

Working paper

Managing the Macroeconomy in an Oil Rich Country

The Case of Ghana

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Abstract

The discovery of commercial quantities of oil and gas off the coast of Ghana in June 2008 has given rise to high expectations and optimism for improved prospects for rapid economic development and poverty reduction. However, there have been public concerns for the proper management of the increased foreign exchange inflows and the transparent use and fair distribution of the financial gains. There are also fears of a possible Dutch disease, which could reduce competitiveness in key export and import-competing sectors and adversely impact the livelihoods of major parts of the population. The challenges of effective fiscal policy relate to the fact that oil revenues constitute a larger part of government revenue and they are volatile, unpredictable, exhaustible and mostly driven by external demand. This paper provides an empirical analysis over the 1970-2011 period using CVAR estimations within a fiscal response framework. The main finding is that oil revenues have the potential to impact positively on macroeconomic performance. This is based on estimated government's fiscal behaviour or response with respect to foreign aid and tax revenue. The paper concludes by noting that the realisation of these benefits is not guaranteed and will depend crucially on whether the implicit assumption that the incentives associated with oil revenues will be similar to that of foreign aid or tax revenue.

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Introduction

The discovery of commercial quantities of oil and gas off the coast of Ghana in June 2008 has given rise to high expectations and optimism for improved prospects for rapid economic development and poverty reduction. However, there have been public concerns for the proper management of the increased foreign exchange inflows and the transparent use and fair distribution of the financial gains. There are also fears of possible negative consequences, which could reduce competitiveness in key export and import-competing sectors and adversely impact the livelihoods of major parts of the population. Both economic theory and available evidence suggest that natural resources provide opportunities for income growth, but continued dependence on resource rents presents serious concerns. History and the experiences from resource-rich countries in Africa are not encouraging. Many resource-rich countries have ended up with disappointing growth performance during the periods of natural resource booms. This phenomenon is generally called “the curse of natural resources”. This arises due to a number of reasons.

First, the discovery of natural resources has tended to be associated with appreciation of the real exchange rate, leading to what is often referred to as “Dutch Disease.” The real appreciation arises in two ways: i) growth in the value of natural resource exports increases the supply of foreign exchange and creates pressure for a nominal appreciation; and ii) resources are attracted into the booming sector, increasing costs and reducing profits for other sectors. The real appreciation renders other sectors and non-natural resource exports less competitive. Usually, the manufacturing and agricultural export sectors, such as cocoa in the Ghanaian case, suffer most as they become uncompetitive. Second, oil prices have been known to be notoriously volatile by nature with a consequent volatility in resource export revenue. These price fluctuations and the related volatility in revenue from exports create macroeconomic instability and problems for fiscal policy. Third, natural resource rents have been linked to increased corruption and deterioration in the quality of institutions.

Ghana first discovered offshore oil reserves in the 1970s but by 1990 production was still negligible. The Ghana National Petroleum Corporation (GNPC) was established in 1983 by the government to promote the exploration and production of oil. There were several agreements that were reached by the corporation and a number of foreign firms. Out of these agreements, US-based Amoco was to prospect in 10 offshore blocks between the eastern border of Ghana with Togo and Ada; Diamond Shamrock was to explore the Keta Basin; and the Tano River Basin was for Petro Canada International for exploration. In 2007, the Jubilee oil field was discovered and it was said to have up to three billion barrels (480 million cubic meters) of light oil. Additional discoveries were made during 2011 which included the Banda-1 exploration well which discovered oil offshore West Cape Three Points Block, Teak-2 located offshore West Cape Three Points Block which has encountered high-quality oil, condensate and natural gas, Enyenra-2A appraisal well, offshore deep water Tano, has successfully encountered oil in excellent quality sandstone reservoirs and the Sankofa 2A well has also been successfully drilled and appraised.

Production of oil in Ghana started in late 2010 and has now reached a level of about 100,000 barrels per day, which is close to planned targets. In 2011, total produced

volume of crude oil summed up to 24,195,895 barrels (66,290 barrels on average per day) against the targeted 30,929,005 barrels (84,737 barrels on average per day). The deficit in production in relation to the target was mainly due to difficulties encountered in production at the Jubilee fields. In 2012 there was an improvement despite the difficulties encountered in the first and second quarters of the year. An increase of about 8.9 per cent over the 2011 total produced volume of crude oil was achieved. The volume of crude oil produced in 2012 was 26,351,278 barrels. Exploration continues and according to the government of Ghana, the country is expecting to expand its reserves within the next few years to around 5 billion barrels.

Since production of oil started, oil revenues have become significant for Ghana's public finance. In accordance with Section 48 (Act 815) of the Petroleum Revenue Management Act (PRMA), 2011, the receipts from crude oil are to be made known to the general public through publication of receipts.¹ The first lifting of oil by GNPC on behalf of the state was in March 2011 and a total of 995,259 barrels was lifted. Throughout 2011, a total of four different lifting was undertaken which make up 3,930,189 barrels with a realized total revenue of US\$444.12 million (GH¢690.26 million). In 2012, five liftings by GNPC were again done with an average of 986,207 barrels and all together provided a total of 4,931,034 barrels. In 2011, total receipts from crude oil amounted to US\$444.12 million, representing approximately 6 percent of total revenue. In 2012, government received an amount of US\$541.07 million as revenue from crude oil with a projected petroleum receipts of US\$581.72 million for the fiscal year 2013. The major part of petroleum income is income tax. The additional oil entitlement and GNPC commercial profits are also considerable. The third and smallest component is royalties. At the upper end of estimates, Ghana's oil reserves can have significant impact of the performance of the economy. van der Ploeg (2011) estimates that at its peak, production from the Jubilee field could generate up to 30 per cent of the government's annual income, if oil is at \$75/barrel. Ghana must harness its oil revenues to both promote sustainable economic growth and provide for future generations. As rightly noted by van der Ploeg (2011), Ghana's PRMA appears weighted too heavily towards short-term spending.

In this paper, we investigate the likely impact of oil revenue on economic performance in Ghana. The broad objective of this paper is to explore the effects of oil dependency on real growth and examine the likely outcomes of the fiscal response to Ghana's recent oil find. More specifically, the following questions would be addressed: How is oil likely to shape the Ghanaian economy? How challenging is economic management likely to be in the presence of oil? Since Ghana has only been producing oil for two years we will address these questions by examining the experience with foreign aid and tax revenue in a fiscal framework. The core of the paper uses time series data to assess the relationship between fiscal variables including foreign aid, estimate the parameters of the fiscal relationship and simulate alternative impacts of the oil revenue on government fiscal variables and economic growth. While the comparison between foreign aid and natural resource revenue may seem odd, we will argue that in terms of fiscal and macroeconomic effects the relevant differences between natural resource

¹ The PRMA outlines how government's portion of the oil receipts is to be used. The revenues are to be allocated between the annual budget and sovereign wealth funds as the income is received.

revenue and foreign aid are in fact few. In fact the analysis also allows us to treat oil revenue as being used in fiscal terms - in the same way as tax revenue

The rest of the paper is organized as follows: The Section II provides a review of the literature with respect to natural resource curse, fiscal response to aid and aid and growth. In Section III provides a brief overview of the economic performance in order to provide background information on Ghana. An outline of the methodology, including the motivation for using aid as a proxy for oil revenue is presented in Section IV. In Section V we present the results and discussions. The final section contains the concluding remarks and draws some policy implications.

Literature Review

The Natural Resource Curse: Theory and Literature Review

There is by now a voluminous literature on the link between natural resources and economic performance. There is a growing uneasiness over a trend that seems to suggest that a country which is abundantly endowed with natural resources must definitely suffer low economic performance. In their seminal work published in 1995, Sachs and Warner postulated an apparent negative impact of natural resource abundance on economic growth over the period 1960-1990. Sachs and Warner (1995) provide evidence that resource-rich countries have lower economic growth rates than their resource-poor counterparts. Since this influential work, it is widely accepted that natural resource abundance is associated with poor economic performance. Typical examples of countries that have suffered this phenomenon include Sudan and Nigeria, which over the past fifty years have made several efforts to leverage resource wealth for development but had woefully failed in the process (Moss and Young, 2009).

Indeed, a large body of literature has emerged in economics and political science analyzing the tendency that those countries with high levels of natural resources exhibit worse economic and political outcomes. Important theoretical and empirical studies have tried to understand why and how natural resources can become a “curse” for a country rather than a “blessing”. The literature on the “curse of natural resources” generally identifies a negative effect of natural resources on economic performance. Corden and Neary (1982); Gelb (1988); Auty (1990); Karl (1997); Sala-i- Martin (1997); Sachs and Waner (1999, 2001); and Gylfason (2001), among others, have provided articulated theoretical arguments and empirical work on whether natural resources are a curse or blessing, and how the abundance or dependence on natural resources could be a curse. Much of this work confirms the inverse correlation between economic growth and natural resource exports.

By far, the most talked-about effect of natural resource wealth is the associated appreciation of the real exchange rate, a phenomenon often referred to as “Dutch Disease.” The appreciation of the exchange rate arises due to the rise in the value of natural resource exports, which generally makes other (non-natural resource) commodity exports less competitive. The “Dutch Disease” is derived from an economic

phenomenon observed in the Netherlands, where the discovery of natural gas reserves in the 1960s had severe effects on the Dutch manufacturing industries by causing the Dutch real exchange rate to appreciate. This appreciation of the real exchange rates makes the local manufactures less competitive in the international market, resulting in the gradual deterioration of the manufacturing sector. Fears of a “Dutch Disease” customarily assume that a sizeable inflow of Overseas Development Assistance (ODA) will exacerbate macroeconomic instability, namely, by raising inflation and appreciating the real exchange rate. Moreover, it is also assumed that growth will be impaired because exchange-rate appreciation will hamper the competitiveness of a country’s export sector (Rajan and Subramaniam, 2005).

According to Wunder (1997), the “Dutch Disease” fundamentally tells a story of sectoral reallocation in an open economy facing a foreign exchange transfer. An overvalued currency was the first identified symptom associated with the ‘Dutch Disease’ (Gylfason, 2001b). The natural resource boom and the associated surge in raw-material exports tend to drive up the value of the domestic currency in real terms. Since natural resource abundance is often accompanied by booms and busts, exchange rate volatility is highly likely. The unstable exchange rates create uncertainty that tends to hurt exports and capital flows, including foreign investment. Apart from the exchange rate volatility, the increasing currency value also means that the non-booming trade sector is no longer attractive to the workforce. As for that matter, labour turn to the non-tradable sector (such as services) and through an increase in the demand for non-tradable goods, the price of the non-tradable sector increases. This leads to a real exchange rate appreciation (Gordon, 2006).

