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OIL PRODUCTION AND GHANA'S ECONOMY: WHAT CAN WE EXPECT?

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ABSTRACT

This paper has two key objectives. First, it seeks to estimate the impacts of oil production on Ghana's economy using a computable general equilibrium model. Second, it proposes policies to mitigate the adverse impacts oil activities may have on various sectors of the economy. The results indicate that production from the Jubilee oil field could increase the GDP growth rate by 3.5 percent per annum. The growth rate could more than triple if additional wells are brought into production and the natural gas utilised rather than flared or re-injected. However, the results also show that despite the increase in oil and other commodity exports, aggregate exports actually decline. Moreover, increased household disposable incomes, mostly from increase in urban employment, coupled with the decline in agricultural production, implies an increase in imports and faster growth in domestic prices relative to imported prices. The net result is a worsening of the trade balance.

Two key recommendations are; First, there is a need for government to provide incentives for the development of new sectors with linkages to the oil sector with the view to boosting local content and participation and employment. Second, policies are required to mitigate the adverse impacts of oil production, particularly in the agricultural and manufacturing sectors. New sectors that could link up with the oil industry include building and maintenance of equipment for storage and distribution of oil and derivates; data processing and storing of seismic data; air transport services; tourism and related recreational activities, international trans-shipment and entrepôt services. There are currently infrastructural and human capital impediments to the growth of such activities and as such there is a need for medium and long-term plans to build capacity in these areas.

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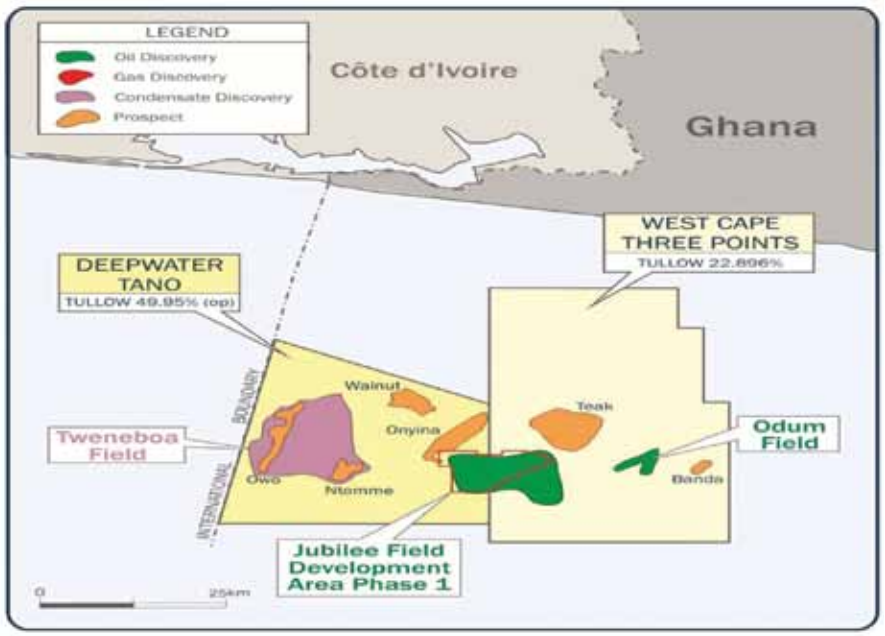
1. INTRODUCTION

Ghana is on the verge of becoming a significant oil producer. Oil was first discovered in Ghana in 1970 by the US firm AgriPetco off the coast of Saltpond. However, the reserves were not in sufficient commercial quantities and were abandoned for some time. The field is currently being exploited by a joint venture comprising the Ghana National Petroleum Corporation (GNPC) and Lushann Eternit Energy Limited of Houston. The Saltpond Oilfield is currently producing 600 barrels of crude oil per day and there are plans to increase output to 2,000 barrels per day. The Jubilee Oilfield was discovered in June 2007 by Kosmos Energy LLC in the Gulf of Guinea's Tano Basin, (Figure 1).[1] Ultimately, 278 million barrels of oil (mmbo) are expected to be recovered over 20 years of the Phase I development (Tullow, 2009). However, the recoverable reserves of the field are estimated to be more than 600 mmbo with an upside potential of 1.8 billion barrels. The Phase I production begun in December 2010 and is expected to deliver 120,000 barrels per day when in full production. Since the Jubilee discovery, another substantial oil discovery has been made. Tullow Oil announced in September 2010 that it had discovered between 70 and 550 million barrels of light crude oil in the Owo field within its Deepwater Tano Block (see Figure 1). Such level of proven reserves puts Ghana at par with neighbouring Cameroon (400 mmbo) and above Côte d'Ivoire (100 mmbo), but much below Nigeria (36 billion barrels).

