Oil and Gas Production and the Growth of Ghana's Economy: An Initial Assessment

Acquah-Andoh, E., Gyeyir, D. M., Aanye, D. M. & Ifelebuegu, A.

ESSN 2411-9407

Publisher: Academic Research Publishing Group

International Journal of Economics and Financial Research
ISSN(e): 2411-9407, ISSN(p): 2413-8533
Vol. 4, Issue. 10, pp: 303-312, 2018
URL: http://arpgweb.com/?ic=journal&journal=5&info=aims

Academic Research Publishing Group

Original Research

Oil and Gas Production and the Growth of Ghana's Economy: An Initial Assessment

Elijah Acquah-Andoh*
School of Energy, Construction and Environment, Coventry University, CV1 5FB, England

Denis M. Gyeyir
Public Interest and Accountability Committee (PIAC), P. O. Box CT 9807, Cantonments, Accra, Ghana

David M. Aanye
ENI Ghana Exploration and Production Ltd. Una Home, 12 Bypass Rd, Airport City Accra, Ghana

Augustine Ifelebuegu
School of Energy, Construction and Environment, Coventry University, CV1 5FB, England

Abstract

Oil and gas resources present enormous opportunities for the economic development of low income economies, but poor management of these resources can result in dire consequences for the foundations of the resource-endowed nation. The discovery of oil and gas in Ghana is as significant as the policies and measures to ensure optimum benefits to the nation. This paper evaluates the sustainability of petroleum production in the light of the medium term policy structure, the Ghana Shared Growth and Development Agenda (GSGDA). In particular, the economic contribution of oil and gas to Ghana's GDP and sustainable investment options for petroleum revenues were examined using ordinary least squares (OLS) regression. The evidence suggests that at current production levels, petroleum is not a significant contributor to Ghana's GDP after adjusting for the contribution from other sectors of the economy. The consistent appreciation of Ghana's real effective exchange rate between 2010 and 2013 led to a deterioration of the competitiveness of the non-oil sector and declining contribution of the agricultural sector to GDP; and further eroded the net impact of petroleum production. Investing petroleum proceeds in the non-oil sector and expansion of the export base are a viable option for utilising petroleum revenues.

Keywords: Ghana; Economy; Oil and gas production; Growth; Investments; Petroleum revenue.

1. Introduction

The discovery of treasures such as petroleum in developing countries has often not only triggered jubilation but also ignited optimism of economic emancipation. However, puzzling consequences are encountered a few years into exploitation of these resources in a majority of oil rich economies (Sachs and Warner, 2001). Countries such as Nigeria, who have maintained invariably the same Gross National Product (GNP) for 40 years despite its massive petroleum resource endowments and others such as Iran and Venezuela with minus one per cent growth rate for over 33 years have been cited as examples in scholarly writing (Gylfason, 2001)

In consequence, the management of the newly discovered resources in Namibia, Sierra Leone, Botswana and Ghana among other countries have been subjected to careful analysis and research as a result of the mixed historical experiences in oil-rich low income economies. For example, the critical role of national policies and institutions in sustainably managing petroleum resources for long term national development using a case study of Norway has been thoroughly examined by Larsen (2005). Except for Botswana, Sachs and Warner (2001) have discounted the inherent potential of natural resource endowments to drive export-led growth for most developing countries due to systemic managerial lapses. The revenue windfalls from the oil sector induce unusual spending exposing such economies to unpredicted volatilities. Richmond *et al.* (2013) cite imbalances between investment-led growth and maintaining economic stability through stabilisation buffers as igniting untargeted spending of petroleum revenues.

The Ghana Shared Growth and Development Agenda (GSGDA)[1] is a policy framework introduced in the same year as oil production commenced in Ghana in 2010. The medium term policy specifies areas of target in agricultural modernisation, oil and gas development, infrastructure and education. The policy document emphasises sustainable oil and gas resource exploitation with linkages to the environment, agricultural production and the rest of the economy. Four years down the course of oil production, the practical measures taken to achieve the objectives set out in the policy framework and the economic impact of the successes and failures on Ghana's economy is subjected to scrutiny in this study. Of particular concern is the economic impact of petroleum production and sustainable

[1] A medium term policy framework spanning the period 2010-2013 with five thematic focal areas of agriculture, infrastructure (including energy, oil and gas), water and sanitation, health and education.

*Corresponding Author

revenue management options for oil and gas proceeds. The extent to which these areas under consideration contribute to the achievement of the objectives of GSGDA is systematically examined.

1.1. Government Policy and Petroleum Resource Management

The socio-economic opportunities presented by petroleum production are enormous. To meet intergenerational needs, the sustainable and optimal exploitation and utilisation of the benefits derived from these finite resources is essential (Djiofack and Omgba, 2011). Suitable policies, plans and programmes of action and rigorous efforts by government, institutions, civil society and communities are inevitable in the achievement of this goal. Toft and Duero (2011) outline the crucial role of politically established policy agenda in determining the terms, conditions and investment risks encountered in the upstream petroleum sector.

In like manner, Ghana's upstream oil and gas exploitation is greatly influenced by the appropriateness of government policy.

According to Kolstad *et al.* (2009), policy initiatives that fail to combat the interests and incentives for institutional disequilibrium create difficulties for a country to escape the negative consequences of natural resources endowments. In the view of Al-Kasim *et al.* (2013), weak governance and corruption within and outside the oil sector in like manner influence revenue management, government spending decisions and levels of welfare improvements. Tsani (2013) notes that volatilities in oil prices coupled with instabilities in revenues has created a challenge in revenue management for resource-rich economies. Manteaw (2010) outlines the challenges with other resource extraction such as Ghana's mining sub-sector with marginal contributions to government revenue. Poverty, mismanagement, corruption and inefficient institutions continue to hamper economic development in Ghana. The role played by critical sectors in the national development agenda often elude the attention of policy makers. Inadequate review of policy objectives in relation to these sectors has often denied the nation some valuable lessons.