It is important to note that the negative effects of natural resources are often contingent on the magnitude of the resource rent accruing to the state and how the revenue from these resources are used. As Morrison (2012) points out, it is not so much the discovery of natural resources *per se* that hurts economic performance but rather the revenue that these resources generate for the government and how these revenues are expended. As such, it is possible for natural resources to be a “blessing” and not a “curse” if the revenues fall into the hands of a competent and non-corrupt government. On that reasoning, there seems to be a very close parallel between the “natural resource curse” and aid effectiveness literatures, as both are important nontax sources of revenue for governments in developing countries. Morrison (2012) provides a very cogent review of both stands of literature and draws interesting similarities between the effects of foreign aid and that of natural resources, for example, oil. What emerges from Morrison’s (2012) review of the most recent literature is encouraging – the recent literature has dispelled the notion that natural resources must necessarily be associated with a curse. Where the institutional environment is found to be of good quality, natural resources may not have negative effects and can even have positive economic impacts (see Hodler, 2006; Mehlum, Moene, and Torvik, 2006; Robinson, Torvik, and Verdier, 2006; Bhattacharyya and Hodler, 2009).

Fiscal Effects of Aid: Theory and Literature Review

Literature on how aid affects the fiscal behaviour of governments has been growing. Studies in this area have been classified into two broad groups by Osei et al. (2005). They explained that the first broad group which is on fungibility studies have sought to

analyze effects of aid on the composition of government spending. They argue that aid is fungible if it is given for one purpose (say investment) and used for another (consumption). One implication for macroeconomic management in terms of aid is that it is vital for it to be invested so as to lay the foundation for higher growth in the economy rather than use it for current consumption (Sackey, 2001). Evidence of considerable fungibility is found in most studies. Devarajan et al. (1998) in a study of fungibility of aid in 16 African countries found that most aid (90%) boosted government expenditures (as opposed to leading to lower taxes). About half of the aid was used to finance external debt service payments, one-quarter of the aid was used to finance investments and the final quarter went into current account spending. However, McGillivray and Morrissey (2000) noted that fungibility may not be important in practice; even if aid is not necessarily allocated to where it is supposed to be spent (in the view of donors), it contributes to government spending.

The second group of studies uses fiscal response models (FRMs) and goes further to argue that aid has complex impacts on government fiscal behaviour—on tax effort and borrowing in addition to effects on the allocation of expenditures. These studies tend to discover that aid eventually leads to increased spending, and total spending often increases by more than the value of aid (McGillivray and Morrissey, 2004). There is evidence that aid has had a beneficial impact on investment and recurrent spending in Sub-Saharan African countries (Commission for Africa, 2005, p. 314). Asea and Reinhart (1996) found that failure to deal appropriately with the heavy capital inflows could derail the significant structural reform programme that had been undertaken. One of the seven problems identified by Manning (2012) concerning aid is that government (and other) spending is open to malpractice and inefficiency in all countries, and in particular where institutions are weak, and accountability to donors trumps accountability to local stakeholders. He further cited high dependency on aid and crowding out of the private sector by the state as another problem of hindering aid effectiveness. The availability of aid has facilitated the public sector to be a larger element of the economy than would otherwise have been in the more aid-dependant states and as such the private sector is marginalized (Manning, 2012).

Osei et al. (2005) using data spanning the period 1966-98 find that aid to Ghana was mainly associated with reduced domestic borrowing and increased tax effort. In other words aid did influence 'good economic policy' in Ghana. Osei (2012) noticed from data for the period 2002-07 that, whenever aid inflows increased, government's capital expenditure also increased and that recurrent expenditures has a lower correlation with aid flows, relative to capital expenditures. This confirms findings by McGillivray (2003) that aid is associated with increased public expenditures, including those which are pro-poor, the fungibility problem notwithstanding. Domestic borrowing as suggested by Osei et al. (2005), has been the main long-term financing item for primary deficits in Ghana, and that aid is used to alleviate short- to medium-term constraints with the implication that in periods where the level of domestic borrowing is lower, or after it has been lowered, aid would have a greater impact on spending if limits to borrowing were maintained. Osei et al. (2005) continued that policymakers in Ghana perceived aid as an alternative to domestic borrowing and thus spending was not directly influenced by the year-on-year fluctuations in aid inflows.

Aid and Growth

Several macro cross-country econometric studies in the past found a negative relationship between aid and GDP growth, and wanted to explain it by aid reducing domestic savings or increasing the capital-output ratio (Griffin, 1970; Griffin and Enos, 1970). Papanek (1972) argued that aid might well reduce domestic savings by increasing total income and consumption, but could still increase total savings and investment. He found a positive relationship between aid and GDP growth, but there were wide unexplained variations in aid effectiveness between countries. According to Loxley and Sackey (2008), aid increases investment, which is a major transmission mechanism in the aid-growth relationship. Furthermore, grant aid is more effective than other forms. In a survey of 41 studies of the relationship between aid and savings (17 of which covered all foreign resource inflows), Hansen and Tarp (2000) noted that the majority concluded that total savings increased but by less than the amount of the aid inflow. There was the conclusion that aid has a positive impact on growth only when governments pursue sound fiscal, monetary and trade policies and, hence, should be targeted to low-income countries pursuing sound economic management (World Bank's *Assessing Aid*, 1998). Ali *et al.* (1999) reach related conclusions, arguing that aid to Africa can be particularly effective in the context of properly aligned exchange rates (as a proxy for 'sound' policy).

Hadjimichael *et al.* (1995), Durbarray *et al.* (1998) and Hansen and Tarp (2000, 2001) on the other hand found that aid had a significant impact on growth, regardless of the policy environment, 'as long as the aid to GDP ratio is not excessively high' (Hansen and Tarp, 2000, p. 389). Dalgaard *et al.* (2004) found that, though aid is a significant determinant of growth in the developing world, the magnitude of its impact depends on climate-related circumstances. Empirically, Lensink and White (2001) examined whether there is evidence that supports the notion of negative effects of high aid inflows. This they did by using a quadratic aid variable. They found that aid has a positive and significant effect on growth but aid squared had a negative effect on growth, though this latter finding was very sensitive to the choice of countries and to model specification. Though evidence of negative returns to aid was found, this happened at very high levels of aid inflows, that is, at an aid-GNP ratio of about 50 per cent for the receiving country. This is roughly in line with the finding of Durbarray *et al.* (1998), but at least double the findings of around 25 per cent by Dalgaard and Hansen (2001), Hansen and Tarp (2000) and Hadjimichael *et al.* (1995).

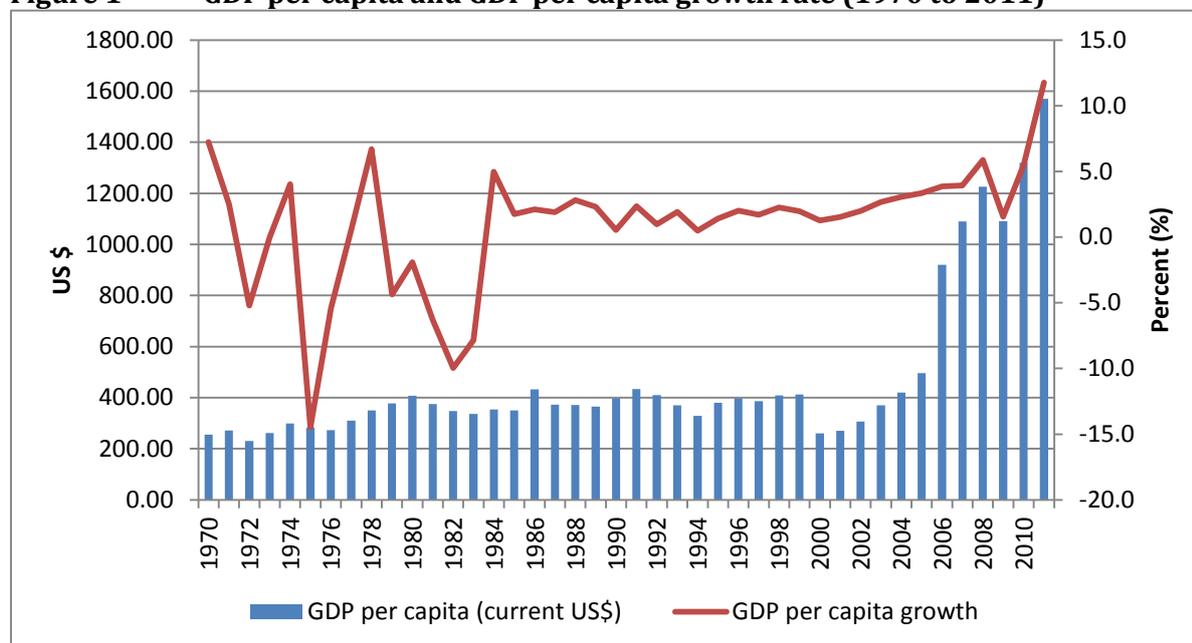
Burnside and Dollar (1997, 2000) concluded that the effectiveness of aid in promoting growth depended on the policy regimes of recipient countries. According to the Collier–Dollar selectivity approach, optimal aid allocation favours countries with high levels of poverty, low per capita incomes and sound policy regimes (Collier and Dollar, 2002). Manning (2006) argues that members of the Development Assistance Committee (DAC) 'should develop constructive dialogue with other bilateral donors based on recognition that sustainable development and poverty reduction should be the core purpose of aid' (p. 372). Some caution is in order over arguments that more aid is bound to be productive of better development outcomes—and indeed, most studies suggest that aid, like most other inputs, is subject to diminishing returns (Manning, 2012).

Background to Ghana's Economy

Economic Growth Trends

The economic growth trends for Ghana reveals two distinct periods (Figure 1). The first period covers the first two and half decades of post-independence Ghana with growth averaging near zero and with large volatility. The second period spans the period of economic recovery to date. This period recorded generally positive growth on average. In addition the last 10 years of the sample shows the beginnings of growth acceleration. Economic growth was particularly strong between 2002 and 2008, averaging at 6.1 percent per annum. In the year 2011, the economy grew at an unprecedented rate of 14.4 percent, making it the fastest growing economy in the world. This growth though was principally driven by oil production which started during the last quarter of the 2010 (ISSER, 2012).

