Averting the Resource Curse:  
Policy Issues for Ghana at the 
Start of an Oil Era

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January 2010
Acknowledgements

This report was prepared as part of the Woodrow Wilson School for Public and International Affairs Graduate Policy Workshop titled, “Designing and Managing Adjustment Programs in Low-Income Economies,” instructed by Dr. Iqbal Zaidi in Fall 2009. The workshop entailed a field visit to Accra, Ghana from October 31 - November 8, 2009, during which the authors met with a range of individuals, including policymakers from the Bank of Ghana and Ministry of Finance; researchers from economic policy think tanks; commercial bankers; representatives from the International Monetary Fund and World Bank; staff members of the United Nations; and trade association leaders. The authors would like to extend their sincere thanks to all those who generously shared their time, insights, and expertise. The authors take full responsibility for any errors and omissions in this draft.
Executive Summary

In the wake of an oil discovery, Ghana is poised to become an oil exporter when anticipated production begins in 2011. Unlike other major oil producers in Sub-Saharan Africa with deep oil reserves, Ghana’s challenge will be to manage the short lived windfall for the benefit of future generations while avoiding the effects of Dutch Disease. This paper aims to serve as a resource for Ghanaian policy makers to anticipate the effects of oil production on the economy (Findings) and respond effectively using available monetary and fiscal tools (Recommendations).

FINDINGS

The onset of oil production provides Ghana with the opportunity to spur growth but may also lead to pronounced macroeconomic volatility and destabilization. Ghana’s emergence as an oil producer is expected to have a range of monetary and fiscal implications for the country including:

- **Inflation**: Increases in the world price of oil will translate into an increase in the government revenue, applying pressure on fiscal expansion. This may lead to a rise in inflation through increased aggregate demand.

- **Dollarization**: Oil production may affect dollarization through three channels: If inflation rises, we would expect a rise in the demand for foreign currency deposits; if the exchange rate appreciates, dollarization will likely decrease; if there’s an increase in net exports then firms in the traded sector will tend to hold more dollars.

- **Private Capital Flows**: The onset of oil production will only attract capital inflows as long as the country moves to stabilize its macroeconomy, by pursuing policies that encourage higher growth, lower inflation, and lower exchange rate volatility.

- **Dutch Disease**: Oil production is likely to result in an appreciation in the real exchange rate. This would have three main implications, namely a loss in competitiveness in the traditional sectors, output decline in the traditional sectors and a movement of labor from the traditional sectors into the non-traditional ones.

- **Debt Sustainability**: The public debt-to-GDP ratio is projected to stabilize, rather than decrease as would be expected, throughout the medium-term oil production period. The primary balance is expected to improve in the medium-term but the non-oil primary balance is expected to be higher in the last two years of the forecast period (2013-2014).

- **Government Receipts and Expenditures**: Oil discovery will bring new challenges for Ghana due to the volatility of oil prices. Oil will constitute up to 20 percent of the government revenue, and a possible decline of oil prices will hurt the government resources. Irregular oil receipts have implications on smoothing expenditure payments and engaging in effective short- and medium-term fiscal planning. Conversely, an increase in oil prices will put pressure on the government to increase spending.

- **Fiscal Space**: Oil production will contribute to Ghana’s ability to create fiscal space to the extent that it will increase the discretionary spending resources available to the government. Oil revenue should not be seen as a replacement for domestic resource mobilization and other fiscal space creation efforts that are important for long-term fiscal sustainability.
Recommendations

Transparency, accountability, public financial management, quality institutions and governance are fundamental characteristics that must be met if efforts to improve domestic resource mobilization and enhance macroeconomic stability are to succeed. In addition, oil revenue management policies such as oil price fiscal rules, generation funds, oil committees and an agenda for transparency and public reform can be used to effectively manage development of an oil producing country.

Ghana's medium-term growth would benefit from efforts to encourage effective fiscal management policies and to ensure broader macroeconomic stability as developed in following five recommendations:

- Maintain prudent fiscal measures in the non-oil sector and use non-oil fiscal indicators for multi-year budgeting cycles. This includes establishment of forward-looking guidelines that reduce the non-oil primary deficit and debt.
- Ensure that policies and procedures to promote effective expenditure smoothing and improve tax revenues from the non-oil sectors are credibly implemented before oil production begins, including the establishment of clear guidelines and procedures.
- Engage in preemptive measures to mitigate the harmful effects of real exchange rate appreciation on the export competitiveness of goods in the non-oil sector through stronger export promotion policies.
- Encourage quality reporting on capital flows by modifying the 2006 Foreign Exchange Act.
- Continue developing the private sector by encouraging higher infrastructure investment, and deepening markets to promote gradual and sustainable de-dollarization.

Ghana's approach to an oil stabilization fund should be shaped by considerations of fund management style, opportunity cost, rigidity, investment portfolio and timing. The implications of these considerations determine the timing of initiation of the fund, the types of rules that guide the allocation and extraction of resources, fund management structure, and whether revenues are to be invested domestically or internationally. There are a few oil fund examples from other African countries that can be leveraged in the development of Ghana's fund. The key is that the management of oil resources to smoothen revenue volatility and build rainy day reserves depends critically on an oil stabilization fund that is designed for greater accounting and transparency of resources.

The medium term development prospects of Ghana are encouraging, built on a history of strong institutions, democratic governance, and strengthened by the possibilities that new oil income brings. To avoid the resource curse will require mostly short-term oil revenue planning, while sustainable development requires broader macroeconomic stability and fiscal consolidation along with a credible structural adjustment and reform agendas. These efforts taken together will not only lay the foundation for growth in non-oil export sectors, but set the stage for achievements on critical development goals for the benefit future generations.
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I. Introduction

In 2007, oil deposits were discovered in the Jubilee field off the coast of Ghana. In the wake of this discovery, Ghana is poised to become an oil exporter when anticipated production begins in 2011. Based on current estimates, the Jubilee field contains up to US$2 billion in reserves and will enable Ghana to extract an average of 120 thousand barrels of crude oil per day. Oil production is projected to generate new budget resources of up to 7 percent of GDP annually. The IMF predicts that cumulative oil and gas revenues from the Jubilee field could reach $US20 billion over the field’s estimated 20-year lifespan.