1.3 The Ghana Shared Growth and Development Agenda

Various political regimes, since Ghana's independence, have sought to pursue policies with different areas of focus aimed at achieving economic development. This started with the Consolidated Development Plan in 1957 and an ambitious Seven-Year Development Plan by Dr Kwame Nkrumah, the nation's first Prime Minister, in 1963 (Mensah-Bonsu, 2008). In consequence, the first policy framework since the advent of the fourth Republican Constitution was the Coordinated Programme of Economic and Social Development policies dubbed, Ghana: Vision 2020, the first development policy launched after Ghana's return to constitutional rule in 1993. It was aimed at consolidating the foundations for accelerated economic and social development to propel Ghana to a middle income country by 2020 with thematic areas being poverty alleviation, enhancement of human resources, increasing employment and strengthening social infrastructure (NDPC, 1995).

The medium term national development policy frameworks which succeeded Vision 2020 are the Ghana Poverty Reduction Strategy (GPRS Ⅰ) and the Ghana Poverty Reduction Strategy (GPRS Ⅱ) aimed at reducing poverty and enhancing livelihood and as a pre-requisite for debt relief under the Highly Indebted Poor Countries Initiative (HIPC). A comprehensive policy integrating oil and gas since the resource was discovered in commercial quantities in 2007 is the Ghana Shared Growth and Development Agenda (GSGDA), a medium term policy which covers the period from 2010 to 2013. Its strategic direction is to lay the foundation for structural transformation of the economy through industrialisation, based on modernised agriculture and sustainable exploitation of natural resources especially minerals, oil and gas (NDPC, 2010). A significant component of the medium term policy is therefore petroleum production which commenced in the latter part of 2010 the year the policy was also introduced.

The thematic areas of focus include agriculture, infrastructure, water and sanitation, health and education. The objectives within these thematic areas include ensuring and sustaining macroeconomic stability, enhanced competitiveness of the private sector, propelling agricultural modernisation and natural resource management, oil and gas development, infrastructural development, human development, employment and productivity and transparent and accountable governance. Specific to the oil and gas sector, the policy emphasises employment creation, environmental protection, revenue management and transparency, capacity building, economic diversification, increasing access to petroleum products and petroleum pricing (NDPC, 2010). These constitute the main subjects of review and analysis in this paper.

Research work encompassing government policies in relation to different aspects of Ghana's economic development have been conducted. Studies with focus on Ghana's energy resources have dwelled mostly on energy pricing, access and consumption particularly hydroelectricity (Adom and Bekoe, 2012; Adom *et al.*, 2012; Miller *et al.*, 2011), bio fuel (Afrane, 2012; Duku *et al.*, 2011; Jumbe *et al.*, 2009; Mohammed *et al.*, 2013; Quaye, 1996), wood fuels (Afrane, 2012) and other renewable energy sources (Arthur *et al.*, 2011; Ofori-Boateng *et al.*, 2013; Osei *et al.*, 2013) and the environmental consequences of these energy forms (Scheren *et al.*, 2004). Some of these research studies have analysed issues relating to government policy and these energy forms. Particularly, Kemausuor *et al.* (2011), for instance investigated the achievement of the Millennium Development Goals (MDGs) ensuring access to energy through the provision of electricity, cooking fuel and renewable energy. Heller and Heuty (2010) also analysed the accountability mechanisms in Ghana's proposed oil legislations, mainly the Petroleum Revenue Management Bill (PRMB) and the Petroleum (Exploration and Production) Bill. A similar research to the present is that of Asafu-Adjaye (2010) which sought to estimate the impact of oil production on Ghana's economy using the computable general equilibrium model and proposed policies to mitigate the negative consequences of oil and gas production on Ghana's economy. The GSDA being an all-encompassing framework starting in the same year as offshore oil and gas production and extending three years into the country's journey of oil production, a large research gap requires to be filled particularly with regards the sustainability and economic contributions of this

policy framework on Ghana's oil sector. Findings are expected to contribute immensely to policy options and uncover opportunities for a sustainable oil and gas production and utilisation of proceeds.

The rest of the paper is organised as follows; section two presents the methods and a brief review of literature, section three presents the results and discussion and section four concludes the study.

2. Methods

This paper is based on the positivist philosophy. The alignment to this paradigm can be attributed to the use of empirical data instead of opinions, analysing relationships within the data obtained and building propositions that are applicable to the larger unit. Pugh (1983) as cited in Easterby-Smith *et al.* (2008) used a similar philosophy in his study of manufacturing organisations in West Midlands. According to Biggam (2008), the philosophy emphasises quantifiable data which is not influenced by predictable human behaviour hence making findings more objective and reliable.

Thus, our work is based on an experimental research design ans we test hypotheses to establish facts that address the research aim. The largely quantitative nature of this study provides a justification for the use of the technique. In the view of Easterby-Smith *et al.* (2008), the ideal methodologies for carrying out a research based on the positivist paradigm are experimental and quasi-experimental strategies. The use of this technique is justified by the largely quantitative nature of the study with clear objectives requiring the use of statistical techniques. Quantitative analysis involving the use of statistical methods (regression analysis) was conducted in fulfilment of objectives of measuring the economic impact of petroleum production with the aid of the Statistical Package for Social Scientists (SPSS).