Figure 1 Location of Ghana's Jubilee Field Phase I Development



Source: Tullow Ghana Ltd. (2009)

Based on the fiscal regime in place,[2] and a price assumption of US$75 per barrel, the potential government revenue would be about US$1.0 billion on average per year between 2011 and 2029. At a price of US$65 per barrel, the potential government revenue would be about US$828 million on average per year. By comparison, government revenue in

2008 reached US$3.7 billion (excluding grants) and GDP of US$16.1 billion. Therefore, oil production will only increase the size of the economy by just over 10-12 percent but will increase government revenues by a quarter.[3] This implies that oil production per se will not have a huge impact on the economy under a business-as-usual scenario, which in this study is defined as the current structure of the economy and current government policy framework.

In a country where the average per capita income is still below $400 per annum and most people live under $1.25 per day, the prospect of oil production has heightened public expectations. According to a survey conducted by Reuters, Ghana's economy could grow at about 14.7 percent in 2011, one of the world's fastest growth rates, boosted by oil production (Ndaba, 2010). There is a need to properly manage these expectations, as the average citizen may not receive any private benefits from oil production in the short to medium term. The reality is that the foreign partners will aim to recoup their investment in the shortest possible time. The extent to which the Government's receipts can be translated into benefits for the people depend crucially on the implementation of appropriate policies backed by strong institutions.

One of the major concerns about Ghana's entry into oil production is the adverse effects associated with that industry. Previous studies of resource-rich countries paint a relatively pessimistic picture of exploitation of natural resources, variously referred to as the natural Resource Curse and/or the Dutch Disease. These studies suggest that real exchange appreciations driven by natural resource booms could have negative effects on long-term development by reducing the relative size of domestic manufacturing and production. In a similar vein, another important body of literature suggests that natural resource abundance produces institutional weaknesses and mismanagement of natural resource wealth (e.g., see Auty 1998 and 2001; Gelb, 1988). However, a growing number of more recent papers and country analyses show that it is possible to avoid the pitfalls of resource abundance, by pro-actively establishing a sound institutional framework and macroeconomic management (e.g., Bravo-Ortega and de Gregorio, 2007).

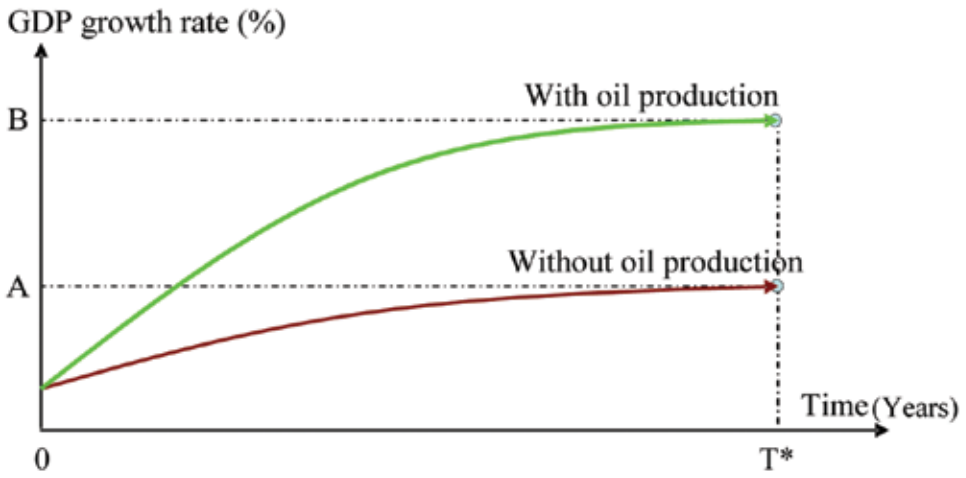
Given the concerns about Ghana's nascent oil industry, this paper has two key objectives. First, it seeks to estimate the impacts of oil production on the non-oil sectors using a computable general equilibrium (CGE) model. The goal is to identify the potential positive and negative economic impacts of oil production. The second objective is to propose policies to mitigate the adverse impacts. In particular, we examine a number of policies that could maximize the local benefits from oil exploration. The paper is structured as follows. Section 2 briefly describes the modeling approach in a non-technical manner. Interested readers are referred to sources for further information on the modeling approach. Section 3 presents and discusses the model results. Section 4 discusses various strategies for local content promotion in the oil industry and makes recommendations for Ghana. Section 5 concludes.