The onset of oil presents both opportunities and challenges for macroeconomic management in Ghana. Ghana has recorded strong GDP growth in recent years, increasing from 3.7 percent in 2000 to 7.3 percent in 2008, aided by debt relief and improved public management practices. Economic gains have in turn enabled the government to undertake major infrastructure investments and make progress in alleviating poverty through targeted social spending. While the experience of other African oil producers raises concerns about the potential of an oil-induced “resource curse,” a number of aspects of Ghana’s political economy, including the relative strength of its democratic institutions and prior experience managing resource wealth from gold, may better position the country to avoid the pitfalls of oil production.

At the same time, Ghana enters the oil production era with a challenging macroeconomic situation. Highly expansionary fiscal policies in 2007-8 in the lead-up to the presidential election resulted in the fiscal deficit increasing from 7.5 percent in 2006 to 14.5 percent in 2008 (IMF 2009). The current account deficit as a percent of GDP is now approximately 20 percent. As a result, Ghana has a very small window to engage in fiscal consolidation. If Ghana is unable to effectively reduce its fiscal deficit prior to the onset of oil production, oil revenue will, at least in initial years, be primarily absorbed as deficit financing. In such a scenario, oil revenue will have limited potential to create fiscal space and be channeled to address development objectives.

Oil also has implications for the nature of capital inflows and private sector behavior. Oil is expected to increase Ghana’s capacity to engage in private borrowing. The experiences of other African oil producers, in which increases in oil-driven foreign direct investment have had a number of negative economic repercussions, suggest that Ghana must invest in institutions that facilitate productive uses of new capital, and in particular, ensure that banks have the necessary capacity to assess risks. High rates of inflation may also pose a challenge to effective macroeconomic management. Although the country already records higher inflation measures than most of its African counterparts, Ghana saw inflation further increase from 10 percent in 2007 to more than 20 percent in early 2009.

Additionally, oil presents significant public management challenges. Given annual oil revenue expected to measure in the hundreds of millions of dollars, Ghana must develop effective oversight mechanisms, guard against the negative macroeconomic implications of global oil price fluctuations, and determine the optimal combination of oil revenue saving and spending. While mechanisms to manage oil revenue, such as a stabilization fund, may assist the country in revenue smoothing, they are not a substitute for stronger fiscal discipline and prudent macroeconomic policies. The experiences of other African oil producers suggest that in the absence of an effective legal and regulatory framework and fiscal discipline, oil can lead to conflict, corruption and the use of oil windfalls for unproductive purposes. Oil will also be politically difficult for the government of Ghana as it attempts to institute fiscal tightening measures amidst civil society group demands for new oil revenues to be used for poverty alleviation and other development objectives. Thus, Ghana faces the challenge of enacting a medium-term macroeconomic strategy that encourages fiscal prudence while still enabling policymakers to pursue growth and development objectives.

While recognizing that oil poses significant political economy and environmental challenges in Ghana that merit further consideration and analysis, this paper limits its scope to the macroeconomic management challenges Ghana is expected to face as an oil producer. In Section II we examine the monetary and fiscal implications of oil production for Ghana. We first consider the impact of oil on inflation management, dollarization, and capital inflows in Ghana. We also consider the potential of oil production to lead to long-term real exchange rate appreciation, often termed “Dutch Disease.” We then look at the fiscal dimensions of oil production, focusing on implications for debt management and sustainability, revenue and expenditure smoothing, and fiscal space. We proceed to Section III with an analysis of policy options for oil-producing Ghana based on the experiences of other African oil producers. Based on our analysis, we provide recommendations for policymakers tasked with managing Ghana’s macro-economy at the onset of oil. Finally, in Section IV, we present a possible framework for implementing proposed recommendations. This paper aims to serve as an additional resource for Ghanaian policymakers who have the important and ambitious responsibility of achieving macroeconomic stability, effective fiscal management, and growth and development objectives as Ghana enters the oil era.
II. Implications of Oil Production

A. MONETARY IMPLICATIONS

This section provides an assessment of how oil production will impact Ghana’s monetary outlook. We explore how oil production will impact key monetary policy indicators, including inflation, exchange rates and the current and capital accounts. The section also discusses the potential Dutch Disease implications of oil production.

1. The Impact of Oil Production on Inflation

The impact of oil price fluctuations on inflation will change once Ghana becomes an oil producer. As Ghana is currently an oil importer, the effects of oil price changes on the economy are likely to differ once oil production starts in 2011. While the oil-price related drivers of inflation for oil importers are linked to a rise in costs of production input, inflation in oil exporting countries is mostly caused through fiscal expansion following the influx of oil revenues. The degree of this impact under both the oil import and oil export scenario are likely to differ based on a variety of factors outlined in the section below.

i. Factors Affecting the Pass-Through of Oil Prices to Inflation

Inflation targeting may help keep in check the pass-through of oil prices to inflation. As of 2007, Ghana officially introduced an Inflation Targeting (IT) framework, using the 12-month change in the headline CPI as primary target, while also monitoring core inflation, excluding energy and utility prices (IMF 2009). Figure 1 provides an overview of inflation rate since 1990, which has been 23.7 percent on average, while average inflation in the last five years has declined to 14.3 percent. Figure 2 displays the log of CPI against the log of Ghana’s retail prices of premium gasoline denominated in Cedi. Inflation seems to grow at the same trend as Ghana’s retail gasoline prices, although it is not responsive to short-term fluctuations. This could partly be explained by the government’s policy to subsidize oil prices. In the case of sharp world oil price movements, the subsidy would dampen the effect and thus lead to lower divergence of gasoline prices from other prices.