2.1. The GDP-Oil Growth Model

An empirical test of the extent of contribution to GDP by Ghana's petroleum sub-sector was conducted by formulating a multiple regression model named, the GDP-Oil Growth Model specified as follows.

$$GY = \beta_0 + \beta_1 AGR + \beta_2 \mathrm{SER} + \beta_3 \mathrm{OIL} + \beta_4 \mathrm{MNU} + \beta_5 \mathrm{MIQ} + \beta_6 \mathrm{OND} + \mu \ldots \quad (1)$$

Where;

GY denotes Ghana's quarterly Gross Domestic Product

AGR represents Agriculture share of GDP

SER represents Services Sector share of GDP

OIL represents Crude Oil contribution to GDP

MNU represents the Manufacturing Sub-sector contribution to GDP

MIQ represents the Mining and Quarrying sub-sector contribution to GDP

OND represents the 'Other Industry Sub-sector' (electricity, water and sewerage and construction)

μ is the residual term

β_0 is the constant

β_1 to β_6 represent the coefficients of the six variables in the model

The model estimation and specification above is similar to the model used by Wen (2011) in his analysis of the effect of coal abundance on economic development. The following null and alternative hypotheses were thus formulated

H_o: the output from crude oil is not a significant determinant of GDP

H_1: the output from crude oil is a significant determinant of GDP

The multiple regression made use of quarterly constant GDP statistics, drawn from the Ghana Statistical Service (GSS), as the explained variable. These were regressed against the relative quarterly contributions by sectors and sub-sectors; namely, Agriculture, Services, Petroleum, Manufacturing, Mining and Quarrying and Other Industry Sub-sectors made up of Electricity, Water and Sewerage and Construction. The relatively short period of Ghana's commercial oil production history and hence scanty data about oil production compelled the use of quarterly data in order to capture sufficient dynamics of the impacts of oil production in Ghana by the regression model. Available data is from the last quarter of 2010 to the last quarter 2012. To adjust for the impact of inflation, GDP figures at Constant 2006 prices were used.

To ensure easy and meaningful interpretation of results, the fitted model for the regression was transformed by taking the logarithm of both the dependent and independent variables to aid the measurement of the impact of individual variables.

Equation 1 was thus transformed as:

$$GY = \beta_0 + \beta_1 logAGR + \beta_2 logSER + \beta_3 logOIL + \beta_4 logMNU + \beta_5 MIQ + \beta_6 OND + \mu \ldots \quad (2)$$

This made it possible to provide economic interpretations of the coefficients of the variables as elasticities and to meaningfully estimate the impact of oil production on Ghana's economy.

Multiple regression was preferred as a method of data analysis due to the need to estimate the impact of oil production while adjusting for the influence of other variables. Many other factors contribute to determining the level of GDP of a country and such influences can best be catered for using multiple regression analysis. The problem of non-inclusion of variables correlated with the explanatory variables is what Koop (2005) refers to as omitted variable bias and is overcome by the use of multiple regression. Multiple regression not only expresses a linear relationship but measures the effect of changes in variables on another variable. This enabled predictions to be made regarding changes in the model output.

2.2. Economic Impact of Oil and Gas Production

A study of the link between natural resource endowments and the economic growth and development of resource rich economies has yielded contrasting results. For example, Wen (2011) observed that traditional economic theory prior to the 1960s viewed natural resource endowments as a precondition for capital accumulation and economic development, but other studies (Auty, 2001; Gylfason, 2001; Sachs and Warner, 2001) have associated resource abundance with slower economic growth via a series of mechanisms often resulting in a 'resource curse'[2]. The significance of resource endowments on the growth path of resource-abundant economics has been argued on both sides by a third set of scholars (Esfahani *et al.*, 2013; Sachs and Warner, 2001). The 'traditional', 'resource curse' and other economic theories of natural resource endowments have not eluded academic discourse on the economic impact of oil and gas production.

2.2.1. The Traditional Positivists View of Natural Resource Endowments

A number of writers have studied and expressed optimism regarding the degree to which oil production impacts on the economies of different oil-producing nations. Asafu-Adjaye (2010) applied a counterfactual simulation of the Computable General Equilibrium (CGE) model to determine the impact of oil production on Ghana's economy. The results presented in two scenarios showed the impact of oil production from the Jubilee Field in the first scenario is a 3.5 percent per annum increase in GDP growth rate and a more than threefold increase in growth rate for the second and more optimistic scenario. The results of the simulation using various economic variables are presented in Table 1.

Table-1. Impact of Jubilee Field Oil Production on Ghana's Economy

Variable	Scenario One	Scenario Two
GDP Growth	3.5	12.2
Trade Balance (US $ million)	-402.01	-1280.90
Terms of Trade	2.3	5.8
Aggregate Exports	-10.2	-28.5
Aggregate Imports	6.9	23.4
Household Disposal Income	3.7	12.8
Welfare (US $ million)	113.23	257.93

Adapted from Asafu-Adjaye (2010)

The results from Table 1 show an overall net positive impact of oil production on Ghana's economy with sectoral variations regarding the extent of the impact.

Papyrakis and Gerlagh (2004) employed regression analysis to estimate the impact of natural resource endowments and economic growth. A positive impact of natural resources was discovered between natural resources and economic growth with the inclusion of explanatory variables such as corruption, investment, openness, education and terms of trade. It was observed that the largely positive impact of a variable like investment was due to the fact that natural resource wealth decreases the need for savings and provides an uninterruptible stream of future income which is less reliant on man-made capital. Stijns (2006) examined the correlation between subsoil wealth and human capital accumulation and revealed a significantly positive relationship particularly in developing economies like Ghana which could spur economic development. Using static and dynamic and estimation methods[3] for Lower-Middle Income Countries (LMICs), Aydın (2012) showed that Ghana's oil wealth could boost its per capita income growth by two percentage points in the long term with strong macroeconomic policies and reduced fiscal deficits. The extents of the impact of this essential resource are verified in the light of the GSGDA using an ordinary least squares (OLS) regression. A number of assumptions are required for precise estimation of the regression parameters and to produce other favourable qualities. If the assumptions of normal distribution, homogeneous variance and zero expected value of the residual among others are held, there is a potential to result in an unbiased OLS estimator, minimum variance of all linear unbiased estimators and use of the t and F tests in drawing inferences. However, OLS assumptions are stringent hence any violation of these assumptions and multicolinearity of data has the potential to strip the model of its constructive properties. This can introduce issues of biased and inefficient estimates of the standard errors and may not allow for correlation within residuals.