2. THE MODELLING APPROACH

To analyse the potential impacts of oil production in Ghana, we perform a counterfactual simulation using a CGE model of the Ghanaian economy. General equilibrium models are noted for their ability to measure the impacts of one or more policy variables on several sectors simultaneously. Oil production will have backward linkages (i.e., supply of inputs) as well as forward linkages (which result from the processing and marketing of the product).[4] These linkages will have ripple effects in the economy (often referred to as secondary effects). The CGE model uses as its main data source an input-output (I-O) table of the economy which registers flows between the different sectors of the economy. The CGE model used here is the Global Trade Analysis Project (GTAP) model (version 6.2a), a multiregional and multisector CGE model which captures world economic activity in 57 different industries of 87 regions of the world (Hertel, 1997).

The GTAP model is referred to as a comparative-static model because it provides projections at only one point in time, the solution. The comparative static approach may be illustrated with the aid of Figure 2. Without oil production, the Ghanaian economy could be on a growth trajectory A at a given point in time, say, a 7 percent per annum growth rate. With the start of oil production, there is a jump in the economy's growth rate, reaching a higher trajectory of B, say, 15 percent after oil production has stabilised by time T*.

Figure 2 Illustration of the comparative-static approach



Comparative statics is only concerned with the gap AB and it does not say anything about how the economy got to point B. The gap AB is 8 percent at T*, which is the increase in the economy's growth rate due to oil production. In general, comparative models are solved for

a short run (t = 2 years) and a long-run (t = 5-10 years). They are not very specific about the timing of effects and represent the time taken for an economy to adjust following a policy shock.

In this application, we utilise the GTAP Africa Data Base which includes data for 39 regions (30 African regions and 9 other aggregated regions) including Ghana. The data for Ghana is based on the 2005 social accounting matrix (SAM) jointly constructed by the International Food Policy Research Institute and the Ghana Statistical Service (GSS) using national accounts, trade and tax data, and household income and expenditure survey data. The model uses an algebraic framework resulting from imposing the conditions of producer and consumer maximization on the accounting framework of the SAMs. The algebraic framework is used to analyse the behaviour of numerous economic agents including producers, households, and governments. The standard GTAP assumption is perfect competition and constant returns to scale where bilateral trade is handled via the Armington framework (products are differentiated by country of origin). The model assumes that there is a regional household that collects all income and allocates across private consumption, government, and saving. Household demand for commodities and services are in constant difference elasticity form, which assumes non-homothetic preferences and is more flexible than the constant elasticity of substitution form. Producers are assumed to have a constant elasticity of substitution production function (Hertel and Tsigas 1997; McDonald and Walmsley, 2003).