A stable macroeconomic environment may reduce the impact of oil price hikes on price levels. A country with sound macroeconomic policies and persistently lower levels of inflation is likely to experience lower inflationary pressures as a result of increasing oil prices compared to countries with a less robust macroeconomic environment (Gregorio et al. 2007). Although Ghana has been one of the more stable economies in Africa, with GDP growth averaging about 5 percent since the 1980s, fiscal expansion in 2007-8 caused inflation to rise. Recent cuts in spending to cool down the economy have in turn resulted in a slowdown in economic growth in the latter half of 2009 (IMF 2009). Moreover, the recent depreciation of the Cedi from 1.17 to the dollar in the beginning of 2009 to 1.45 in October 2009, and the resulting rising costs of imports pushed price levels up.

Fiscal dominance and volatilities in government spending restrain the ability of BoG to effectively target bursts of inflation produced by oil price shocks. Fiscal dominance in Ghana has been a major constraint to effective implementation of monetary policy. Furthermore, it has been the primary driver of inflation thus far. Despite BoG’s legal independence to use monetary instruments as needed to achieve its inflation targets, the government’s spending and borrowing needs have, to a certain degree, tied BoG’s hands in setting interest rates. A rise in interest rates makes government borrowing more expensive while also increasing the cost of debt servicing.

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1 According to the estimates of the IMF and other organizations, oil production is anticipated to begin in Ghana in 2011. Of course, a number of factors may lead oil production to begin slightly earlier or later than this projection. For the purposes of this paper, we will refer to oil production as beginning in 2011.

2 Debt sustainability is discussed in greater detail under the Fiscal Implications Section.
Oil price fluctuations have a higher pass-through where oil is a significant component in the economy’s cost structure. An oil-importing economy that heavily uses oil as a production input is likely to face more severe consequences as a result of oil price increases. Based on information gathered through interviews in Ghana, it appears that the agriculture sector, which comprises 37 percent of the GDP, heavily relies on oil as a production input, mainly for transportation of crops from farms to markets. This is likely to affect inflation in two stages. First, the costs of production for the agricultural sector will rise following an oil price increase, holding other things constant. If these are passed on to consumers, the general price level of food and agricultural products will go up. Second, as a result of this price increase, workers are likely to demand higher wages. For oil-exporting economies, the effect is less severe as the energy sector will benefit from oil price increases; however, the production costs for other sectors could still rise. The overall effect is ambiguous and depends on the relative size of the energy sector and any fiscal response of the government.

**ii. Ghana as Oil-Importer: Past trends in inflation and oil price movements**

Empirical studies suggest that a positive relationship exists between oil price increases and inflation. Cointegration analysis shows that a long-run relationship exists between oil prices and inflation (Tweneboah et al. 2008). In particular, their results show that a 1 percent rise in oil prices leads to a 1.2 percent rise in inflation. This supports the above hypothesis that an economy that heavily uses oil as a production input will be subject to inflationary pressures as oil prices rise. The authors further use impulse response functions to examine the short-run dynamics of the model. The results show that in response to a one standard deviation increase in oil prices, interest rates initially decline in an effort to smoothen the negative impact of the shock on economic output. This brief decline in interest rates is soon followed by an increase to counter inflationary pressures. The response shows that output falls by a total 0.36 percent while prices rise by a total of 1 percent over a period of 6 years. This seems to imply that the BoG response to oil price hikes is insufficient to effectively counter inflation. Various reasons could explain this finding, including insufficient institutional credibility, lack of responsiveness of the private sector to changes in the prime rate, or prioritization of other key macroeconomic variables including output and exchange rate stabilization in monetary policy decision making processes.

Increases in interest rates have not always been effective in countering inflation, sometimes even resulting in a positive relationship with price levels. The authors further examine the response of the economy to a one standard deviation increase in interest rates. Results suggest that while output falls immediately, prices rise by about 0.05 percent per year over a period of 6 years. Although the increase is minor given the levels of inflation in Ghana, these observations correspond to statements by BoG and economic policy think tanks, according to which Ghana has at times seen a positive relationship between interest rates and inflation. In order to pin down the effect of interest rates on price movements, it is important to determine the source of inflation. One reason that could explain a positive relationship between inflation and interest rates is an increase in the marginal cost of capital that is passed on to consumers. If borrowing becomes more expensive for businesses, they may increase prices to cover their rising costs. However, in the long run, we would expect a decline in demand due to higher interest rates to outweigh the upward pressure on prices. Another—and in Ghana’s case more significant—explanation for a positive correlation between interest rates and inflation is the large role of the government spending. An increase in government expenditures financed by borrowing can crowd out private capital and push up interest rates, while also fueling inflation.