2.2.2. The Resource Curse Theory

The resource curse theory was initially put forward by Auty (1993). Auty (2001) employed the competitive industrialisation and staple strap models to analyse the relationship between political economy, natural resource endowments and economic development. The study applied certain pre-conditions, policy, capital accumulation to generate economic outcomes on diversification, GDP growth and the Dutch disease[4]. It was concluded a development path is likely to be pursued by resource-rich economies which distorts the economy in favour of rent

[2] The decline in economic growth associated with resource endowments often occurring through a cumulative set of mechanisms notably retarded diversification, erratic GDP growth and the Dutch Disease.
[3] Micro and macroeconomic models used to analyse the interactions between endogenous and exogenous variables at a particular time or over a time-path for decision making purposes.
[4] The exchange rate depreciation and resource reallocations that result from a booming extractive sector and diminishing agricultural and manufacturing sectors due to foreign exchange inflows from resource extraction.

seeking resulting in a staple trap. In the analysis, Ghana was cited as a classic example of resource rich countries with strong Dutch Disease effect, retarded diversification and erratic GDP growth.

Gylfason (2001) further asserted an inverse relationship between per capita GNP and share of natural capital in national wealth by conducting regression analysis for over 90 countries. The study also noted that oil rich countries tend to experience slower economic growth in the long term. Several other studies (Boyce and Herbert Emery, 2011; Papyrakis and Gerlagh, 2007; Sachs and Warner, 2001; Scheren *et al.*, 2004) have subjected this to critical analysis with similar results. Papyrakis and Gerlagh (2004) using regression analysis asserted that countries (such as Nigeria and Venezuela) rich in natural resources experience slower growth than countries that are natural resource deficient (such as Hong-Kong and Japan). Boyce and Herbert Emery (2011) portrayed evidence of slowed growth in natural resource exporting economies using cross-sectional growth regression. Based on his staple trap model, Algeria's economy remained locked in the trap with hydrocarbons yielding 30% of GDP, 60% of government revenues and 95% of exports but constituted a meagre three percent of direct employment as at 1990 (Auty, 2003; Nashashibi *et al.*, 2000).

Aydın and Acar (2011) revealed that oil price shocks results in a decline in economic growth and a rise in inflation simultaneously with the degrees of net importation, dependence on oil, share of taxes in fuel prices and the effects of policy reactions by advanced economies as determinants of the exposure of a developing country like Ghana. Oil and gas production is therefore crucial in cushioning macroeconomic volatilities.

Bjorvatn and Farzanegan (2013) conducted panel regression and robustness tests on 120 countries controlling for variables cited in criticism of the resource curse thesis and revealed the income effect of demographic transition is limited by higher resource rents. It was also concluded that natural resources such as oil hamper the capacity of an economy to support a dynamic manufacturing sector and create jobs for young people resulting in low per capita incomes and a resource curse.

2.2.3. The Neutralists Worldview

Another body of literature have resorted to a neutral stance on the significance of the impact exerted by oil and gas production on the macro economy citing the relationship as dependent on other economic variables. Using a long-run macro econometric model assuming the form of a Cobb Douglas production function, Esfahani *et al.* (2013) identified the growth of oil income ($g°$)) relative to the combined growth of labour (n) and technology (g) as determinants of the long term impact of oil on the output of an economy. The analysis demonstrated that where $g° < g + n$, the economic impact of oil income tends to drive towards zero whereas if $g° \geq g + n$, oil income exerts an autonomous impact on capital accumulation in the long term. A study that sought to capture the link between policy and political power balance and oil rents on economic growth using panel regression was undertaken by Bjorvatn *et al.* (2012). It was concluded that high fractionalisation of government as it is the case with multi-party democracy in Ghana tends to produce weak governance (resulting in a weak policy framework) and oil revenue appear to be wholly wasted. This suggests that political power imbalances and weak policies erode the direct positively significant effects of petroleum revenues on real GDP.

3. Results

3.1. The Impact of Crude Oil Production on Ghana's Economy

The output generated from the analysis of the sectoral impact of oil production in SPSS is presented in Table 2.

Table-2. GDP-Crude Oil Growth Test Results

Model	Std. Error	Standardized Coefficients	t	Sig.
		Beta		
(Constant)	130.768		-3.722	.065
Agricultural Sector	.011	.782	89.354	.000
Manufacturing Sector	.116	.098	12.214	.007
Mining and Quarrying	.050	.150	16.149	.004
Other Industry	.162	.051	4.694	.043
Services Sector	.042	.344	30.282	.001
Petroleum Sector	.109	-.013	-1.231	.344

Dependent Variable: Total GDP per Quarter
R-Squared = 0.999
Adjusted R-Squared = 0.998

3.1.1. Interpretation of Model Results

Given that GDP is an aggregate of the output from various sectors of the economy, the joint significance of the variables was expected to be high. This has been confirmed by high R^2 value of 0.999 implying that nearly 99.9 per cent of the variation in GDP is the result of the contribution from the various sectoral outputs. The t-statistics for all the variables except for petroleum sector are positive and significant as shown in Table 2.

At 5 per cent confidence level, 'Other Industry' (made up of electricity, water and sewerage and construction) is a significant determinant of GDP whereas Agriculture, Manufacturing, Mining and Quarrying and Services sectors are significant at 1 per cent. Adjusting for the contribution of the other variables, petroleum output is not a significant determinant of Ghana's GDP at the current level of production. Therefore we fail to reject the null

hypothesis and conclude that the share of crude oil at current production level is not a significant contributor to Ghana's GDP. After correcting for the sample size and the number of predictors depicted by the adjusted R^2 value, the significance of the model was still high at 0.998. It therefore implies that our model is significant.