Figure 1 GDP per capita and GDP per capita growth rate (1970 to 2011)

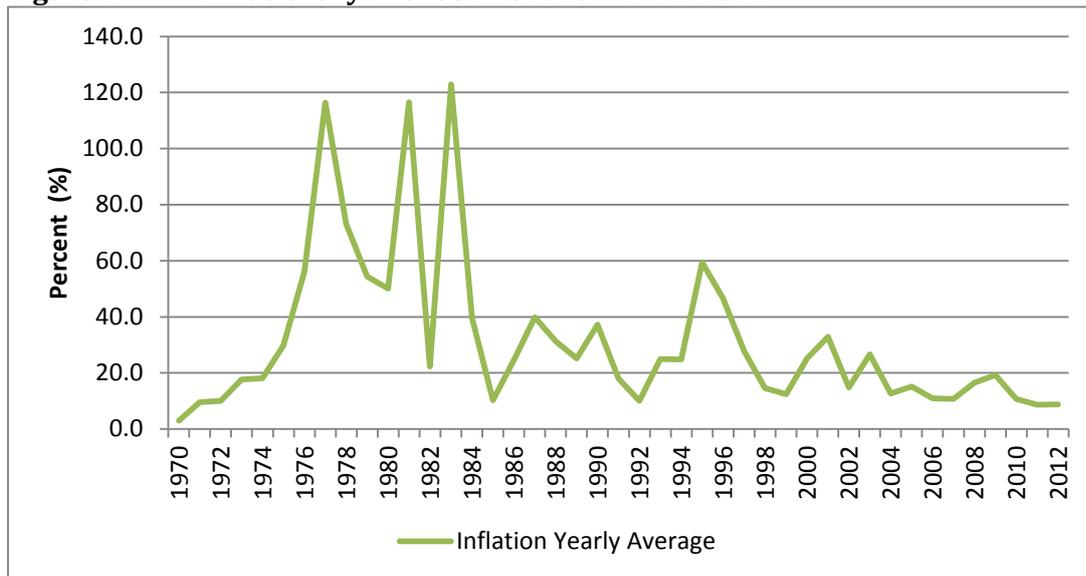


Source: World Bank Development Indicators, 2012

Inflationary trends

Inflation has been an intractable problem to the Ghanaian economy. The worst case was recorded in 1983 when the country had severe food shortages – inflation in that year peaked at about 123 per cent. The last 10 years have seen marked improvements compared to the early 1980s (Figure 2). The adoption of inflation targeting in 2003 seems to have contributed to this disinflationary era. Amoah and Mumuni (2008) attribute the jumps in 2003 and 2005 to the strong external oil price shocks. It is important to mention that this period also coincided with the implementation of deregulated prices of domestic petroleum products. Jerks in 2008 and 2009 were influenced in part by the developments in the global food crises and also the financial crises. Inflation dropped to 8.7% in 2011 from a double digit of 10.7% in 2010 and has since remained as single digit.

Figure 2 Inflationary Trends in Ghana - 1972-2012

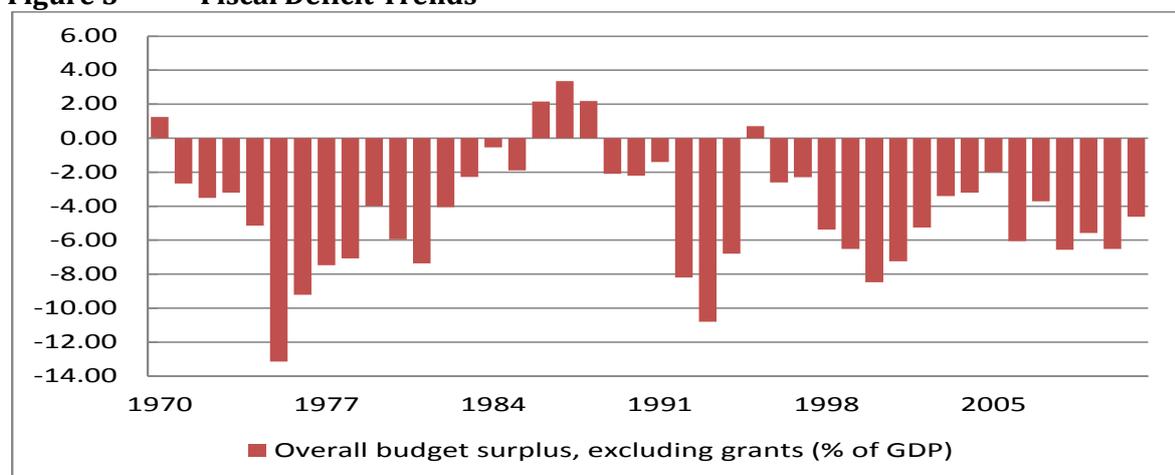


Source: World Bank Development Indicators 2012, and Ghana Statistical Service.

Government Fiscal Trends

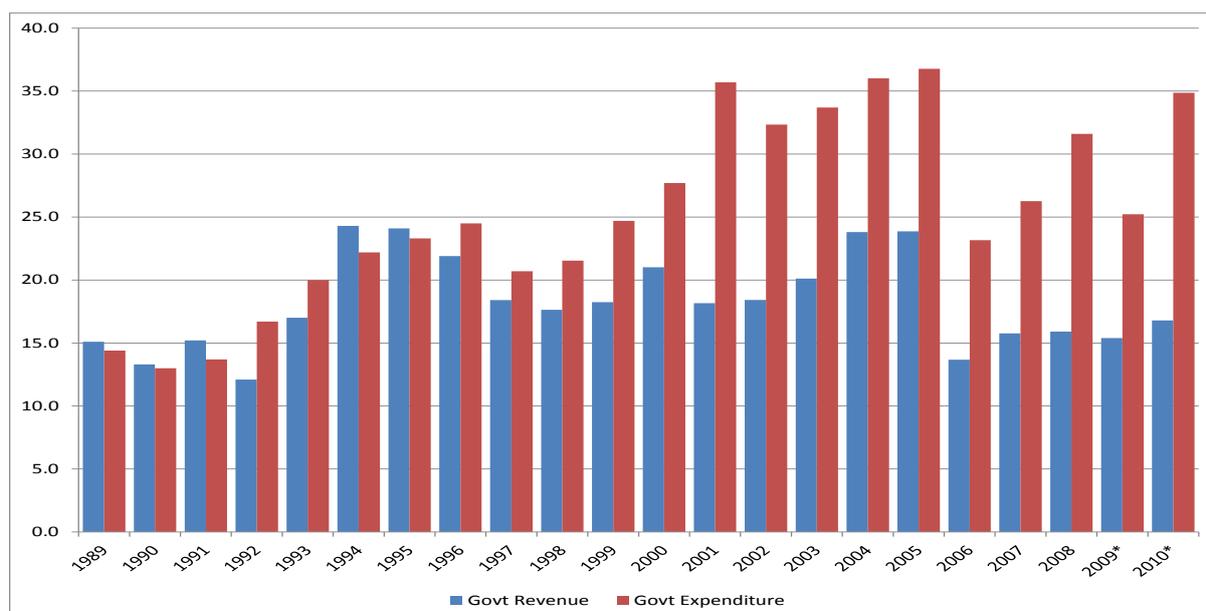
Fiscal balance trends of Ghana shows that the country has over the last 4 decades mostly run deficits. The magnitude of the deficits seems to have been smaller from about 1984 to date. The deficits narrowed after 1983 and by the late 1980s the country was recording surpluses. Unfortunately this was short lived and by the early 1990s, the country had reverted to the deficits position. Foreign aid did play a part in the improvement in fiscals over that period (See Addison and Osei, 2001; Osei et al, 2005). A notable feature of Ghana’s fiscal deficits in more recent times is the improvements observed for the period 2002 to 2005. The improvements came from the strict compliance to the Highly Indebted Poor Countries (HIPC) initiative conditions set for fiscal management. Unfortunately after reaching HIPC completion point, the country’s fiscal position worsened again.

Figure 3 Fiscal Deficit Trends



Source: World Bank Development Indicators, 2012

Figure 4 Trends in Government Expenditures and Revenue



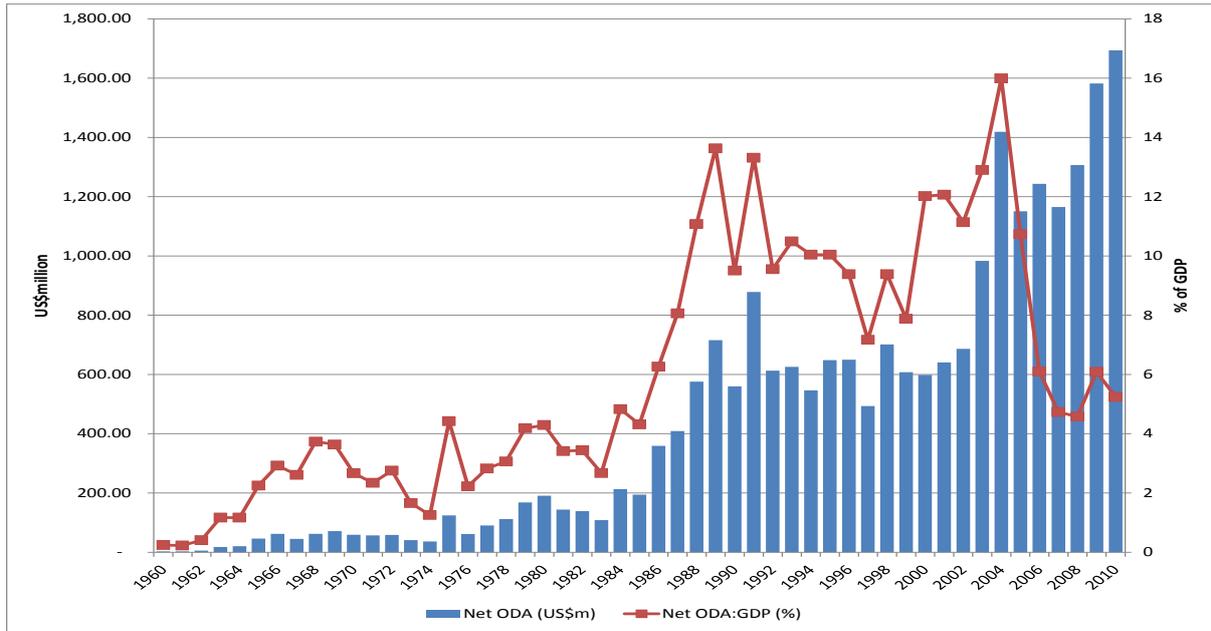
Source: Various Issues of Government of Ghana Budgets

It can be noted from Figure 4 that generally expenditures have exceeded revenue. The problem is that the expenditure increases have generally matched the revenue increases, so that it has been difficult to record a consistent reduction in the deficits. Even when deficits had to be reduced under the HIPC conditionalities, the expenditure pressures remained strong, almost matching that of revenue. Not surprisingly therefore upon reaching the HIPC completion point, the expenditure-revenue gap again widened. Indeed one could argue that foreign aid has helped both directly and indirectly, in maintaining fiscal discipline in the post-reform period.