**iii. Ghana as Oil Exporter: Lessons from the effect of oil price fluctuations on inflation for a small oil-exporting economy**

Disproportionate fiscal expansion may lead to a rise in inflation once oil production starts, which may be partly offset by exchange rate appreciation. The situation for Ghana as oil exporter will change primarily in that an increase in oil prices may lead to an appreciation of the currency and increased revenue to the government, depending on the government’s financial policies. A stronger valued currency enables imported production inputs to be purchased at relatively cheaper prices. This may have a declining effect on overall price levels in Ghana. However, as mentioned above, the fiscal response of the government is crucial in determining the overall effect on inflation. If government spending increases disproportionately, this is likely to cause a rise in aggregate demand, thus pushing price levels up. Since estimation of the inflationary impact of oil prices in Ghana cannot be conducted until macroeconomic data becomes available following the start-up of oil production, this paper leans on other countries’ experience to draw inferences.
TABLE 1. AVERAGE PERIOD INFLATION FOR SELECTED COUNTRIES

<table>
<thead>
<tr>
<th>Period</th>
<th>Algeria</th>
<th>Cameroon</th>
<th>Cote d'Ivoire</th>
<th>Ecuador</th>
<th>Gabon</th>
<th>Iran</th>
<th>Kuwait</th>
<th>Mexico</th>
<th>Nigeria</th>
<th>Venezuela</th>
</tr>
</thead>
<tbody>
<tr>
<td>t-10</td>
<td>9.10</td>
<td>12.10</td>
<td>5.63</td>
<td>20.88</td>
<td>9.86</td>
<td>15.91</td>
<td>5.60</td>
<td>21.36</td>
<td>15.40</td>
<td>11.00</td>
</tr>
<tr>
<td>t-5</td>
<td>24.76</td>
<td>4.41</td>
<td>4.76</td>
<td>33.99</td>
<td>2.21</td>
<td>21.13</td>
<td>1.58</td>
<td>62.38</td>
<td>25.87</td>
<td>38.85</td>
</tr>
<tr>
<td>t0</td>
<td>12.36</td>
<td>8.20</td>
<td>9.69</td>
<td>54.46</td>
<td>5.01</td>
<td>29.05</td>
<td>4.25</td>
<td>75.78</td>
<td>48.93</td>
<td>44.90</td>
</tr>
<tr>
<td>t+5</td>
<td>2.43</td>
<td>3.00</td>
<td>2.89</td>
<td>28.29</td>
<td>0.94</td>
<td>19.74</td>
<td>2.01</td>
<td>17.98</td>
<td>12.27</td>
<td>45.09</td>
</tr>
<tr>
<td>t+10</td>
<td>3.03</td>
<td>2.02</td>
<td>3.21</td>
<td>41.29</td>
<td>1.20</td>
<td>14.05</td>
<td>1.38</td>
<td>19.40</td>
<td>15.73</td>
<td>20.75</td>
</tr>
</tbody>
</table>

* t0 represents onset of peak production; see Appendix C for details

Government spending is the primary channel through which oil prices are transmitted to price levels. A Lorde et al. (2009) study of Trinidad and Tobago offers insights into the macroeconomic effects of oil price fluctuations on a small open oil-producing country. Trinidad and Tobago’s case is similar to Ghana in that oil revenues make up 30 percent of the government’s revenue, which is sufficient to make the economy highly susceptible to oil price movements. This is indeed confirmed by the study, which finds a long-run relationship between oil prices and several macroeconomic variables. Ten-year impulse response functions to a one standard deviation increase in oil prices show a strong and persistent impact on price levels, which rise 7 percent above pre-shock levels. Further, short-run results imply that while price levels are not necessarily directly impacted by rises in oil prices, there is an indirect effect on inflation through increased government revenue. A study by Eltony (2000) on Kuwait’s macroeconomic environment has very similar findings to Lorde et al.’s results. The author uses impulse response functions and variance decomposition to find that an increase in oil prices results in statistically significant rises in CPI. The study finds that increased government expenditure is an important factor in explaining these changes. The two cited studies suggest that the impact of oil price shocks on Ghana’s inflation levels as oil-exporter will be primarily determined through the government’s fiscal policy. If the government engages in excessive spending policies in response to increased oil revenues, price levels are likely to rise. At the same time, if the government’s fiscal dominance position is not improved, BoG will continue to face constraints to keep inflation in check through inflation targeting.

Selected countries show that inflation increases in years leading up to peak oil production, possibly due to increased spending and borrowing against anticipated oil revenue. In estimating the effects on inflation under oil production, we further looked at evidence from 16 oil producing countries, including 8 African countries and 8 OPEC members (see Appendix B for results), and the developments of key macroeconomic variables 10 years prior and after significant peaks in oil productions. This analysis reveals interesting trends. Figure 3 shows the average inflation for selected countries in periods t-10, t-5, t0, t+5 and t+10, with t0 representing the onset of peak oil production in each respective country. Out of ten countries presented, six show a peak in inflation leading up to t0, while three others show an upward trend. This could be explained by an increase in government spending in anticipation of incoming oil revenues. The t+5 period shows a clear decline in inflation, indicating that price levels drop in the 5 years following a peak in oil production. One explanation could be real appreciation due to increased exports, resulting in downward pressure on overall price levels. Table 1 provides a more specific look at average period trends in selected countries.

To conclude, Ghana may be subject to inflationary pressures in the light of anticipated influx of oil revenues if the government is inclined to engage in increased fiscal expansion. Although increased oil exports may exercise downward pressure on price levels through an appreciation in the exchange rate, the magnitude of this effect is uncertain given the impact of exchange rate appreciation on other sectors. As suggested in the literature, we would thus expect government expenditure to become the primary channel through which oil prices translate into increased inflation. One of the primary objectives of the

3 Saudi Arabia is not presented, as it is not a price taker in the world market. Brazil, DRC, Russia and Angola are not graphed as they witnessed hyperinflation during at least one of the periods.
government should be focused on expenditure smoothing so as to avoid large fluctuations in spending behavior, and resulting upward pressure on price levels.

2. The Impact of Oil Production on Dollarization

i. The Impact of Dollarization on Monetary Policy

Inflationary pressures may result in increased dollarization of the economy. Ghana's economy is partly dollarized with foreign currency deposits averaging 30.13 percent between 1994 and 2008 as share of total deposits (see Table 2). Building on above discussion of inflationary trends under oil production, this section examines the prospects of effectively targeting inflation given the substantial level of dollarization in the economy, as well as the impact of oil exports on the demand for dollars. In a dollarized economy, high inflation can cause private sector actors to hedge against such risk by substituting towards dollars. As such, if inflation rises due to expansionary fiscal policy as mentioned in the previous section, dollarization is expected to increase. Indeed, Figure 4 shows a positive co-movement of inflation and dollarization in Ghana, implying that an increase in inflation incentivizes currency holders to substitute towards dollars.