With regards the individual variables, the impact of the various determinants of GDP and petroleum production which is the focus of this study is estimated using the fitted model transformed by taking the logarithms of both the dependent and independent variables. This facilitated an economic interpretation of the coefficients as elasticities with respect to changes in GDP.

Integrating the coefficients from Table 2 into equation (2) results in equation 3;

$$logGY = 0 + 0.782logAGR + 0.344logSER - 0.013logOIL + 0.098logMNU + 0.15logMIQ + 0.05logOND \ldots \quad (3)$$

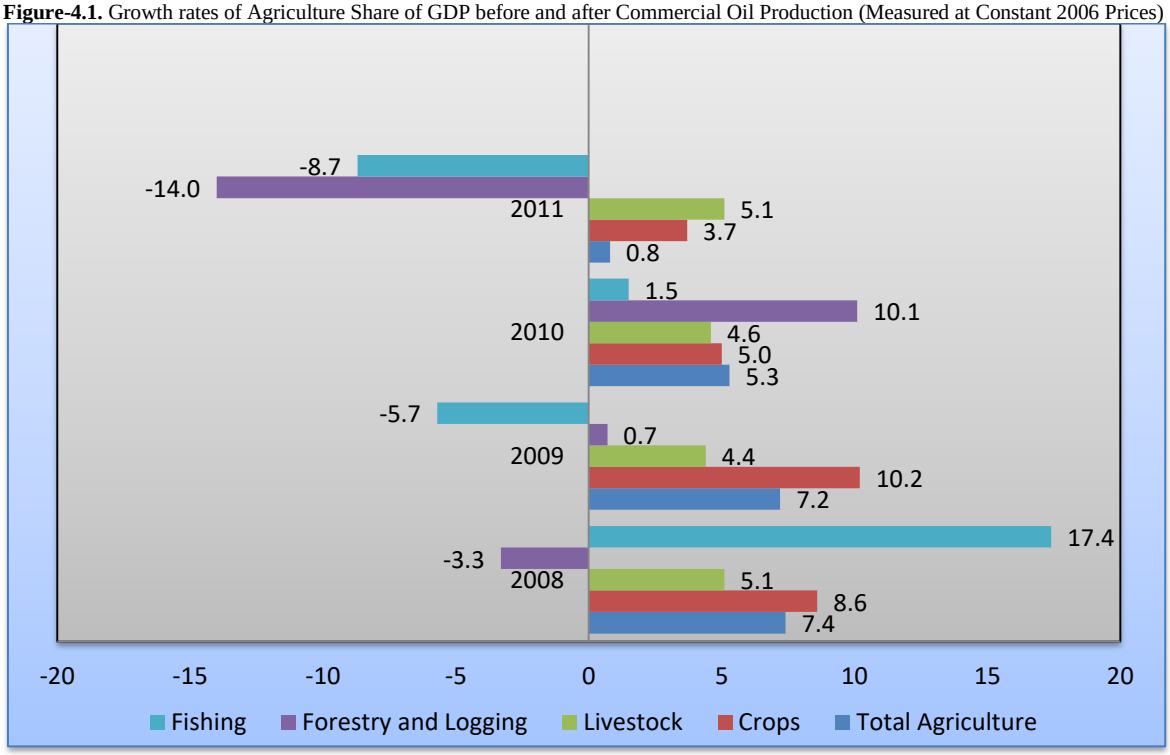
The coefficients from equation three (3) are interpreted as elasticities representing the percentage change in GDP as a result of the percentage change in the contribution from each sector or sub-sector. The percentage changes however are adjusted for changes in the other sectors of the economy. In the case of the petroleum sub-sector, using the approximation that $e^y \approx 1 + y$, the base-e log of the variable *OIL*is exponentiated as $e^{logOIL+0.013} = e^{logOIL}e^{0.013} = OIL\ e^{0.013} \approx OIL\ (1 + 0.013)$ denoting an approximate increase of one per cent in '*OIL'*. Therefore, it can be concluded that a percentage increase in the share of petroleum sector GDP would result in approximately one per cent reduction in Ghana's GDP adjusting for the contribution from all other sectors and sub-sectors included in the model. The next section investigates the extent to which structural alterations and distortions resulting from the influx of petroleum have caused a declining competitiveness of major agricultural output as a share of GDP. The importation of heavy machinery and other equipment required for extraction of oil and gas have placed a huge burden on the exchange rate driving up unexpectedly the prices of major inputs used in the manufacturing sector.

4. Discussion

Petroleum production taken in isolation contributes towards the growth of the Ghanaian economy through GDP, support services and human capital development. For instance, since 2010 up to the end of 2014, nearly three billion dollars (US$ 2.811 billion) has accrued to the state of Ghana through petroleum revenues (PIAC Report 2014). Tullow Oil Ghana for example offered 114 scholarships in 2013 alone and the company is expected to sponsor at least 50 Ghanaian nationals annually to pursue various careers within the petroleum industry. GNPC as well as the Ministry of Energy and Petroleum have scholarship and training programmes with similar objectives. Capacity building programmes in various aspects of the oil and gas value chain are commendable features of the local content arrangement.

However, when petroleum production is juxtaposed with the rest of the economy particularly agriculture which is the mainstay of the economy different results are seen. The growth rates of individual sub-sectors under the agricultural sector two years before and after the commencement of oil production were used. The results spanning the period 2008 to 2012 are presented in Figure 4.1.