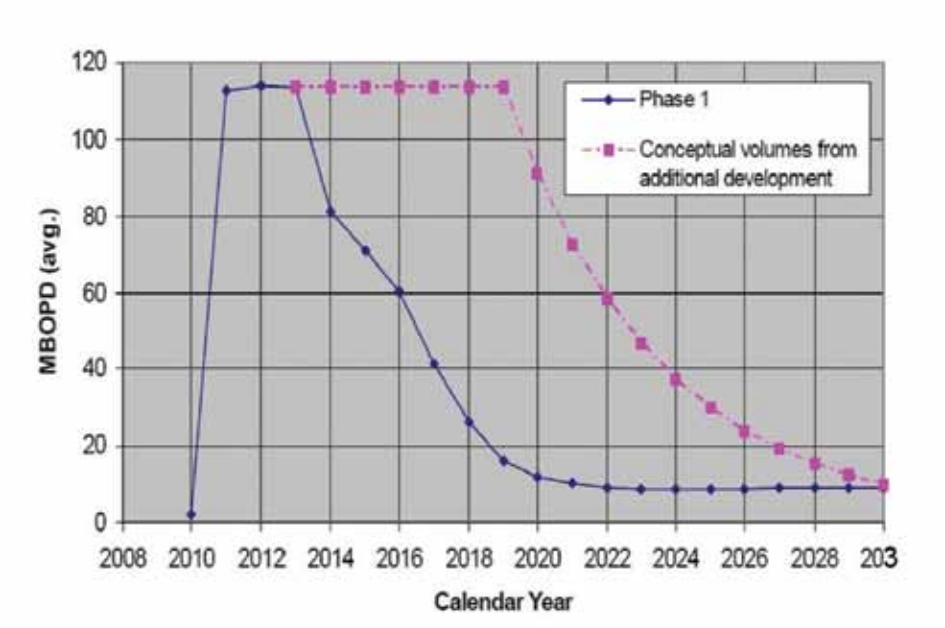
We adopted the standard GTAP model closure with taxes, tariffs and technical change parameters set exogenously. Since population is determined by demographic factors, it is also set exogenously. Our closure rules also reflect the situation in developing countries where there is no full employment of unskilled workers. In most of these countries there is commonly an excess supply of unskilled labour that can be used by industries in case there is an increase in production. To account for this fact, wage rates are assumed to be exogenous and labour supply is assumed to be endogenous. Lastly, we account for fixed prices in the market for commodity exports. In this application, we have aggregated the 57-sector GTAP database to 14 sectors to facilitate the solution.

3. EMPIRICAL RESULTS AND DISCUSSION

3.1 Assumptions and Simulation Scenarios

First oil production from Phase I of the Jubilee Oilfield is planned for December 15, 2010 and the field is expected to produce oil for 20 years. Immediately after First Oil, the field will be capable of flowing up to 55,000 barrels of oil per day (bopd). But as new wells are completed over a three to six month period, average production volume is expected to reach 115,000 bopd by the first full year of operation (Figure 3).

Figure 3 Production Profile Forecast for the Jubilee Field



Source: Tullow Ghana Ltd. (2009)

According to the project operator, Tullow Ghana Ltd, further project phases may extend the project life and increase ultimate recovery as shown in Figure 3. Another associated resource in the Jubilee field is natural gas. Currently, the infrastructure does not exist to utilise the gas resources. A small proportion of the separated natural gas (about 15 percent) will be used for power generation to run the Floating Production Storage and Offloading vessel (FPSO), while the remainder will be re-injected into the reservoir. Plans are underway to build a gas pipeline to the shore and also to develop a natural gas processing facility. Considering the possibility of utilising the natural gas, as well as additional production wells coming on stream, the Jubilee field could have a much bigger economic impact. Therefore we consider two scenarios in the policy experiments. The first is a conservative one in which the field will produce 115,000 bopd. This represents a 190 percent increase in the current volume of oil output. The second scenario assumes that additional wells come into production and also that the natural gas is utilised. Because the volume of output in this scenario is more difficult to predict, we have arbitrarily chosen a 30 percent increase over the projected output of the Jubilee field in its first full year of operation, which is equivalent to about 247,000 bopd.

The correct way to interpret the results in the following section is to consider two 'what if' scenarios. The first is to ask what would be the economic impact of the proposed project if the proposed projection of 115,000 bopd is actually achieved in about one to two years of production. The second simply asks what the impacts would be if actual production were to be much higher than projected due to additional utilisation of the oil and gas resources. It is important to keep in mind that the reported results are not forecasts of what the actual

impacts would be. Rather, they give us some sense of the relative magnitudes of the impacts of the two scenarios on some key macro and micro economic variables. However, with some further work, the model could be modified to give year by year forecasts.

3.2 Macroeconomic Impacts

For Scenario 1, the results indicate that oil output from the Jubilee field will increase the GDP growth rate by 3.5 percent per annum (Table 1). This represents a growth rate that is additional to the current GDP growth rate of about 7.5 percent per annum. As will be shown later, even though there is an increase in oil and other commodity exports, aggregate exports actually decrease. In this case, aggregate exports decrease by 10.2 percent, while aggregate imports increase by 6.9 percent. The net result is that the trade balance declines by US$402 million. The terms of trade (i.e., the ratio of export to import prices) increases by 2.3 percent. Also, household disposable income increases by 3.7 percent, while welfare (measured by equivalent variation) increases by US$113 million. Therefore, the net decline in exports, combined with the increase in consumption expenditure moderates the impact in the massive increase in oil production, resulting in a modest increase in the GDP growth rate.