Dollarization may render monetary policy less effective. Higher inflation and the resulting increased demand for dollars may compromise the effectiveness of monetary policy. Since BoG can only control domestic interest rates, there is a risk that a partly dollarized economy will not be as responsive to the Bank's monetary policy. In particular, if BoG raises interest rates in an effort to curtail inflation, but the private sector continues to borrow in dollars at lower interest rates, the room to effectively tighten monetary policy will be limited. Central to this issue is whether we find covered interest rate parity in Ghana, whereby interest rate differentials are neutralized by changes in the exchange rate. If the structure and regulation of financial markets allows for easy substitution between dollar and local currency deposits and if there are limited transaction costs to doing so, currency substitution will be responsive to changes in interest rates.

Moreover, substitution is likely to be higher if changes to interest rates are perceived to be of permanent nature.

ii. The Impact of Oil Production on Dollarization

The effect of oil production on dollarization is expected to occur through three different channels:

1. Inflation: A rise in inflation will result in increased demand for foreign currency deposits. As mentioned above, inflationary pressures with the onset of oil production are likely as a result of fiscal expansion. However, an increase in the BoG interest rate to tackle inflation will make domestic assets more attractive and result in substitution from dollars to Cedi, at least in the short run until financial markets adjust. We are thus likely to observe two opposing effects of inflation on demand for dollars.

2. Exchange Rate: An appreciation of the exchange rate is usually accompanied by a decline in demand for dollars. This may be both due to expectations of additional appreciation as well as increased confidence in the currency and economy as a whole.

3. Exports: An increase in exports is likely to result in domestic firms engaged in the tradable sectors to hold more dollars. If these firms receive income in dollars, they may also be likely to demand loans in USD from Ghanaian banks. A cross-country comparison of foreign currency deposits ratios based on our 16 country sample reveals that five out of seven of those countries which had foreign currency deposit data are subject to an increase in foreign currency deposits following the beginning of a peak oil production period. This seems to support the argument that the increased demand for dollars within the tradable sectors plays a significant role.

De-dollarization efforts should be gradual and least distorting as possible. Although dollarization is often accepted as a byproduct of global financial integration of small developing countries, the risks resulting from liability dollarization of banks and the private sector expose the economy to risks due to exchange rate instability. Hence it may be in the government's interest to encourage a decline in dollarization. Forced conversion or direct regulation of foreign currency deposits is rather distorting, and from an efficiency point of view it may be more feasible to alter incentive structures in the financial market to foster a gradual transition towards local currency deposits.
BoG should adopt currency-sensitive banking regulation that forces banks and firms to internalize the currency risk. However, it may be feasible for the government to adopt policies that will strengthen banking regulation and reflect the different degrees of risks for dollar deposits and loans, through differentiated depositors’ insurance, different pricing of dollar financial instruments or different reserve requirements for dollarized banks.

Macroeconomic stability and financial deepening will be conducive to de-dollarization. The local currency market should be made more attractive to provide incentives for permanent substitution to domestic currency. Finally, macroeconomic stabilization should increase the confidence in the local economy, which would facilitate the de-dollarization process. If the government succeeds in putting in place fiscal rules that ensure expenditure smoothing and fiscal sustainability during the oil production era, we can expect a sustainable decline in inflation. Lower inflation, coupled with a reasonably stable exchange rate, should in turn lead to long-term declines in financial dollarization.

3. The Impact of Oil Production on Capital Inflows

Foreign capital inflows have played a crucial role in financing the gap generated by Ghana’s current account deficits. Because capital inflows have huge implications for current account sustainability, Ghana has paid close attention to the composition and size of its short-term capital inflows. Although short-term inflows are viewed as more dangerous in financing the current account deficits than long-term inflows, they have been preferred to long-term inflows. Long-term inflows are expected to appreciate the real exchange rate, compromise the competitiveness of the economy, and re-introduce structural trade deficits, which will in turn exacerbate the initial current account deficits. In addition, Ghana’s weak public financial management, and its tendency to borrow heavily in order to meet social and development commitments, contributes to higher interest rates and consequently, lower investment by the private sector. The lack of affordable credit may lead the private sector to borrow from alternate sources, in the form of hot inflows of foreign capital that may be backed by risky assets and collaterals.

As Ghana becomes an oil producer, concerns over the composition and size of short-term capital inflows will continue, and most likely, increase. Promoting sound macroeconomic policies will play a key role in ensuring that Ghana uses its inflows productively while managing the risks associated with rapid capital inflows and possible reversals. This section highlights the importance of promoting sound macroeconomic policies as Ghana attracts more private capital in the onset of oil production. It first looks at the overall trends in capital flows in oil-producing and non-oil-producing Sub-Saharan African countries in order to determine the key factors that attract capital flows. It then examines trends in capital inflows in a group of oil producers in order to determine to what extent the same factors continue to attract capital flows in the presence of oil.

i. Private capital flows in Sub-Saharan Africa

Private capital flows in Sub-Saharan African countries have quadrupled between 2000 and 2007, and Ghana has been among the leading destinations. Although the region accounts for a small proportion of capital flows worldwide, capital flows surpassed official aid flows for the first time in 2006 and are expected to soon replace official aid as the most important source of external finance for Sub-Saharan Africa. This puts a premium on sound macroeconomic management, transparent capital account policies, and financial sector reforms to ensure that countries use the inflows productively while avoiding macroeconomic instability and sudden reversals. In the long run, the benefits of capital inflows will depend on the quality of domestic institutions and the depth of financial markets (IMF 2008b).
Investors are increasingly attracted to the region’s better macroeconomic performance. Although direct foreign investment flows continue to go largely to resource-intensive countries like Nigeria and South Africa, capital flows have increasingly gone to a small group of other countries – notably, Ghana, Senegal, Tanzania, Uganda, and Zambia – in response to higher global liquidity, improved risk ratings, and attractive yields. In addition, investors have also been attracted by Sub-Saharan Africa’s recent solid macroeconomic performance and more stable political situations. In fact, many Sub-Saharan African countries now compare favorably with Southeast Asian countries in the 1980s in terms of GDP, inflation, financial depth, size of government, and international reserves (IMF 2008b).