Figure-4.1. Growth rates of Agriculture Share of GDP before and after Commercial Oil Production (Measured at Constant 2006 Prices)



Source: Ghana Statistical Service (2013)

The GDP growth rate of the agricultural sector averaged 7.3 per cent over the two years period (2008-2009) prior to commercial oil production in Ghana in 2010. The two years average after 2010 has however witnessed a drastic reduction to 1.05 per cent. This is attributable to the negative growth rates of the forestry and logging sub-sector as well as cocoa. Although the commencement of oil production particularly the huge investments in oil wells in 2011 could divert attention from investment in the agricultural sector, a number of other possible explanations could be assigned for these growth trends.

The significantly high growth rates of 26.6 per cent and 14.0 per cent in 2010 and 2011 for cocoa output declined to negative rates as oil production soared. The depletion of timber resources evident by the negative growth rates of the forestry sector for two consecutive years in 2011 and 2012 and the revision of the Forest and Wildlife Policy can also account for the shrinking agricultural sector. The trend however points to a decreased regard for investment and an evolving unconsciousness about agricultural production with the advent of oil and gas. The GSGDA policy objective of boosting agriculture amidst oil production judging from the statistics discussed earlier lacks initial signs of robust achievement.

The low standard error values displayed in table 2 implies that there is little uncertainty regarding the behaviour of the variables in the model and further support the prediction that oil sector contribution after adjusting for the other sectors could have insignificant impact on Ghana's GDP. In addition, equilibrium real effective exchange rate has witnessed consistent appreciation, a possible result of the importation of oil extraction-related services and equipment into the country amidst deteriorating institutional management.

With little value addition to Ghana's raw material export base, erratic power supply and rising cost of imported industrial inputs, the manufacturing sector is bound to suffer from reduced competition. In addition, the persistent deceleration and eventual stagnation of the agricultural sector growth by the end of 2011 further corroborates the prediction of the model. Indeed the forestry and fisheries subsectors according to the Ghana Statistical Service (2013) experienced significantly negative growth rates in excess of eight per cent. The overall share of agriculture to total GDP continues to witness a decline, reducing from 25.3 per cent in 2011 to 23.0 per cent in 2012 and further to 22.0 per cent in 2013.

The Ghana Cedi also depreciated by a cumulative value of 14.5% in 2013 and 16% in just the first half of 2014. The manufacturing sector of Ghana also witnessed a rapid expansion from 7.6 per cent in 2010 to 17.0 per cent in 2011 but sharply declined to five per cent in 2012. Whether the decline in growth from 2011 to 2012 is an optimal or sub-optimal response to the growing oil and gas sector would depend on the flexibility of the economy and the sufficiency of data to prove a real decline resulting from oil production. Importantly though, these are warning signals to the influx of the Dutch Disease effects and seek to challenge the GSGDA objective of applying science, technology and innovation to modernise agriculture and create linkages with industry through the proceeds generated from oil and gas production.

The negative (-0.103) relationship between petroleum production and GDP is attributable to structural changes in the economy and distortions caused by the commencement of oil production to other productive sectors such as agriculture and manufacturing. This supports the findings of Ghana's Centre for Policy Analysis (2014) that erosion of international price competitiveness of the tradable subsectors (such as gold and cocoa) of the non-oil sector is a consequence of the inflow of oil wealth.

The results also follows from Gylfason (2001) who discovered a negative relationship between natural capitals in national wealth using regression analysis for more than 90 resource endowed economies. However, the t-statistics show values above 0.05 for all other variables in the model and buttress the significance of the contribution from the other sectors except for the petroleum sector. The t-statistic for petroleum sector is minus 1.231 which shows that the result for the sector is not significant. Investment in oil and gas projects saw a decline over the period 2011 to 2012 and could be responsible for the insignificant contribution from petroleum. A total of 21 oil fields were at various stages of appraisal and development by the end of 2011 with very few additions in 2012 such as the Voltaian Basin Projects.

Only the Jubilee and Saltpond fields were producing by the close of 2012 as a result of slowed investment and limited addition to already producing fields and the expected revenue growth thereof. Also, oil production adds to the natural resource wealth of Ghana making available cheap funds and distorts other productive sectors hence the insignificant contribution from petroleum after adjusting for these distortions. This contradicts the findings of Asafu-Adjaye (2010) who, using a counterfactual simulation model predicted that oil production from the Jubilee Field could generate a 3.5 per cent increase in growth rate of Ghana's economy annually. His findings however failed to take into account the counterproductive effects the growth of the petroleum sector would exert on the non-oil sectors. The results could partially be attributed to the slowed growth of significant investment over the period 2011 to 2012 in the development of oil wells.

Another possible explanation for the results is the growing nature of the sector as oil production just began in the last quarter of 2010. Except for 2011, the non-oil sector still contributed in excess of 90 per cent of the annual GDP growth rates even until the first half of 2014. Also, the effect of oil production on other productive sectors is yet to be realised on the economy with a positive impact envisaged in the long term. This possibly corroborates Aydın (2012) assertion that in the long run, oil wealth in Ghana could boost per capita income growth by two percentage points. Oil production has however spurred human capital development as scholarships and capacity building programmes aimed at equipping people with the skills to participate in the oil industry are prevalent.

5. Conclusion and Policy Implications

Ghana joined a host of other African countries in a bid to extract her hydrocarbon reserves, anticipating a turn-around of economic circumstances within the framework of a structural transformation agenda imbedded in a medium term development plan, the Ghana Shared Growth and Development Agenda (GSGDA), which set forth in the same year as commercial oil production commenced. The extent to which sustained long term impacts can be made depends on the contributions made to economic development through operations and output from the oil sector, ability to avoid the Dutch Disease and how revenues are invested to create long term value that will benefit future generations.