Table 1: Impact of Jubilee Oil Production on Ghana's Economy

Variable	Scenario 1	Scenario 2
GDP growth	3.5	12.2
Aggregate exports	-10.2	-28.5
Aggregate imports	6.9	23.4
Trade balance (US$ million)	-402.01	-1280.90
Terms of trade	2.3	5.8
Household disposable income	3.7	12.8
Welfare (US$ million)	113.23	257.93

Note: All values except trade balance and welfare are expressed as percentage change from underlying growth path.
Source: Model simulation results.

In Scenario 2, which is the more optimistic outlook for oil production, there is more than a threefold increase in the economy's growth rate. Following the trend in the previous scenario, exports increase at a faster rate than imports, resulting in a larger trade balance of about US$1.3 billion. The growth in household disposable income closely follows the growth in GDP and there is a doubling of welfare with an increase of US$257.9 million.

3.3 Sectoral Impacts

The modelling results indicate that although oil production has a net positive effect on Ghana's economy as a whole, it will not directly benefit all sectors of the economy. For example, the results show that the project has the potential to impact adversely on the agricultural sector in general, in particular, domestic production of crops and livestock. This could be due to a number of reasons including the fact that capital is bid away from the sector because of the decline in the rate of return to investment and also because of

declining terms of trade in the sector. The modelling results summarised in Table 2 show that, in Scenario 1, value added in the grains and crops sector contracts by about 4 percent, while the meat and livestock sector contracts by about 1 percent. It is interesting to note that the resource export sectors such as cocoa and mining are not negatively impacted by oil production as might have been expected. This is mainly due to the fact that the prices of these commodities are determined on the world market. Therefore, oil production as a new activity does not reduce the rates of return and investment in these sectors as much as it does in, say, import substitution sectors such as grains and processed food. The results in the second column of Table 2 indicate that a further increase in the level of oil production has even greater devastating effects on the agricultural sector. In this case, grains and livestock production declines by about 19 percent, while meat and livestock declines by about 11 percent. These changes are caused by a combination of factors including multi-sectoral general equilibrium adjustment effects through supply and demand drivers, as well as changes in the labour market.

Table 2: Impacts of Jubilee Oil Production Sectoral Output

Sector	Scenario 1	Scenario 2
Grains and Crops	-4.03	-18.65
Meat and Livestock	-1.3	-11.18
Forestry	9.16	26.71
Oil	118.22	140.55
Cocoa	122.16	147.42
Fisheries	-0.58	0.8
Mining	55.47	-287.36
Processed Food	-3.77	-28.17
Textiles and Clothing	-8.9	-36.62
Light Manufacturing	-3.13	9.52
Heavy Manufacturing	-8.69	-36.7
Utilities and Construction	14.57	70.3
Transport and Communications	-5.82	-20.64
Other Services	-1.88	-8.92
Capital Goods	27.05	56.31

Note: All values are expressed as percentage change from underlying growth path.
Source: Model simulation results

Oil production also has a strong negative impact on the manufacturing sectors, which contract at varying rates ranging from 4 and 9 percent per annum under Scenario 1. The impacts are much more adverse in Scenario 2 for most industries. The only sectors that benefit from oil production are utilities/construction and production of capital goods, which increase by 15 percent and 27 percent, respectively, under Scenario 1. The growth in capital goods is to be expected as oil production is a capital intensive activity. Furthermore, the discovery of oil should increase general construction activity in the country.

The potential adverse impact of the booming oil sector on agriculture fits the classic example of the 'Dutch Disease' (Corden and Neary, 1982). This phenomenon was first

identified in Holland, when revenue from North Sea oil flooded into the country. It occurs when an influx of resource wealth, and the spending that comes with it, drives up the exchange rate and inflates the domestic economy. This is a problem because it reduces the international competitiveness of the country's non-resource exports and import-competing activities. The result is that a resource project can indirectly take place at the expense of other forms of activity. Apart from the appreciating exchange rate, the other causal factor in the Dutch Disease phenomenon is that the high rate of return generated by the booming oil sector tends to bid resources (labour and capital or mostly labour – skilled and unskilled) away from other sectors, further depressing non-resource sector output.