FDI accounts for the highest proportion of private capital in Sub-Saharan Africa, while portfolio investments account for a minor share. A study by Mills (2008) shows that private debt accounts for a sizable portion of private capital flows in Ghana, Senegal, Tanzania, Uganda, and Zambia, and the surge in private debt flows over the past few years reflects syndicated bank lending to private and public corporations (Table 3). It is also important to note that all five countries constitute a group of more recent recipients of private capital flows and thus, are a much more appropriate comparative group for Ghana. Countries like South Africa and Nigeria are much larger economies with longer histories of private capital flows, so they were excluded from this analysis.

The level and composition of Ghana’s capital flows present advantages and disadvantages compared to other countries in Sub-Saharan Africa. Ghana has received proportionally less private debt but more portfolio investments than its peers, which are considered to be less volatile. However, these portfolio investments have been concentrated in government securities, and may expose Ghana to potential vulnerabilities, as the primary government debt and stock markets have limited depth and liquidity. Attracting portfolio inflows more to equity purchases, along with more foreign direct investment, would also reduce vulnerability, since equity investments are non-debt creating, and can help transfer managerial/technological skills and support the government’s private sector-led growth strategy. Countries with large and liquid equity markets also tend to experience sudden capital reversals less often.

| Table 3. Private Capital Inflows to Selected Sub-Saharan African Countries (in Millions of USD) |
|-------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
|            | 2000  | 2001  | 2002  | 2003  | 2004  | 2005  | 2006  | 2007  | % of GDP*         |
| Ghana      |       |       |       |       |       |       |       |       |                  |
| FDI        | 59    | 56    | 50    | 50    | 332   | 145   | 636   | 855   | 14               |
| Portfolio  | 96    | 32    | 0     | 25    | 0     | 414   | 383   | 206   | 7                |
| Private Loans | 27  | -77   | -18   | -73   | -95   | 39    | -12   | 30    | -1.2             |
| Senegal    |       |       |       |       |       |       |       |       |                  |
| FDI        | 63    | 63    | 63    | 63    | 63    | 63    | 63    | 63    | 4                |
| Portfolio  | 0     | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 0                |
| Private Loans | 135 | 27    | 155   | 161   | 223   | 132   | 332   | 274   | 12.9             |
| Tanzania   |       |       |       |       |       |       |       |       |                  |
| FDI        | 464   | 374   | 448   | 498   | 472   | 541   | 653   | 700   | 25               |
| Portfolio  | 0     | 0     | 0     | 0     | 0     | 0     | 160   | 703   | 5                |
| Private Loans | 0   | 46    | -93   | -201  | -289  | 84    | 126   | -296  | -3.8             |
| Uganda     |       |       |       |       |       |       |       |       |                  |
| FDI        | 155   | 162   | 188   | 217   | 293   | 353   | 399   | 484   | 20               |
| Portfolio  | 303   | 255   | 320   | 324   | 217   | 159   | 251   | 507   | 20               |
| Private Loans | 14  | 14    | 21    | 37    | 53    | 73    | 87    | 188   | 4.3              |
| Zambia     |       |       |       |       |       |       |       |       |                  |
| FDI        | 122   | 72    | 303   | 347   | 364   | 380   | 467   | 811   | 25               |
| Portfolio  | -1    | 8     | 0     | 2     | 0     | 122   | 92    | 908   | 10               |
| Private Loans | 0   | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0                |

Source: IMF African Department Database, 2008. *In percent of 2007 nominal GDP
ii. Private capital flows in oil-producing countries

Selected countries show that capital flows increased in years leading up to peak oil production, possibly due to increased investment in the oil sector but also due to their sound macroeconomic policies. Table 4 shows that 9 out of 11 countries faced a positive trend in foreign direct investment. Although increased investment in the oil sector could explain the rise in capital flows before and during the onset of peak oil production, countries that experienced an increase in foreign direct investment faced higher growth, lower inflation, and lower exchange rate volatility.

iii. The role of macroeconomic stability on capital flows

Macroeconomic stabilization policies will play a key role in attracting private capital inflows, which may increase at the onset of oil production. Macroeconomic volatility worsens the problem of international asymmetries and can become a major source of vulnerability to the financial system. Thus, real growth in GDP, lower inflation, and lower exchange rate volatility serve as signaling mechanisms to bolster investor confidence and attract more foreign capital. Overall, countries that receive higher FDI and portfolio investments face higher growth, lower inflation, and lower exchange rate volatility after the onset of oil production.

Ghana’s strategy of partial capital account liberalization following a package of macroeconomic stabilization programs has attracted foreign capital. The PRGF arrangement allowed Ghana to bring down the fiscal deficit from 10 percent of GDP in 2000 to 3 percent in 2005 and inflation from 40 percent in 2000 to near 10 percent in 2006. With the HIPC and MDRI debt relief initiatives, total public debt fell from 119 percent of GDP in 2003 to 42 percent in 2006. Low and predictable rates of inflation and debt relief are more likely to contribute to economic growth and attract capital flows.

iv. The role of capital account liberalization on capital flows

Ghana partially liberalized its capital accounts with the introduction of the 2006 Foreign Exchange Act, which allowed non-residents to purchase domestic government securities with maturities of three years or longer and minimum holding periods of one year. Foreign purchases of equities were also completely liberalized. Capital account restrictions were put in place because of the fear that capital account liberalization would expose the economy to potential huge capital flights and financial crises.