Aid Flows to Ghana

In Figure 5 we show the inflows of aid as proportion to GDP for Ghana, over the period 1965 to 2011. The data suggest that there was a sharp increase in aid inflow from about 1984. Indeed the annual average net ODA to Ghana over the period 1960 to 1984 was about US\$78 million. As a percent of GDP this was about 2.5 percent annually. However from about 1985, there was significant increase in net ODA on the whole – the annual average over the period 1985-2010 was over US\$809 million, over ten-fold the pre-1984 period average. The increase in aid flows to Ghana during ERP and post-ERP has not been trivial. As Harrigan and Younger (2000) note, aid to Ghana as a percent of GDP and in per capita terms exceeded the SSA average from about the late 1980s. The other marked increase in more recent years coincide with the start of the HIPC initiative – between 2002 and 2003, net ODA increased from about US\$680 million to over US\$980 million.

Figure 5 Aid Flows to Ghana (1965-2011)



Source: World Development Indicators, 2012

Methodology

Cointegration Analysis

Model Specification

Following Juselius et al (2011) we base our estimations on a cointegrated VAR model of the form

$$\Delta y_t = \alpha(\beta' y_{t-1}) + \Pi \Delta y_{t-1} + \varphi D_t + \varepsilon_t \quad (1)$$

Where;

y_t – is a p -dimensional vector of non-stationary variables defined above.

α – is a $(p \times r)$ matrix of adjustment coefficients

$\beta' y_{t-1}$ – are the r cointegrating relations

D_t – is a $(n \times 1)$ vector of dummies and deterministic variables

φ – is a $(p \times n)$ matrix of coefficients

Π – is a $(p \times p)$ matrix of short run adjustment coefficients

Δ – is a first difference operator

ε_t – is a $(p \times 1)$ vector of error terms with a distribution as $Niid(0, \Omega)$

Using this general CVAR framework, we estimate three empirical models with a view to understanding the relationships between our macroeconomic variables. The three models that we estimate are as follows:

Model 1: y'_t is (gdp, aid, tax revenue, total government expenditure, domestic borrowing)

Model 2: y'_t is (gdp, aid, tax revenue, govt recurrent spending, Capital spending, domestic borrowing)

Model 3: y'_t is (gdp, aid, tax revenue, public investments, domestic borrowing)

In Model 1, statistical tests indicate that a VAR(3) passes most tests when dummies are included. Three impulse dummies are included in this model for the years 1974, 1991 and 1992. In Model 2 we replace the government expenditure variable with two components (recurrent expenditure and capital expenditure). The aim here is to try and address the question of how aid is used vis a vis recurrent and capital spending. The model 2 is a VAR(1). The Model 3, which is a VAR(3) uses public investments instead of government expenditures. For each of these three models we estimate a variant in which we include a trend in the long run relationship. The trend term is restricted to only the long run because the variables are all in logs and so including the trend term in the short-run part of the model presupposes that growth (change in the log of the variables) can go to infinity.

Using Aid as a Proxy for Oil Revenues

This study seeks to understand how oil revenues will affect macroeconomic management in Ghana. Ideally one can use the behaviour of the managers of the macroeconomy in the presence of oil revenues to predict future behaviour. On the one hand oil production has just started in Ghana and so there is limited data to allow for any rigorous analysis of how the revenues from oil will affect macroeconomic outcomes. However we suggest that a second best option will be to use a good proxy for oil revenues, and in this case foreign aid. This is particularly so given the type of relationship that we study in this paper. It is important to note that one of the key channels through which oil revenues are known to affect macroeconomic outcomes in an economy is through real exchange rate appreciation. The same channel is also important for how aid impacts on the macroeconomy (Opoku-Afari, Morrissey, & Lloyd, 2004).

This approach to analysis is in following Morrison (2012) who provides a detailed prognosis of how there should be no particular difference between a country getting its revenue from aid or, for example, oil. The reason is that the problems that connect natural resource wealth to poor political and economic outcomes derive from how the revenue from these resources is used and since both are largely nontax revenues and large in many instances, these two revenue sources have quite similar effects. One could argue that the main difference in principle is that donors monitor and exert some pressure over how aid is used and through the aid relationship have some influence on economic policy, especially macroeconomic management. The counterargument is that aid has been associated with improvements in macroeconomic and especially fiscal management in Ghana (Osei et al, 2005) and has helped establish institutions to encourage a more transparent use of oil revenues. Furthermore, as oil is local revenue it

can encourage greater accountability if Ghana's democratic institutions prove up to the task.

Results

Unit Root Tests

As a precursor to the estimation of the cointegration VAR, we investigate the properties of the data particularly regarding their stationarity or otherwise. We employ the Augmented Dickey-Fuller (ADF) tests here to test for the order of intergration of the series. The results show that all the variables, except private investments, are non-stationary and of the order 1 (Table 1). Private investment is however found to be trend stationary. Plots of the actual series as well as their correlogram are shown in the appendix. We therefore proceed to test for cointegration.

Table 1 Results of Unit Root Tests

		$\Delta Y_t = \alpha + \beta T + \gamma Y_{t-1} + \sum_{i=1}^p \delta_i \Delta Y_{t-1}$	$\Delta Y_t = \alpha + \gamma Y_{t-1} + \sum_{i=1}^p \delta_i \Delta Y_{t-1}$			
Variable	Lag	H ₀ : $\gamma=0$	$\phi_3 - \beta = \gamma = 0$ H ₀ :	$\phi_1 - \alpha = \gamma = 0$ H ₀ :	H ₀ : $\gamma^{NT}=0$	Inference
GDP	1	-0.0483	6..54	6.83	0.0501	I(1) with drift
Aid	0	-0.5589	5.915	2.02	-0.1256	I(1)
Texp	0	-3.2	13.14	----	----	I(1) with trend
Recexp	0	-2.54	8.73	----	----	I(1) with trend
Capex	4	-0.4847	8.24	----	----	I(1) with trend
Taxrev	0	-3.13	11.09	----	----	I(1) with trend
Dfin	0	-3.17	10.6	----	----	I(1) with trend
Inv	0	-2.6	7.0	----	----	I(1) with trend
Inv_pu	0	-1.83	3.37	1.45	-1.15	I(1)
Inv_pri	0	-5.71	32.6			I(0)
Critical Values		-3.55	6.73	4.86	-2.95	

Note: The critical values are at 5% significance level and indicate the level at which we reject the null as specified on row 2.

Determination of Cointegration Rank

The choice of the cointegration rank is very important as it affects not only the set up of the model, but also subsequent inference made. We employ the *trace test* (maximum likelihood test) in the determination of the cointegration rank. As Juselius et al (2011) note, we should expect at least one cointegration relationship which will come from cumulated productivity shocks as all the variables are in real terms. Based on our tests, we find that Models 1&2 have a rank of 1, using 5% significance level. However the tests will point to a rank of 2, for Model 1 (without trend) and Model 3 (without trend) at 10% significance level. For Model 3 and at the standard 5% significance level, the test suggest a rank of 2 and 1 for the without trend and trend cases respectively.

Table 2 Testing for Cointegration Rank

		Without Trend		With Trend	
	H ₀	Trace Statistic	P-Value	Trace Statistic	P-Value
Model 1	r ≤ 0	94.464	0.000**	107.8	0.001**
	r ≤ 1	94.464	0.058	57.963	0.142
	r ≤ 2	24.413	0.189	34.843	0.255
	r ≤ 3	7.8085	0.493	17.441	0.391
	r ≤ 4	0.59716	0.440	4.2534	0.707
Model 2	r ≤ 0	117.18	0.001**	128.07	0.008**
	r ≤ 1	65.227	0.109	73.444	0.380
	r ≤ 2	45.255	0.085	51.187	0.366
	r ≤ 3	26.613	0.114	32.467	0.369
	r ≤ 4	12.548	0.133	17.017	0.422
	r ≤ 5	2.082	0.149	5.3634	0.554
Model3	r ≤ 0	110.39	0.000**	130.53	0.000**
	r ≤ 1	48.769	0.039*	54.678	0.234
	r ≤ 2	26.649	0.113	32.176	0.385
	r ≤ 3	10.111	0.277	14.771	0.600
	r ≤ 4	0.0057347	0.940	4.5108	0.671

Note: *, ** indicate the null that the number of cointegration relationships is at most r , is rejected the significance level of 5% and 1% respectively. The alternative hypothesis is that the number of cointegrating relationships is $r+1$

We go on to test certain key hypotheses that we believe are of interest to unravelling the relationship between aid and tax revenue on one side, and the other macroeconomic variables on the other. To explain these hypotheses we rewrite Equation 1 in a more explicit form, with the assumption that we only have one cointegration relationship (i.e. rank =1). Given the variables in Model 1 and with the assumption of a rank of 1, the CVAR can be written as

$$\begin{bmatrix} \Delta \text{laid} \\ \Delta \text{lgdp}_t \\ \Delta \text{ltexp}_t \\ \Delta \text{ltxrev}_t \\ \Delta \text{IDfin}_t \end{bmatrix} = \begin{bmatrix} \alpha_{11} \\ \alpha_{21} \\ \alpha_{31} \\ \alpha_{41} \\ \alpha_{51} \end{bmatrix} [\beta_{11} \text{laid}_{t-1} + \beta_{12} \text{lgdp}_{t-1} + \beta_{13} \text{ltexp}_{t-1} + \beta_{14} \text{ltxrev}_{t-1} + \beta_{15} \text{IDfin}_{t-1}] + \Pi \Delta Y_{t-1} + \phi D_t + \varepsilon_{it} \quad (2)$$

Based on this specification and following from Juselius et al (2011) we test these three hypotheses.

Hypothesis 1 – Aid (tax revenue) is weakly exogenous: This is tested as $H_0^1 : \alpha_{11} = 0$. In this case foreign aid (or tax revenue) is not affected by any deviations from the long-run equilibrium. It is important to note that a non-rejection of this hypothesis does not imply that aid (tax revenue) is not affected by the other macroeconomic variables in the short-run.