Table 3: Trade Impacts of the Jubilee Phase I Oil, by Sector (Scenario 1)

Sector	Exports	Imports	Ratio of domestic to imported prices
Grains and Crops	-8.2	5.3	2.8
Meat and Livestock	-16.7	8.8	3.7
Forestry	23.8	-13.6	-5.2
Oil	221.2	-3.1	-14.6
Cocoa	97.5	-0.1	-23.5
Fisheries	7.4	-22.9	-42.0
Mining	48.5	-7.1	-2.5
Processed Food	-5.9	3.6	2.2
Textiles and Clothing	-15.5	5.2	3.3
Light Manufacturing	-3.9	7.1	1.2
Heavy Manufacturing	-14.6	8.7	3.0
Utilities and Construction	-9.6	6.3	3.6
Transport and Communications	-6.9	3.5	3.9
Other Services	9.2	4.0	4.1

Note: All values are expressed as percentage change from underlying growth path,
Source: Model simulation results

Table 3 shows why net exports decline despite the massive increase in oil production. Basically, the import-competing sectors lose their external competitiveness due to the activities in the oil sector. Therefore, exports in these sectors decline. However, given that households experience an increase in their disposable incomes, they increase their demand for food, clothing and other goods and services which now need to be imported. Therefore, as can be seen from Table 3, imports for goods such as grains/crops and meat/livestock increase by 5 percent and 9 percent, respectively. Imports of processed food, manufactured goods and services also increase by rates ranging from 1 to 4 percent. The table also shows a rise in the ratio of domestic to imported prices, which fuels upward increases in the general price level.

It is important to appreciate that the potential Dutch Disease effects associated with oil production can be largely avoided if the revenues are managed appropriately. The current proposal in the Petroleum Revenue Management Bill to invest part of the revenue from the oil sector in a Heritage Fund is a step in the right direction as it will to some extent help to minimise the effects of the Dutch Disease. Prudent spending of the proceeds from the fund

will mitigate the effect on the exchange rate and minimise the impacts on the non-mining and oil sectors. In that sense, therefore, the Dutch Disease problem can be seen more as a result of how the Government chooses to apply the revenue from resource extraction, rather than a result of the resource extraction activity itself.

Although, the model does not explicitly measure employment by sector or region, a number of conclusions on employment can be derived from the model's results. First, given that oil production and associated activities are predominantly urban based, while agriculture is predominantly rural-based, it can be inferred that the increase in household income will mostly accrue to urban residents. Thus, the increase in oil production will increase urban employment, while decreasing rural employment. This means that rural poverty will increase relative to urban poverty and hence there will be a need for targeted programmes to increase rural employment.

4. MAXIMISING THE DOMESTIC BENEFITS FROM OIL PRODUCTION

According to recent versions of export base theory[5], large capital-intensive mining projects tend to create inflated expectations of local benefits. This arises because foreign investors send an unusually high share of mining revenue flows abroad to service foreign capital. Furthermore, the fiscal linkage (i.e. taxation) tends to dominate domestic linkages from such projects and the revenues tend to accrue to the national government, rather than to regional/local administrations. Another important factor is that most of the inputs tend to be imported, leading to limited backward linkages. Similarly, forward linkages (e.g., from the processing and marketing of the outputs) are also limited because processing activities, if any, are often carried out closer to overseas final markets.

Recent works published in the local content literature have expressed support for active government participation in the development of specific activities as a means of increasing local content of industrial activity, thereby promoting economic development (e.g., see Rodrik, 2004) It is argued that government's failure to intervene could be a major impediment to product diversification, structural change, and economic development. The reason given is that the emergence of new productive activities, as is the case in Ghana's emerging oil industry, is often constrained by the lack of or poor price signals which create substantial uncertainties for private economic agents and therefore make it difficult for them to make informed decisions. The challenge for government is what criteria to use for identifying and promoting specific activities. Based on Rodrik (2004), we offer these three guidelines:

- Government incentives should target activities that promote economic diversification by creating new areas of comparative advantage;
- Government should not merely target sectors, but should also identify activities that can generate cross-cutting opportunities;
- the activities that are promoted should have the potential to provide sufficient spillovers and demonstration effects.