Although Ghana's petroleum receipts have had substantial budgetary contributions, created new employment and investment opportunities, at present petroleum has contributes less to GDP vis-à-vis contributions from the other sectors and sub-sectors of Ghana's economy. Petroleum output at current production levels is not a significant contributor to Ghana's GDP after adjusting for the contribution from other sectors of the economy. This is partly attributed to a decline in investment in oil and gas development projects over the period 2011 to 2012. Also, a likely explanation is the fact that the industry is still fledging and is in its incubation period recording annual production of 24,195,895 and 26,351,278 million barrels in 2011 and 2012 respectively. Resultant revenues were 30% and 46.7% below their 2011 and 2012 targets respectively yielding a very low net value of less than two per cent of GDP despite the substantial initial capital investments. The revenue available for spending in the priority areas of the GSGDA was thus reduced.

Further, a 1% increase in petroleum sector share of GDP at current levels results in 1% reduction in output from other non-petroleum sectors. There are significant warning signals of the Dutch Disease effects as agricultural share of GDP has declined consistently with real effective exchange rate appreciation. In the early stages, increased oil production is attended by the importation of heavy oil and gas related extraction equipment and services and with little improvement in value addition to exports results in significant appreciation in real effective exchange rate which is counter-productive for other sectors. This causes great concern and requires immediate policy intervention (on distribution of income and attention to various sectors) as it is a warning signal to the influx of a Dutch Disease particularly as agricultural share of GDP has declined consistently since 2011.

The objectives of the GSGDA have been largely unattained between 2010 and 2013. Although prioritisation of petroleum revenue expenditure has focused on areas under the purview of medium term development programme, four priority areas in the 2011/2012 Petroleum Annual Report have been expenditure and amortisation of loans for oil and gas infrastructure, roads and other infrastructure, agricultural modernisation and capacity building. These have not just covered only two of the seven objectives within the broad focal area of oil and gas development within the GSGDA, but have also not captured critical aspects of the energy value chain including efficient petroleum prices, increased access to petroleum products, economic diversification and transparency particularly in the award of oil blocks. An intra and inter-sectorial harmonization of activities of each thematic area is thus advocated.

This would mean spending on priority sectors of the GSGDA should be scaled up gradually to encompass processing industries, develop linkages with the agricultural sector and build a stronger economic base even in the absence of oil and gas. Even though the Petroleum Revenue Management Act prescribes important scaling-up features such as stabilisation buffers and external savings, the limitations placed by the Act and discretion granted to the Finance Minister have reduced the ability to accumulate significant buffers to cater for shocks given the country's petroleum production profile. For example only one out of the five liftings for 2012 had a percentage lodged in the GHF and GSF. This provides an avenue for random spending in periods of oil revenue surge. Public investment should be planned and gradually scaled-up even during revenue bursts.

In consequence the following are recommended

There is need to ensure a carefully targeted spending of petroleum revenues and windfalls on priority areas of the GSGDA and the Ghanaian economy, viz agricultural, manufacturing and services sectors which are the traditional contributors to Ghana's GDP.

Investment in productive sectors and expansion of the export base through the revenue generated from oil and gas is crucial for sustainability.

The 'gradual scaling-up approach' for petroleum revenue utilisation is recommended for petroleum revenue utilisation in Ghana and the discretionary powers of individuals concerning the decisions about spending petroleum revenues should be reviewed and eliminated.

Reducing external borrowing and seeking domestic participation in the petroleum sector after three years of oil production are absolute requirements for optimal and sustainable production Ghana's petroleum.

Reference

Adom, P. K. and Bekoe, W. (2012). Conditional dynamic forecast of electrical energy consumption requirements in Ghana by 2020, A comparison of ARDL and PAM. *J. Energy*, 44(1): 367-80.

Adom, P. K., Bekoe, W. and Akoena, S. K. K. (2012). Modelling aggregate domestic electricity demand in Ghana, An autoregressive distributed lag bounds cointegration approach. *Energy Policy*, 40(0): 530-37.

Afrane, G. (2012). Examining the potential for liquid biofuels production and usage in Ghana. *Energy Policy*, 40(0): 444-51.

Al-Kasim, F., Søreide, T. and Williams, A. (2013). Corruption and reduced oil production, An additional resource curse factor? *Energy Policy* 54(0): 137-47.

Arthur, R., Baidoo, M. F. and Antwi, E. (2011). Biogas as a potential renewable energy source, A ghanaian case study. *Renewable Energy*, 36(5): 1510-16.

Asafu-Adjaye, J. (2010). Oil production and ghana's economy, What can we expect? *Ghana Policy Journal*, 4: 35-49.

Auty, R. M. (1993). Sustaining development in mineral economies.

Auty, R. M. (2001). The political economy of resource-driven growth. *European Economic Review*, 45(4-6): 839-46.

Auty, R. M. (2003). Third time lucky for algeria? Integrating an industrializing oil-rich country into the global economy. *Resources Policy*, 29(1-2): 37-47.

Aydın, L. (2012). The economic impact of petroleum royalty reform on turkey's upstream oil and gas industry. *Energy Policy*, 43(0): 166-72.

Aydın, L. and Acar, M. (2011). Economic impact of oil price shocks on the turkish economy in the coming decades, A dynamic cge analysis. *Energy Policy*, 39(3): 1722-31.

Biggam, J. (2008). *Succeeding with your Master's Dissertation, a Step-by-Step Handbook.* Open University Press McGraw Hill Education.

Bjorvatn, K. and Farzanegan, M. R. (2013). Demographic transition in resourcerich countries, A blessing or a curse? *World Development*, 45(0): 337-51.

Bjorvatn, K., Farzanegan, M. R. and Schneider, F. (2012). Resource curse and power balance, Evidence from oil-rich countries. *World Development*, 40(7): 1308-10.

Boyce, J. R. and Herbert Emery, J. C. (2011). Is a negative correlation between resource abundance and growth sufficient evidence that there is a resource curse? *Resources Policy*, 36(1): 1-13.