Hypothesis 2 - Aid (tax revenue) is endogenous: This is tested as $H_0^2 : \alpha_{11} \neq 0; \alpha_{21} = \alpha_{31} = \alpha_{41} = \alpha_{51} = 0$. This means that aid (tax revenue) is purely adjusting so that shocks from aid (or tax revenue) remain only transitory and have no permanent effect on the macroeconomic variables.

Hypothesis 3 - Aid (tax revenue) is not important in the long run equation: This is tested as $H_0^3 : \beta_{11} = 0$.

Table 3 Results of key Hypotheses Tests

	Hypothesis	Aid	Tax Revenue
Model 1	H ₀ : Weak Exogeneity	23.026 [0.000]**	8.2842 [0.004]**
	H ₀ : Endogeneity of Variable	23.101 [0.000]**	33.167 [0.000]**
	H ₀ : Long-run exclusion	23.217 [0.000]**	2.739 [0.098]
Model 2	H ₀ : Weak Exogeneity	41.274 [0.000]**	0.5706 [0.450]
	H ₀ : Endogeneity of Variable	8.2632 [0.142]	52.628 [0.000]**
	H ₀ : Long-run exclusion	40.952 [0.000]**	0.7764 [0.378]
Model 3	H ₀ : Weak Exogeneity	29.84 [0.000]**	7.602 [0.022]*
	H ₀ : Endogeneity of Variable	12.38 [0.006]**	4.347 [0.226]
	H ₀ : Long-run exclusion	40.13 [0.000]**	11.49 [0.003]**

Note: *, ** indicate that the null hypothesis as specified in column 2 is rejected at the 5% and 1% significance level respectively.

Our results, summarised in Table 3 show that for Model 1 foreign aid is not exogenous and shocks to it has a permanent effect on the macroeconomic variables. We also find that foreign aid is important and cannot be excluded from the long run cointegration relationship. This general result for foreign aid is consistent across the three models estimated. The only exception is the endogeneity of foreign aid hypothesis which is not rejected in Model 2, suggesting that foreign aid have not had a permanent effect on the other macroeconomic variables in this model. This suggests that foreign aid has been determined by the macroeconomic variables in the model, implying that donors respond to fiscal variables.

In the case of the tax revenue, we find that it has had a permanent effect on the macroeconomic variables in the models with government expenditures (both the aggregate and disaggregate) plus in Model 2 we do find tax revenue to be weakly exogenous. However in the models with government expenditures, the results show that tax revenue is not important in the cointegration relationship. In contrast, for the Model 3 the results suggest that tax revenue is important in explaining the cointegration relationship.

The results from these three hypotheses, generally suggest that first, both variables of interest, foreign aid and tax revenue, are important in explaining the long run relationships obtained. Second, a shock to either one of these variables is likely to have a permanent effect on the other macroeconomic variables in the model. We therefore proceed to discuss estimates of the impulse response functions, of these two variables of interest, on the other macroeconomic variables.

Impulse Response Results

A shock to Foreign Aid

There are three key features of the response of macroeconomic variables to a shock in aid. First we note that aid impacts positively on output in Ghana, although its impact on public investments is negative. In other words foreign aid has been effective in Ghana. We note that this result holds for all the three models that we estimate (Figure 6, Figure 7, and Figure 8). This finding is consistent with Juselius et al (2011) who find similarly that aid impacted positively on output in Ghana but negatively on investments. Haile (2013) also find that foreign aid impacted positively on output and investment in Ethiopia over the period 1960 to 2009. The second feature of our results is that foreign aid reduced government expenditure but increased tax revenue in Ghana. This finding is consistent with the idea that aid did shape policy in Ghana and in the right direction (Osei 2005). Indeed we note from Model 2 that recurrent spending decreases with a shock in foreign aid (Figure 7). Finally the impulse response functions suggest that foreign aid impacts negatively on domestic borrowing. This finding is consistent with Osei et al (2005), and suggests a positive effect of foreign aid generally for the macroeconomy.

A shock to Tax Revenue

In the case of tax revenue, the main features of the results are summarised as follows: First, the results show that a tax revenue shock increases total output in Ghana. Second, we note that tax revenue impacts negatively on government expenditures, mainly recurrent expenditures. At first this may seem counter intuitive as one would expect a government that is able to raise more taxes, to spend more. However a plausible explanation may be that tax financing tends to be associated with increased domestic/local demand for accountability, and consequently leads to a reduction in recurrent spending in favour of capital spending. In other words because tax financing involves a direct transfer from households, it tends to increase the incentive of the electorate to demand accountability and prudence. This in turn means that public officials have to spend more on public investments to convince the electorate that the taxes are being put to good use. Thirdly our results show that tax revenues in Ghana have contributed to a decline in domestic borrowing. Generally these results suggest

that as domestic borrowing is being reduced a greater share of tax revenue has to be allocated to investment spending.

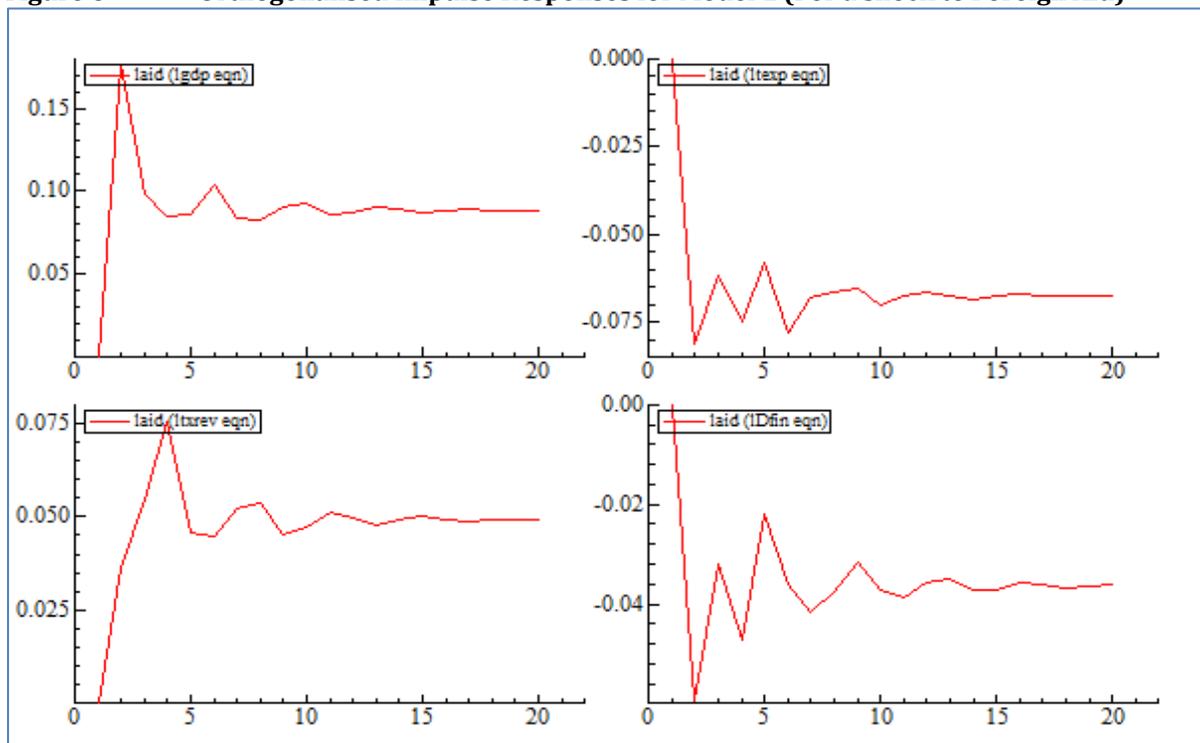
Table 4 gives a snap shot of what the main differences in the two shocks are – i.e. a foreign aid shock versus a tax revenue shock. The main difference in the shocks from these two sources is with respect to the private investment. Generally, for foreign aid, the impact of a shock will be to reduce public investment. However in the case of tax revenue, the effect of a shock will be to increase public investment. As discussed earlier, this could reflect the fact that tax increases need to be justified and the quickest way to show proper use of taxes is to spend on roads and other public investment.

Table 4 Macroeconomic Effects of a shock to Foreign Aid versus Tax Revenue

	GDP	Govt Expenditure	Dom Financing	Recurrent Expenditure	Capital Expenditure	Tax revenue	Public investment
Foreign Aid	+ve	-ve	-ve	-ve	+ve	+ve	-ve (0?)
Tax Revenue	+ve	-ve	-ve(0?)	-ve	+ve	-----	+ve

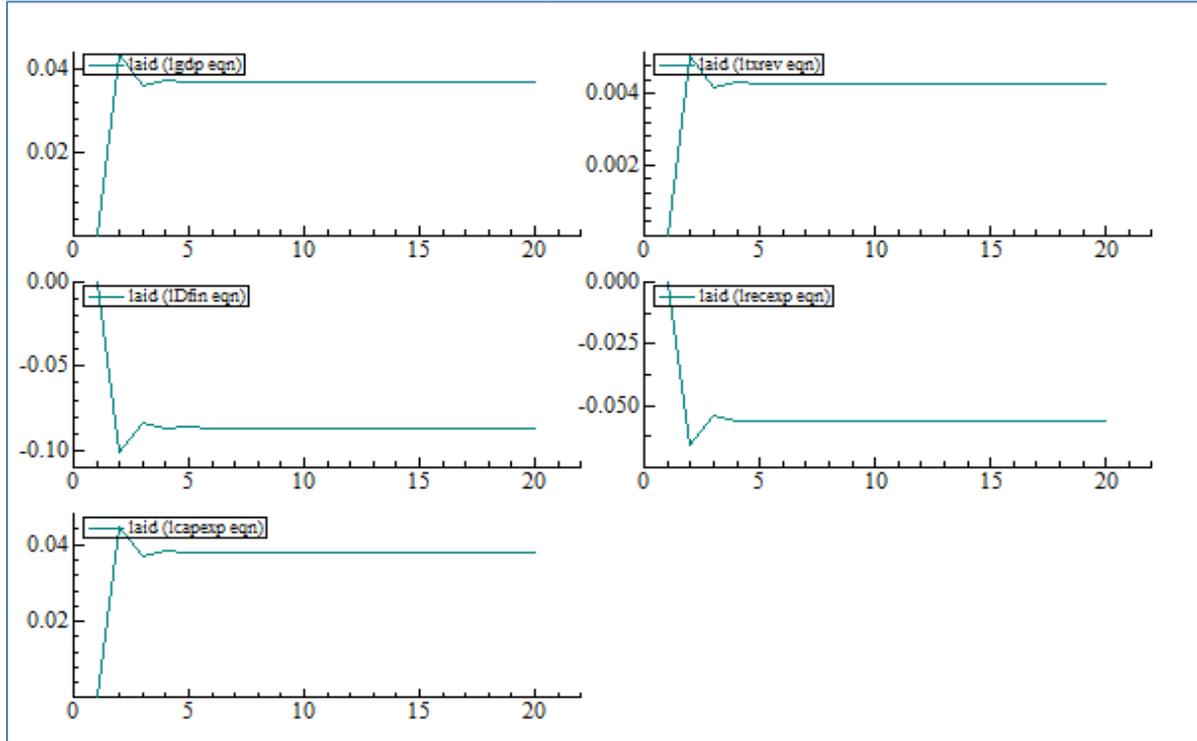
Note: Summary of IR results (reported in Figures 6-11.)