Recent examples of countries that have implemented successful local content policies in their oil industries include Nigeria and Trinidad and Tobago. After many years of missed opportunities for developing its oil sector, Nigeria has finally implemented a raft of local content policies. These include the establishment of an official goal of 45 percent local content by 2006 and 70 percent by 2010. The government has established task specific directives on local content. These include: (i) an expansion of the existing requirement for seismic data processing projects to be sourced in the country, (ii) a requirement that all front end engineering and design work for upstream projects be conducted in country, and (iii) a requirement that floating production, storage and offloading integration work takes place in the country by the end of 2006 (as reported by INTSOK, 2003). Trinidad and Tobago has also implemented programmes for workers' training, small-enterprise capacity building and technology development for its gas industry. The policy objective of the Trinidad and Tobago government is to firmly establish the country as a key supplier of gas to the North American market.

The foregoing CGE analysis confirms the fact that the oil sector has few linkages with the rest of the economy and that, under a business as usual scenario, this will result in adverse impacts on other sectors. The major implications for public policy are twofold. Firstly, the government would need to promote the development of new sectors with linkages to the oil sector with the view to boosting local content and participation. Secondly, policies must be devised to mitigate the expected adverse impacts of oil production, particularly in the agricultural and manufacturing sectors.

4.1 Promoting Local Content and Participation

With Ghana starting an oil industry literally from scratch, the promising areas to target for local content development include the following: building and maintenance of equipment for storage and distribution of oil and derivates; data processing and storing of seismic data; air transport services; tourism and related recreational activities, international trans-shipment and entrepôt services, and agriculture and fisheries. We briefly discuss each of these areas below.

Building and maintenance of equipment for storage and distribution of oil and derivates. This area is located towards the upstream area of the oil industry and there will be potential demand for some unskilled, but particularly skilled labour in technical areas. Activities include structural engineering, as well as civil and infrastructure engineering and supervision. More specialized areas such as electrical, instrumentation and controls, and mechanical engineering for the oil, gas and process industries could be entered into with joint venture companies.

Data processing and storing of seismic data

The current trend in the oil industry is to outsource the collection of seismic and other geological data to specialized firms, while the subsequent data interpretation and modelling is done in house by the oil companies. There is therefore an opportunity for local firms to enter this area of the industry. However, admittedly, there is need for specialised workers who may not easily be available locally.

Air transport services
Servicing of offshore rigs and movement of workers and materials will create a demand for chartered fixed wing air planes and helicopters, as well as for pilots and support teams. Once again there is opportunity for local sector development of this area.

Tourism and related recreational activities
The GOG has expressed a desire to develop tourism as a way of diversifying the economy. It is a well known fact that Ghana has immense tourism potential which remains largely untapped. The tourism sector could have potential linkages with the oil sector. The influx of foreign oil workers and other professional visitors into the country would increase the demand for hotel and other accommodation, recreational activities, food and beverages, transport, communications and other services. However, there are currently a host of infrastructural constraints that hold back the development of tourism and other sectors. These include a lack of transport infrastructure, health risks from malaria, poor sanitation, inadequate health care infrastructure, and poor water and energy infrastructure.

International trans-shipment and entrepôt services
Ghana has a hidden or under-utilised comparative advantage, which is its geographical location. It is located within a couple of hour's flight from many countries in West Africa, and about five hours from other Sub-Saharan African countries. Thus, there is an opportunity to provide services such as port and cargo handling, education, health and financial services for the entire region. In the area of ports, examples of services that could be provided include those that require unskilled labour (e.g., warehousing and sorting), as well as services that employ more skilled labour (e.g., processing, quality control, clerical and logistics).

Agriculture, agro-processing, and fisheries
The government could address the adverse impacts of oil on the non-oil sectors by using revenues from oil production to carry out targeted productivity-enhancing investments that takes into consideration Ghana's existing comparative advantages. For example, the agriculture sector is currently dominated by inefficient small-scale labour-intensive production of basic staples and cocoa. One possible consequence of a booming oil sector is that it is likely to lead to labour shortages. Therefore, it is necessary to make the agricultural sector more efficient with the use of productivity-enhancing inputs (e.g., irrigation, fertilisers, tractors, etc) with a view to producing not only for domestic consumption and exports, but also producing for the food-processing sector in order to generate higher linkages. The fisheries sector could also be developed by transforming it from the current artisanal base to higher value addpresed activities such as fish processing and production for exports.