Overall, capital inflows responded positively to Ghana’s partial liberalization, as non-residents bought domestic government securities worth 3 percent of GDP by the end of 2007, strengthening the long end of the market for government debt, with the average maturity increasing by more than 6 months to 2.1 years (Mills 2008).

Although some capital controls for non-residents remain in place, they do not seem to put Ghana at a disadvantage vis-à-vis its neighbors. Like Ghana, both Tanzania and Senegal continue to have limited restrictions on capital, while Zambia gradually liberalized its accounts while simultaneously promoting macroeconomic stabilization programs. Because Ghana’s capital controls have not remained in place for a prolonged period of time, and have not directly limited or interfered with financial sector development and investor confidence, the costs associated with them may be minimal in the short term.

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i t0 represents onset of peak production; see Appendix C for details.
### TABLE 5. CAPITAL ACCOUNT LIBERALIZATION PROCESSES IN SELECTED SUB-SAHARAN AFRICAN COUNTRIES

<table>
<thead>
<tr>
<th>Status /Sequencing</th>
<th>Fully Open</th>
<th>Partially Open</th>
<th>Fairly Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-step</td>
<td><strong>Uganda (1997)</strong>&lt;br&gt;Liberalization part of a broad package of market-oriented reforms, privatization and trade liberalization</td>
<td><strong>Zambia (1990-95)</strong>&lt;br&gt;1993-1994: Liberalization of capital transactions. 1995: Banks allowed to accept foreign currency deposits.&lt;br&gt;-Liberalization part of broad reforms focused on economic stabilization, competitiveness, and debt restructuring, accompanied by financial market reforms.</td>
<td><strong>Ghana (1995-2006)</strong>&lt;br&gt;Mid-1990s: Partial liberalization of portfolio and direct investment&lt;br&gt;2006: Foreign Exchange Act, allowing nonresidents to buy government securities with maturities of three years or longer and minimum holding period of one year.&lt;br&gt;-Liberalization followed economic stabilization and debt restructuring -Parallel reforms in the primary government debt and stock markets -Efforts to develop interbank money and foreign exchange markets and to strengthen financial sector supervision and soundness</td>
</tr>
<tr>
<td>Sequenced opening</td>
<td><strong>Zambia (1990-95)</strong>&lt;br&gt;1993-1994: Liberalization of capital transactions. 1995: Banks allowed to accept foreign currency deposits.&lt;br&gt;-Liberalization part of broad reforms focused on economic stabilization, competitiveness, and debt restructuring, accompanied by financial market reforms.</td>
<td><strong>Ghana (1995-2006)</strong>&lt;br&gt;Mid-1990s: Partial liberalization of portfolio and direct investment&lt;br&gt;2006: Foreign Exchange Act, allowing nonresidents to buy government securities with maturities of three years or longer and minimum holding period of one year.&lt;br&gt;-Liberalization followed economic stabilization and debt restructuring -Parallel reforms in the primary government debt and stock markets -Efforts to develop interbank money and foreign exchange markets and to strengthen financial sector supervision and soundness</td>
<td><strong>Cameroon (2000-present)</strong>&lt;br&gt;2000: Harmonization of national foreign exchange regulations and liberalization of capital flows within CEMAC&lt;br&gt;-Prudential limits on banks’ net open foreign positions&lt;br&gt;-Residents’ foreign exchange deposits prohibited&lt;br&gt;-Continued administrative restrictions remain on most capital outflows&lt;br&gt;-No immediate plans for further opening</td>
</tr>
<tr>
<td></td>
<td><strong>Tanzania (1990)</strong>&lt;br&gt;1990: FDI liberalization starts&lt;br&gt;1997: Full liberalization of FDI flows&lt;br&gt;1998: Supporting foreign exchange regulations -Continuing restrictions on portfolio investments (government securities) -FDI liberalization coincided with privatization, creation of one-stop shop, and investment promotion</td>
<td><strong>Senegal (1999-present)</strong>&lt;br&gt;1999: Elimination of controls on inward FDI and foreign borrowing by residents&lt;br&gt;-Continuation of administrative restrictions on capital outflows</td>
<td><strong>Senegal (1999-present)</strong>&lt;br&gt;1999: Elimination of controls on inward FDI and foreign borrowing by residents&lt;br&gt;-Continuation of administrative restrictions on capital outflows</td>
</tr>
</tbody>
</table>

In the medium-term, however, Ghana may face vulnerabilities associated with attracting capital flows that its controls may fail to address. Ghana could be faced with foreign investors that may find ways to circumvent capital controls over time. A rising proportion of government securities will become eligible for resale after having been held for over a year, and the potential development of a secondary market for government securities may leave Ghana vulnerable. In this case, the introduction of new market instruments for hedging and managing risks may lessen incentives for sudden flight from domestic markets.

v. The role of private sector development and capital flows

Credit flow to the private sector, domestic liquidity, and broad money supply have declined. The private sector has raised alarm over the higher cost of doing business in the form of higher interest rates, tighter fiscal policy, and reduced investment spending, and these developments may impede private sector growth moving forward. Public sector borrowing in Ghana remains high and has contributed to high interest rates. Although the trend in recent years from the government has been to cut interest rates in order to boost private-sector borrowing, it seems likely that given the risk of inflationary spikes as a result of high international oil and food prices, the Bank of Ghana will maintain higher interest rates. A cut in the interest rate could take place in 2010 as inflationary pressures in the economy subside. However, in the current high interest rate environment, credit flow to the private sector has declined and banks have further increased their base rates during the second quarter of 2009 in line with the tightening of interbank credit. Meanwhile, domestic liquidity has declined, with broad money supply (M2+) growth decreasing from 39.2 percent in 2008 to 37.8 in 2009 (Databank Group 2009). Loan portfolio growth of banks has decreased from 48.7 percent in 2009 to 25.6 percent in 2008 (BoG 2009).