Figure 6 Orthogonalised Impulse Responses for Model 1 (For a shock to Foreign Aid)



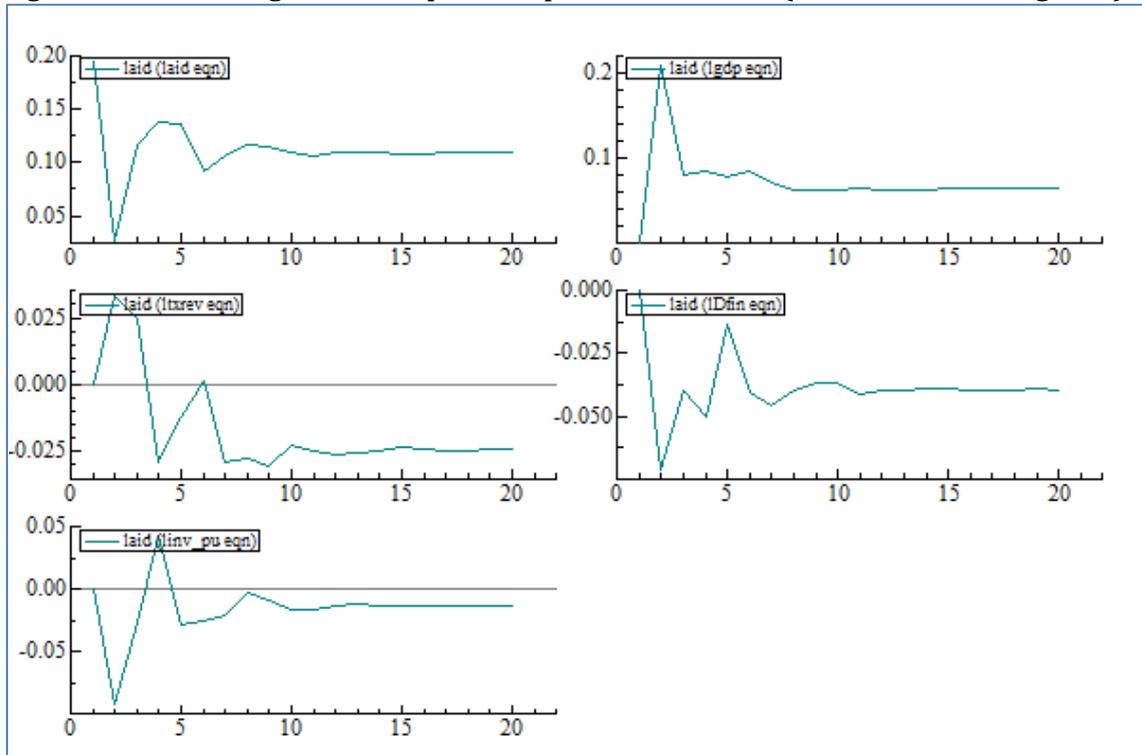
Source: Plots obtained from CVAR using PC_Give 13

Figure 7 Orthogonalised Impulse Responses for Model 2 (For a shock to Foreign Aid)



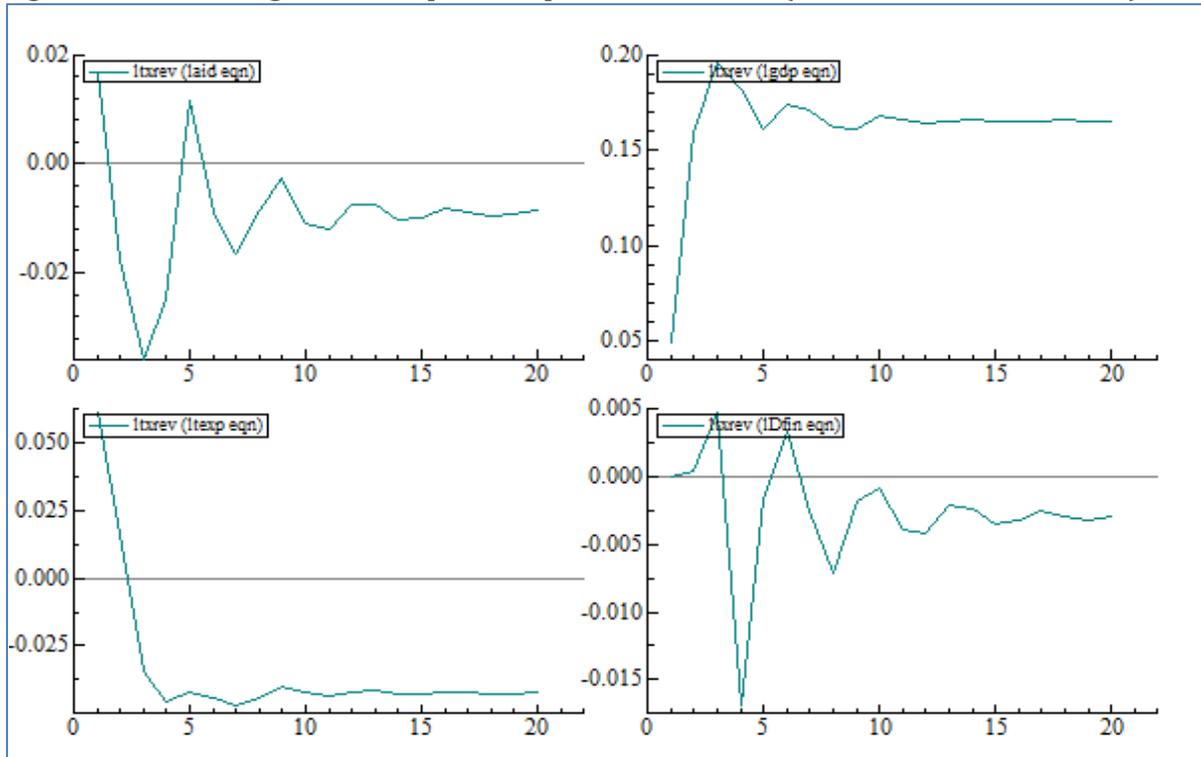
Source: Plots obtained from CVAR using PC_Give 13

Figure 8 Orthogonalised Impulse Responses for Model 3 (For a shock to Foreign Aid)



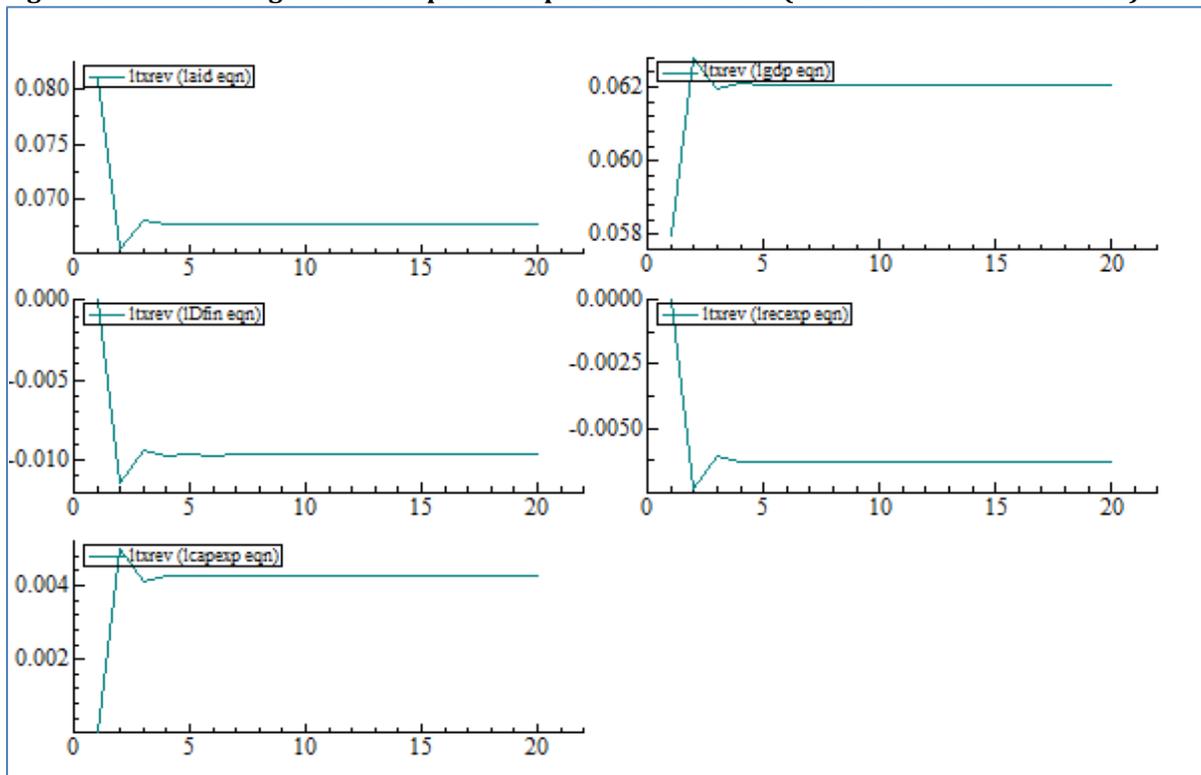
Source: Plots obtained from CVAR using PC_Give 13

Figure 9 Orthogonalised Impulse Responses for Model 1 (For a shock to Tax Revenue)