Centre for Policy Analysis (2014). Ghana economic review and outlook 2013 [online]. Available: www.cepa.org.gh/pressreleases2/Exe_Summary67.pdf

Djiofack, C. Z. and Omgba, L. D. (2011). Oil depletion and development in cameroon, A critical appraisal of the permanent income hypothesis. *Energy Policy*, 39(11): 7202-16.

Duku, M. H., Gu, S. and Hagan, E. B. (2011). Biochar production potential in Ghana- A review. *Renewable and Sustainable Energy Reviews*, 15(8): 3539-51.

Easterby-Smith, M., Thorpe, R. and Jackson, P. R. (2008). *Management research.* SAGE Publications: London.

Esfahani, H. S., Mohaddes, K. and Pesaran, M. H. (2013). Oil exports and the iranian economy. *The Quarterly Review of Economics and Finance*, 53: 221-37.

Ghana Statistical Service (2013). Ghana's gross domestic product [online]. Available: http://www.statsghana.gov.gh/gdp.html

Gylfason, T. (2001). Natural resources, education, and economic. *Development European Economic Review*, 45(4): 847-59.

Heller, P. R. P. and Heuty, A. (2010). Accountability mechanisms in ghana's 2010 proposed oil legislation. *Ghana Policy Journal*, 4: 50-67.

Jumbe, C. B. L., Msiska, F. B. M. and Madjera, M. (2009). Biofuels development in sub-saharan Africa, Are the policies conducive? *Energy Policy*, 37(11): 4980-86.

Kemausuor, F., Obeng, G. Y., Brew-Hammond, A. and Duker, A. (2011). A review of trends, Policies and plans for increasing energy access in Ghana. *Renewable and Sustainable Energy Reviews*, 15(9): 5143-54.

Kolstad, I., Wiig, A. and Williams, A. (2009). Mission improbable, Does petroleum-related aid address the resource curse? *Energy Policy*, 37(3): 954-65.

Koop, G. (2005). *Analysis of economic data.* 2nd edn: John Wiley and Sons Ltd: England.

Larsen, E. R. (2005). Are rich countries immune to the resource curse? Evidence from Norway's management of its Oil Riches. *Resources Policy*, 30(2): 75-86.

Manteaw, S. (2010). Ghana's EITI lessons from mining and policy implications for oil. *Ghana Policy Journal*, 4: 96-109.

Mensah-Bonsu, I. F. (2008). *Ghana's development agenda past and present, KOAFEC on-the-spot workshop for west Africa.* Accra, Ghana.

Miller, V. B., Ramde, E. W., Gradoville Jr, R. T. and Schaefer, L. A. (2011). Hydrokinetic power for energy access in Rural Ghana. *Renewable Energy*, 36(2): 671-75.

Mohammed, Y. S., Mokhtar, A. S., Bashir, N. and Saidur, R. (2013). An overview of agricultural biomass for decentralized rural Energy in Ghana. *Renewable and Sustainable Energy Reviews*, 20(0): 15-25.

Nashashibi, K., Alonso-Gamo, P., Bazzoni, S., Feler, A., Laframboise, N. and Oliva, M. A. (2000). *Estimation of trade protection in middle east and north African countries IMF working paper.* International Monetary Fund: Washington, D. C.

NDPC (1995). Ghana-Vision 2020, a presidential report on co-ordinated programme of. *Economic and Social Development Policies*: Available: http://www.ndpc.gov.gh/GPRS/Ghana's%20Vision%202020%20-%20First%20Step.pdf

NDPC (2010). *Medium-term national development policy framework, Ghana shared growth and development agenda (GSGDA).* Government of Ghana.

Ofori-Boateng, C., Lee, K. T. and Mensah, M. (2013). The prospects of electricity generation from municipal solid waste (msw) in Ghana, A better waste management option. *Fuel Processing Technology*, 110: 94-102.

Osei, G., Arthur, R., Afrane, G. and Agyemang, E. O. (2013). Potential feedstocks for bioethanol production as a substitute for gasoline in Ghana. *Renewable Energy*, 55 (July): 12-17.

Papyrakis, E. and Gerlagh, R. (2004). The resource curse hypothesis and its transmission channels. *Journal of Comparative Economics*, 32(1): 181-93.

Papyrakis, E. and Gerlagh, R. (2007). Resource abundance and economic growth in the United States. *European Economic Review*, 51(4): 1011-39.

Pugh, D. S. (1983). *Studying organisational structure and process.* Sage Publications: London.

Quaye, E. C. (1996). Energy demand in the 21st century, The role of biofuels in a developing country. *Renewable Energy*, 9(1-4): 1029-32.

Richmond, C., Yackovlev, I. and Yang, S. S. (2013). *Investing volatile oil revenues in capital-scarce economies, An application to angola imf working paper no, Wp/13/147.* International Monetary Fund: Washington D. C.:

Sachs, J. D. and Warner, A. M. (2001). The curse of natural resources. *European Economic Review*, 45(4-6): 827-38.

Scheren, P. A. G. M., Kroeze, C., Janssen, F. J. J. G., Hordijk, L. and Ptasinski, K. J. (2004). Integrated water pollution assessment of the ebrié Lagoon, Ivory Coast, West Africa. *Journal of Marine Systems*, 44(1-2): 1-17.

Stijns, J. (2006). Natural resource abundance and human capital Accumulation. *World Development*, 34(6): 1060-83.

Toft, P. and Duero, A. (2011). Reliable in the long run? Petroleum policy and long-term oil supplier reliability. *Energy Policy*, 39(10): 6583-94.

Tsani, S. (2013). Natural resources, Governance and institutional quality: The role of resource funds. *Resources Policy*, 38(2): 181-95.

Wen, Z. (2011). An empirical study of the linkage between resources development and economic development-taken shanxi province as example. *Energy Procedia*, 5(0): 1394-13.