings from the study clearly show a positive and significant relationship between energy, precious metal prices and per capita income in ECOWAS sub-region. However, this relationship is negative for non-energy prices though insignificant in the model. The results also indicate that the sub-region is susceptible to exogenous commodity price shocks as energy producing countries constitute 87 per cent of total gross domestic product of the region. Thus, a likely energy price shock to the region has the potential of affecting more than 80 per cent of the region's economy.

Therefore, there is urgent need to re-think the issues of regional integration agenda among the member countries not only along monetary lines but also along economic diversification in order for the countries in the region to be able to withstand any adverse external shocks.

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Appendices:

Appendix 1: Trends in Balance of Payments in ECOWAS (% of GDP)

	2012	2013	2014*	2015**
ECOWAS	**3.7**	**3.4**	**2.2**	**1.7**
UEMOA	**-5.2**	**-7.0**	**-8.1**	**-8.1**
Benin	-7.6	-8.1	-8.2	-8.5
Burkina	-1.5	-11.1	-10.5	-11.9
Cote d'Ivoire	-1.2	-1.9	-3.4	-2.9
Guinea-Bissau	-7.8	-4.5	-3.8	-5.4
Mali	-2.6	-3.4	-7.9	-7.6
Niger	-15.3	-15.5	-19.6	-22.0
Senegal	-10.9	-10.5	-10.3	-9.1
Togo	-7.6	-13.6	-10.8	-11.4
WAMZ	**5.2**	**5.1**	**3.9**	**3.4**
The Gambia	-17.9	-17.0	-11.9	-13.5
Ghana	-11.8	-11.7	-9.5	-7.0
Guinea	-17.0	-17.8	-16.4	-16.7
Liberia	11.6	-46.7	-33.1	-40.2
Nigeria	7.3	7.4	5.7	4.9
Sierra Leone	-24.7	-11.2	-7.7	-13.2
Cape-Verde	-10.9	-4.9	-7.7	-9.6

Sources: WAMA/ECOWAS Central Banks * Estimates ** Projections

Appendix 2: Summary Statistics

VARIABLES	N	mean	sd	min	max
CA	455	-6.559	7.569	-65.260	22.170
CPI	455	62.970	34.150	-52.600	174.70
SAV	455	10.860	9.912	-24.110	46.130
REER	455	573.200	1,003	0.000	7,858
FDI	455	2.047	3.619	-28.620	32.770
RINT	455	9.843	20.440	-75.750	56.800
GDPC	455	497.600	377.300	130.200	3,588
DEPR	455	5.715	0.738	3.820	7.690
ENEGY	455	37.670	49.160	0.000	164.800
NOENEG	455	14.200	20.320	0.100	92.570
PREMET	455	29.830	56.090	0.500	236.900
LNOPEN	455	-1.996	0.575	-4.605	-0.777
Number of CRID	13	13	13	13	13

Appendix 3: Static Panel Data Analyses

VARIABLES	OLS	FE	LSDV	RE
PREMET	0.673*	0.570*	0.539	0.587*
	(0.407)	(0.336)	(0.409)	(0.344)
ENEGY	1.114**	0.970**	1.415***	1.004**
	(0.534)	(0.448)	(0.544)	(0.457)
NOENEG	-0.760	-0.0233	0.726	-0.179
	(1.546)	(1.284)	(1.562)	(1.312)
CA	1.616	-0.734	-1.584	-0.526
	(1.700)	(1.609)	(1.956)	(1.605)
CPI	1.386***	2.347***	2.758***	2.152***
	(0.469)	(0.427)	(0.521)	(0.430)
DEPR	14.99	95.26***	66.40***	73.89***
	(15.84)	(19.96)	(24.31)	(18.95)
FDI	1.003	-5.830*	-11.61***	-4.632

	(3.659)	(3.211)	(3.878)	(3.244)
LNOPEN	-418.4***	-392.5***		-394.6***
	(21.13)	(21.40)		(21.22)
REER	-0.0298**	0.00232	-0.0111	-0.00614
	(0.0124)	(0.0135)	(0.0164)	(0.0132)
RINT	-1.519***	-3.299***	-3.472***	-2.957***
	(0.586)	(0.709)	(0.869)	(0.677)
SAV	3.605***	4.329***	5.609***	4.373***
	(1.224)	(1.060)	(1.289)	(1.076)
Constant	-560.4***	-1,040***	71.97	-909.5***
	(110.3)	(135.5)	(158.7)	(131.6)
Observations	455	455	455	455
R-squared	0.653	0.673	0.659	
firm effect	NO	YES	YES	YES
F-test	75.89	80.82	36.29	
Prob > F	0.000	0.000	0.000	
Number of CRID		13		13
Wald-chi2				877.5
Prob > chi2				0

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Appendix 4: Dynamic Panel Data Analyses-Difference GMM

VARIABLES	DGMM1	DGMM1-CL-a	DGMM2	DGMM2-CL-a
PREMET	0.592	0.287	-0.207	-0.00702
	(0.389)	(0.225)	(0.000)	(0.185)
ENEGY	0.754**	1.295***	-0.128	0.0559
	(0.340)	(0.482)	(0.000)	(0.352)
NOENEG	-0.227	-1.716*	2.374	1.174
	(0.882)	(0.926)	(0.000)	(1.023)
CA	0.895	-2.040**	4.840	-6.587
	(2.142)	(1.030)	(0.000)	0.000
CPI	2.018	2.871	1.112	0.507
	(1.340)	(2.176)	(0.000)	(3.727)
DEPR	95.99**	-62.04	-660.3	-430.4
	(45.22)	(51.04)	(0.000)	(415.9)

FDI	-5.724	-2.320	-24.91	-19.34**
	(4.576)	(2.347)	(0.000)	(7.890)
LNOPEN	-467.2***	-262.2***	-479.2	-256.5
	(104.2)	(56.37)	(0.000)	(185.0)
REER	0.0229	0.0617	0.159	0.0330
	(0.0202)	(0.0470)	(0.000)	(0.123)
RINT	-2.546**	-0.235	0.296	-0.143
	(1.195)	(0.444)	(0.000)	(1.079)
SAV	4.553*	4.678**	4.811	3.667**
	(2.621)	(2.347)	(0.000)	(1.822)
Observations	442	442	442	442
Number of CRID	13	13	13	13
firm effect	YES	YES	YES	YES
AR(1)_test	-1.478	-0.810	-0.428	-0.308
AR(1)_P-value	0.139	0.418	0.669	0.758
AR(2)_test	-0.579	0.870	0.859	1.529
AR(2)_P-value	0.563	0.384	0.390	0.126
No. of Instruments	375	16	362	16

Robust standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1. DGMM1 & DGMM2 denote One-Step &Two-Step Diff-GMM respectively. Regressions with suffix "CL" follow Roodman (2009)and collapse the instrument matrix. a denotes lag(1 5).