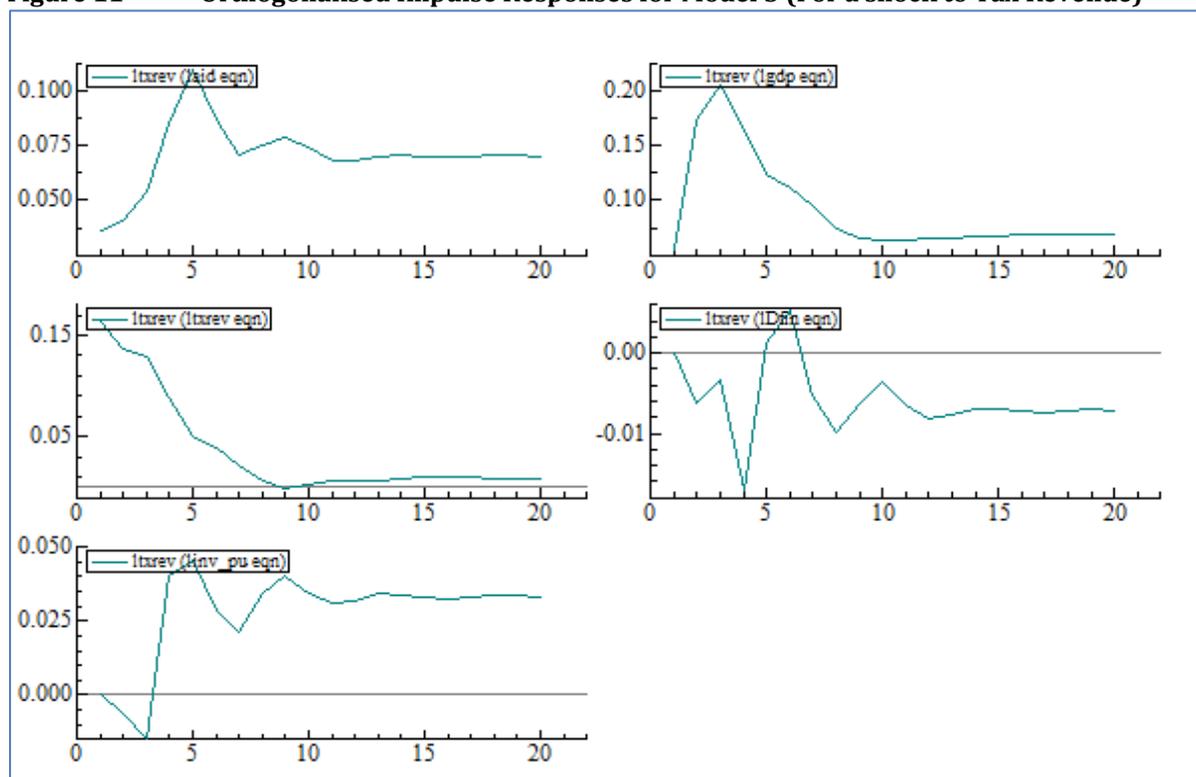
Source: Plots obtained from CVAR using PC_Give 13

Figure 10 Orthogonalised Impulse Responses for Model 2 (For a shock to Tax Revenue)



Source: Plots obtained from CVAR using PC_Give 13

Figure 11 Orthogonalised Impulse Responses for Model 3 (For a shock to Tax Revenue)



Source: Plots obtained from CVAR using PC_Give 13

How Will Oil Revenues Affect Macroeconomic Outcomes in Ghana?

We discuss the possible impact of the oil revenue on the macroeconomy of Ghana by focusing mainly on government's fiscal response and on what it means for output growth. Implicitly, we view oil revenue as similar to either foreign aid or tax revenue. In that respect, the main macroeconomic effects of the oil revenues will be as follows:

Increased Output: One can expect output to increase as a result of the oil production. This is reflected in the performance of the economy in 2011. For instance, one notes that output growth in the mining and quarrying sector in 2011 (when oil production started) was over 206 per cent, compared with about 19 per cent in the previous year. This undoubtedly was a result of the oil production (ISSER, 2012). The big challenge here relates to whether government spending and behaviour generally can induce stronger linkages between the oil sector and the other sectors of the economy. Should that happen, then one could argue that the output effects can support the development transformation of the basic structure of the Ghanaian economy.

Improved Fiscal outcomes: Generally, one should expect that oil revenues will bridge the expenditure-revenue gap of any government, *ceteris paribus*. Our results have also shown that foreign aid and tax revenue increases have both resulted in government behaviour that is consistent with this view. We in particular note that if oil revenues are used in a similar way to foreign aid or tax they will favour capital spending over recurrent spending. This could additionally help improve overall productivity within the economy.

Stabilised macroeconomic environment/Improve in outcomes of other macroeconomic variables: We expect oil revenues to help improve outcomes of macroeconomic variables such as interest rates and inflation by reducing domestic borrowing. Our results show that whether oil revenue behaves like foreign aid or tax revenues, it would result in a decline in domestic borrowing. Typically, an increase in domestic borrowing will result in an increase in interest rates. This in turn increases the cost of business operations and consequently prices within the economy. In respect of this, should oil revenues result in a decline in domestic borrowing, as our results show, it should lead to an improved macroeconomic environment.

It is important to note that these macroeconomic benefits are not guaranteed in the presence of oil revenues. This is primarily because the incentives associated with oil revenues are different from that of foreign aid or tax revenues. As we noted when we discussed our results, foreign aid has been associated with conditionalities and in the case of Ghana, the evidence seems to suggest that these conditionalities have been positively associated with macroeconomic management. Also, in the case of tax revenues, we argued that as increasing tax revenues are associated with a direct transfer from households (in the case of indirect taxes the price you pay for products increase and for direct taxes, your nominal income increases), it evokes in tax payers some responsibility to demand increased accountability from the public sector. The question is whether oil revenues can engender the same kind of incentives that will ensure that maximum macroeconomic dividends are harnessed.

Conclusions

Ghana, as with many other developing economies faces the challenge of meeting the objective of rapid growth and development against the constraint of limited fiscal space. In the past, Ghana has relied on foreign aid to supplement domestic taxes to meet its development challenges. Two key events in recent times suggest that the role of foreign aid in filling the financing gap will become less important in the medium term. First, Ghana in 2007 discovered oil in commercial quantities and production started in 2010. The implication is that, Ghana has an additional source of financing its development. Second, Ghana has recently been accorded the lower middle income status. This means that aid from the traditional sources is bound to change. Essentially, these two events suggest that the importance of foreign aid will reduce as oil revenues become important.

In theory, the start of oil production should provide relief particularly for developing countries with limited fiscal space in the face of very high incidence of poverty and deprivation. However, in practice countries that have found oil (or some other natural resources) in large quantities have not always been able to translate the resource boom into positive development outcomes – they experienced the *resource curse*. It is important to note that oil and gas reserves are exhaustible resources. They have uncertain and volatile revenue streams which have implications for macroeconomic stability of a country that becomes dependent on them. Under the current policy environment pertaining in Ghana, oil dependence may hurt development in a number of ways. Firstly, the oil discovery has raised expectations and increased appetite for

spending by the central government. The discovery of oil wealth dramatically expanded the horizons of both the incumbent government and the opposition parties prior to the recent general elections in 2012. Most of the grandiose campaign promises were made on the basis of the expected oil revenues. Secondly, it is well known that governments in resource-rich countries tend to increase public spending based on unrealistic revenue projections with the consequence of huge budget deficits. Moreover, oil windfalls often decrease the quality of public spending and encourage rent-seeking.

The concentration of fiscal resources from an oil boom leads to the loss of fiscal control (budgetary discipline), engendering excessive and imprudent investment. It also leads to the proliferation of grandiose “white elephant” projects, characterized by gargantuan corruption. In addition, the volatility of oil prices makes planning extremely difficult, which subsequently leads to huge deviations of fiscal outturns from planned targets. Finally, in most oil-exporting countries, external debt becomes uncontrollable, growing by leaps and bounds as pressure on spending rises. It is well known that oil exporting countries have borrowed faster and more than non-oil exporting less developed countries, despite benefiting from petrodollars.

This paper draws selectively from the theoretical explanations discussed in the literature on “aid effectiveness” and the “curse of natural resources” in order to understand the key channels for the transmission of the impact of Ghana’s oil windfall on its economy. In particular, the paper investigates the extent to which oil production in Ghana will translate into improved macroeconomic outcomes.

To do this the paper notes that oil revenues’ effect on the macroeconomy will be largely mediated through government fiscal behaviour. It therefore employs a fiscal response model to simulate the potential effect of the oil revenue on macroeconomic outcomes for Ghana. It notes in particular that oil revenues may behave as foreign aid or as tax revenue. It therefore models the effect of foreign aid and tax revenue on macroeconomic outcomes. In other words the paper uses evidence on how foreign aid and tax revenue has impacted on government’s fiscal behaviour to infer on the possible behaviour with respect to oil revenues. The estimation is done within a cointegration vector autoregressive model (CVAR) framework and using data over the period 1970 to 2011.

The study essentially finds that oil revenues can impact on the macro economy through three main ways. First, it has the potential to increase overall economic growth within the economy, as the revenue supports public investment. Second, oil revenues can help government to become fiscally more responsible. This is because in the past both foreign aid and tax revenue have encouraged a relative switch to capital spending compared to recurrent spending. Finally, the paper finds that oil revenues will impact positively on macroeconomic variables such as interest rates and inflation by reducing domestic borrowing.

The paper concludes by noting that even though there are potential macroeconomic benefits to be obtained from oil revenues, there is no guarantee that these will be realised for Ghana. It, in general, depends on how similar the incentive structure with respect to foreign aid is for oil revenues. In particular, the paper argues that there are two possible ways by which oil revenues impacts on the macroeconomic indicators will be maximised for Ghana. First and more generally, it depends on whether the same kind

of behaviour can be evoked with oil revenue as with foreign aid or tax revenue. The oil revenue management bill is an attempt to impose some form of restrictions on how the oil revenues will be spent. Unfortunately, it does not go far enough and with 70 per cent of the oil revenues going into the consolidated fund, it will be difficult to see government restraining itself with respect to spending. However, if civil society takes it upon itself to continuously monitor and demand proper government overall fiscal management, that could help hold government in check. Secondly, it is important that the efficiency of spending by the government is held to very high standards. This should take two forms. There is the need to reduce leakages in government spending so that the output of every Cedi spent is maximised. In addition, there should be better prioritisation of what we spend each Cedi on. In this way, Ghana can maximise the benefits from the oil revenues.