5. CONCLUSIONS AND POLICY IMPLICATIONS

The aim of this paper has been to estimate the impacts of oil production in Ghana on the non-oil sectors using a computable general equilibrium model and to propose policies for mitigating any adverse impacts. Ghana currently produces about 600 barrels of crude oil per day and the estimated 115,000 barrels to be produced from the Jubilee Phase I Oilfield represents a nearly 200 percent increase in the volume of output. Based on a price assumption

of US$75 per barrel, the average annual gross revenue from Jubilee I is estimated to be US$2.0 billion, from which the government's annual take is expected to be about US$1 billion. To put these figures into context, government revenue in 2008 was US$3.7 billion (excluding grants) and the size of the economy was estimated at US$16.1 billion. Thus, oil production will only increase the size of the economy by just over 10-12 percent but will increase government revenues by a quarter. This implies that oil production per se will not have a huge impact on the economy under a business-as-usual scenario, which in this study is defined as the current structure of the economy and the current government policy framework. Furthermore, as has been the experience in most natural resource dependent economies, oil production has the potential to have negative impacts on the non-oil sectors.

The results of the CGE analysis generally confirm the above expectations of the potential impacts of oil production. It was shown that production from the Jubilee Oilfield could increase the GDP growth rate by 3.5 percent per annum. This implies that if the economy were to be growing at the normal rate of 7.5 percent per annum, the start of oil production could increase the growth rate to 11 percent per annum at the height of oil production by 2012. In the event that additional wells could be brought into production and the natural gas utilised rather than flared or re-injected, the additional GDP growth rate could more than triple. However, the results also showed that despite the increase in oil and other commodity exports, aggregate exports actually decline. The net result is a worsening of the trade balance. On the positive side, there is an increase in household disposable income in line with the GDP growth grows by 3 percent. However, the increase in incomes, coupled with the decline in domestic food production, implies that there will be an increase in imports and a faster growth in domestic prices relative to imported prices. Although the model does not have urban and rural employment sectors, we infer that the increase in household disposable income derives mostly from an increase in urban employment given that oil production and its associated activities are mostly urban based.

The results also indicate that oil production has positive impacts on the commodity export sectors (cocoa, forestry and mining) and the utilities/ construction sectors. However, there are negative impacts on the grains/crop, meat/livestock, manufacturing and service sectors. These effects are viewed as classic examples of the Dutch Disease and arise as a result of increase in public and private income and spending which bids up the real exchange rate and increases inflation in the domestic economy. The net result is a reduction in the international competitiveness of the non-resource export and import-competing sectors. In regard to the Dutch Disease effects, the current proposal to invest some of the proceeds in a Heritage Fund is a step in the right direction as it would partly sterilise the effects on the domestic economy. Furthermore, prudent spending of the proceeds from the fund would mitigate the effect on the exchange rate and minimise the impacts on the non-mining and oil sectors.

Two key recommendations arise from the analysis. First, there is a need for government to provide incentives for the development of new sectors with linkages to the oil sector with the view to boosting local content and participation. Second, policies are required to mitigate the adverse impacts of oil production, particularly in the agricultural and

manufacturing sectors. New sectors that could be developed to link up with the oil industry include building and maintenance of equipment for storage and distribution of oil and derivates; data processing and storing of seismic data; air transport services; tourism and related recreational activities, international trans-shipment and entrepôt services. There are currently infrastructural and human capital impediments to growth of these activities and as such there is a need for medium and long-term plans to build capacity in these areas.

ENDNOTES

[1]The field, located about 12 km from Ghana's coastline and 95 km southwest of the port city of Takoradi, is named after the Ghana's golden jubilee celebration of Independence in 2007.
[2]The fiscal regime comprises the following elements: a 5 percent royalty for oil revenue; a 10 percent initial carried interest, a share of the oil rent growing with the rent amounts; and 35 percent income tax.
[3]Information on the cost of inputs in the oil sector would be needed to estimate the exact value added. This figure is an estimate of the possible upper and lower bounds.
[4]It has however been demonstrated that extractive industries have relatively few linkages with other sectors (e.g. see Auty, 2006).
[5]Export base theory has been one of the most used theories of economic development to describe a local economy and target sectoral economic development. The primary tenet of export-base theory is that the local economy can be divided into exporting and non-exporting sectors (e.g., see Tiebout, 1956).

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