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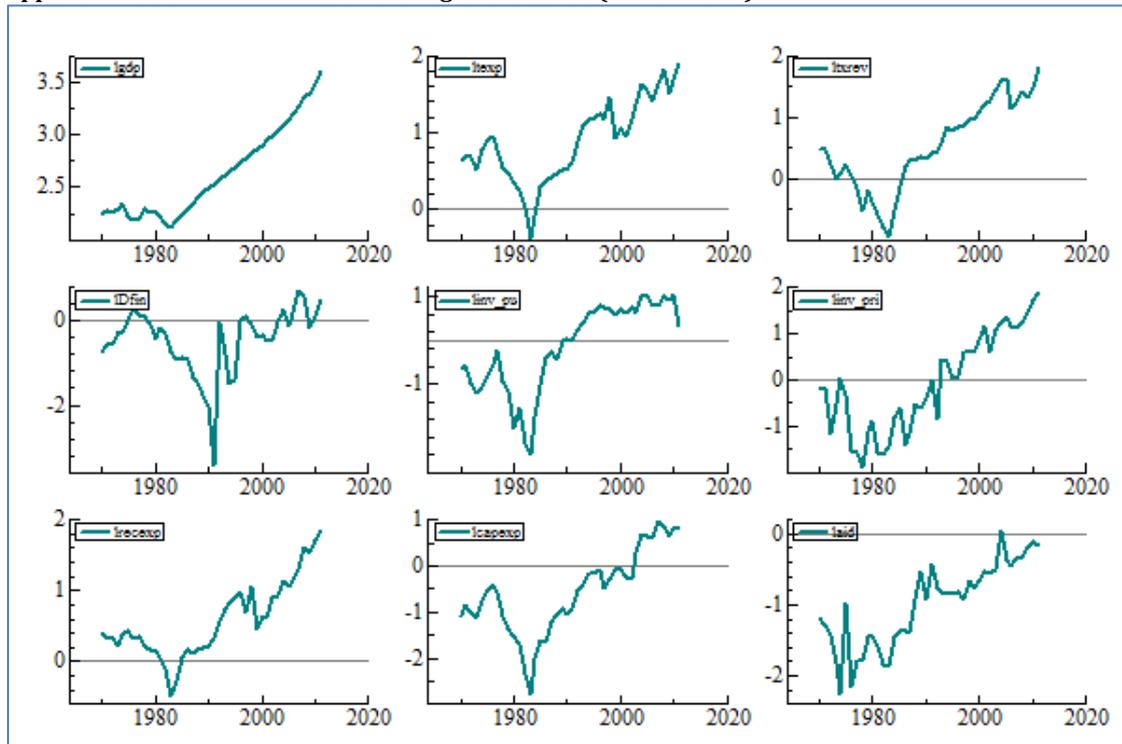
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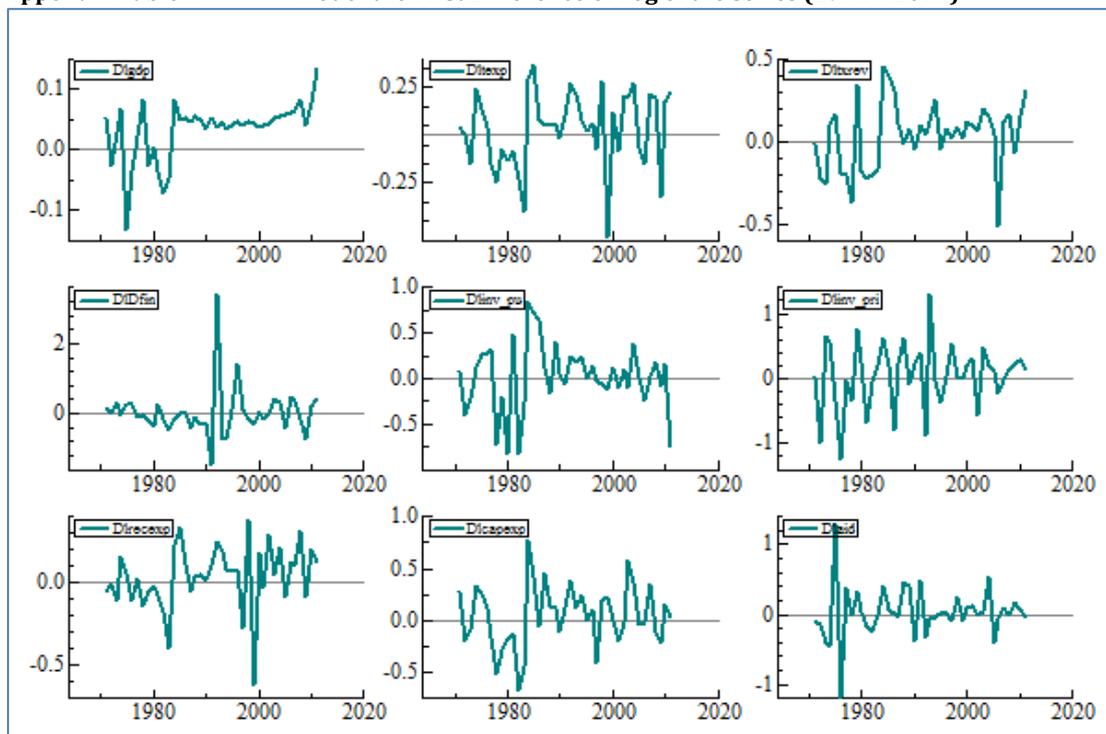
Appendices

Appendix Table 1 Plot of the Log of the series (1970 – 2011)



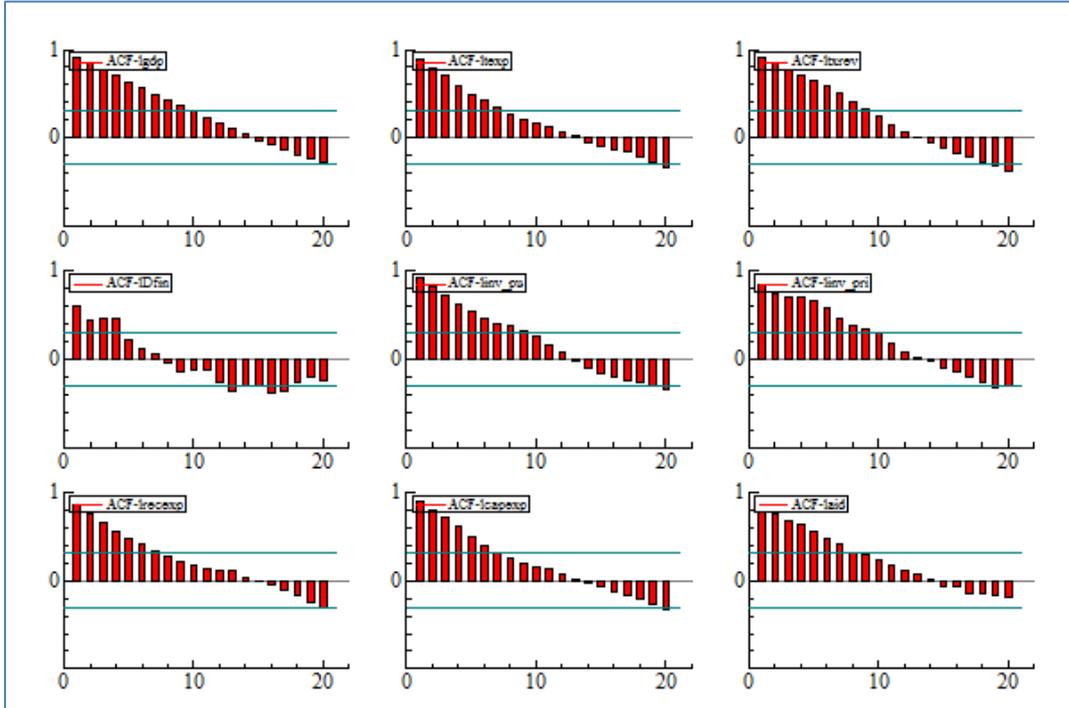
Source: Plots obtained from CVAR using PC_Give 13

Appendix Table 2 Plot of the First Difference of Log of the series (1971 – 2011)



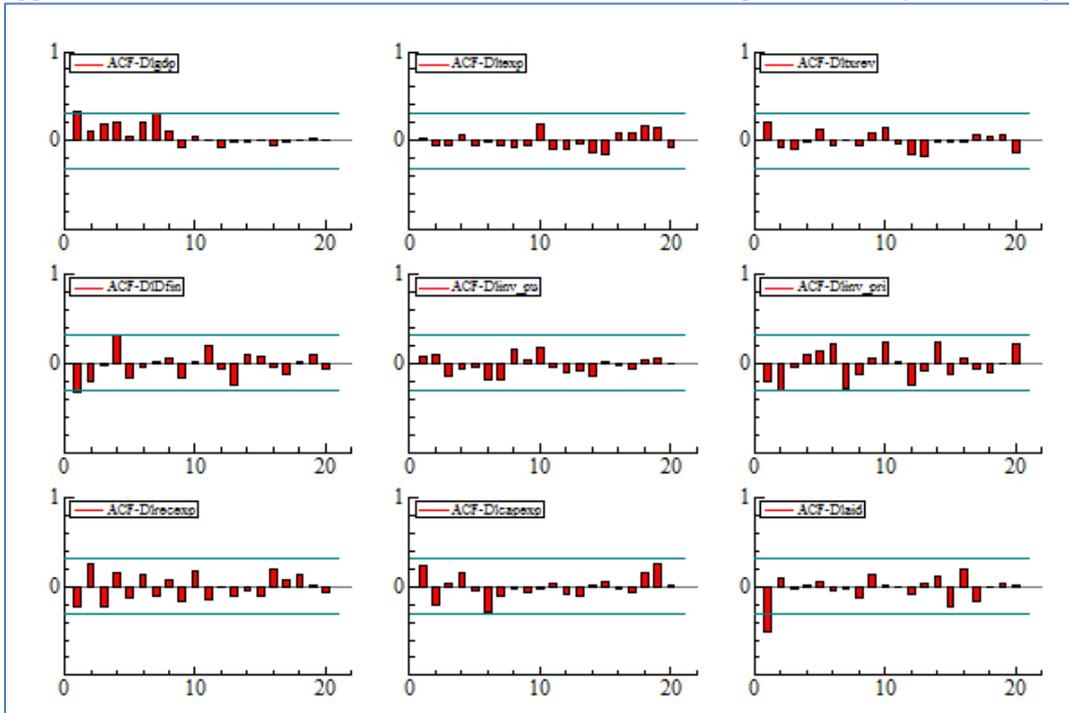
Source: Plots obtained from CVAR using PC_Give 13

Appendix Table 3 Plot of the Autocorrelation Function of Log of the series (1970 – 2011)



Source: Plots obtained from CVAR using PC_Give 13

Appendix Table 4 Plot of the Autocorrelation Function of Log of the series (1970 – 2011)



Source: Plots obtained from CVAR using PC_Give 13

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