Ghana’s high capital adequacy requirements may further stifle the capacity of the private sector to access capital. The Banking Act of 2004 requires banks to maintain a minimum capital adequacy ratio of ten percent. The Bank of Ghana viewed this as a measure to mitigate potential credit and solvency risks, as it is common practice that countries with less diversified financial systems have higher capital adequacy ratios to reflect higher credit risk. However, financial risk tends to be bank-specific, as small banks might face different levels of default risk than large well-established banks or may run into a liquidity crisis fairly easily by making misguided decisions. Capital reserves, then, must be determined by the specific risk conditions that the bank faces by using the value-at-risk as a risk measurement tool. The capital adequacy ratio remains high, reaching 14.8 percent in 2007 from 9.5 percent in 2003 (IMF 2008).4

Ghana’s venture capital market is fairly underdeveloped and restricts access to capital to private businesses. The few venture capital firms in existence impose stringent criteria such as good management, growth potential, technology, research and development, capital resources, and profit margins. Few businesses in Ghana can meet these requirements because most businesses are private businesses with small-scale entrepreneurs, characterized by sole ownership and lack of well-articulated management resources (Arthur 2006). Most small-scale entrepreneurs are unable to raise the initial funds required to open savings accounts within the formal sector, and the substantial collateral that is demanded by the banks as security before loans are granted deter them from seeking bank credit.

4. The Impact of Oil Production on Long-Term Exchange Appreciation (Dutch Disease Effects)

This section applies the model developed by Max Corden (1984) to Ghana. In modeling Dutch Disease, Corden identifies three channels through which the emergence of a booming sector (e.g. oil) hurts traditional sectors. The first one is the spending effect, which implies that when the extra income in the booming sector (B) is spent, the price of non-tradeables (N) relative to tradeables rises. This results in real appreciation. The second effect is the resource movement, which refers to an increase in the marginal product of labor in the booming sector, which in turn, increases the demand for labor. The resource movement effect has two parts. First, the movement of labor out of agricultural and manufacturing sectors and into the booming sector is expected to lower output in the first two, which is called direct de-industrialization or de-agriculturalization. Second, a movement of labor as a result of an excess demand, or indirect de-industrialization, is expected to lead to real appreciation, reinforcing the de-industrialization process. Finally, nominal exchange rate appreciates due to increased revenues from the oil sector.

An oil boom generally results in real exchange rate appreciation. Experiences of other countries suggest that the onset of large resource wealth has “Dutch Disease” effects, where

4 This ratio is much higher compared to countries in WAEMU, CEMAC, and those emerging from post-conflict, as few of them set minimum capital adequacy ratios above 8 percent (IMF 2006a).
the appreciation of the exchange rate has negative impacts on the non-oil sectors, particularly agriculture and manufacturing sectors. Table 6 shows that in most of the cases, real exchange rate has appreciated in selected countries and, as seen in Table 7, appreciation has lowered the share of non-oil exports.

Similar to other low-income countries, agriculture is the most important component of the Ghanaian economy. Discussion of Ghana’s economic base and export status is important given the country’s emergence into the oil export market. Ghana’s traditional sector is agriculture, which constitutes the most important component of the economy. The sector provides about 37 percent of the GDP. Over half of the country’s labor force works in the agricultural sector. Additionally, the manufacturing sector overwhelmingly depends on agricultural inputs. Of the commodities that make up the agricultural sector, cocoa has traditionally been the most important. Currently, Ghana is the second largest producer of cocoa in the world (see Table 8).

Although there has been an increase in recent years in non-traditional commodities, the country’s export composition continues to be heavily dependent on traditional commodities. This shows that the country is facing difficulties with export diversification, which is hazardous for anticipated Dutch Disease effects. In 2008, Ghana’s earnings from exports reached US$ 5,269.73 million, accounting for almost half of GDP. Gold, cocoa and timber have traditionally been the country’s most important export commodities. The total earnings from gold exports in 2008 was US$ 2,246.25 million, accounting for around 40 percent of the total exports. In comparison, the share of cocoa as a percent of total exports has decreased from 40 percent in 2004 to 23.5 percent in 2008 as a result of climate conditions and price changes. Timber has also fallen as a share of export value: timber accounted for 6 percent of total exports in 2008, which is half the export value it constituted a decade and a half prior. Since the 1980s and the implementation of an economic recovery program promoting export-led growth through export diversification and expansion, Ghana has made gains in increasing its non-traditional

<table>
<thead>
<tr>
<th>Period</th>
<th>Algeria</th>
<th>Cameroon</th>
<th>Côte d’Ivoire</th>
<th>Ecuador</th>
<th>Gabon</th>
<th>Iran</th>
<th>Nigeria</th>
<th>Venezuela</th>
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<tr>
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<td>139</td>
<td>140</td>
<td>129</td>
<td>140</td>
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<tr>
<td>t-5</td>
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<td>141</td>
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<td>136</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
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<td>98</td>
<td>124</td>
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<td>101</td>
<td>158</td>
<td>103</td>
<td>101</td>
<td>94</td>
<td>116</td>
<td>65</td>
</tr>
<tr>
<td>t+5</td>
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<td>95</td>
<td>64</td>
<td>101</td>
<td>75</td>
<td>89</td>
<td>147</td>
<td>74</td>
</tr>
<tr>
<td>t+10</td>
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<td>104</td>
<td>64</td>
<td>113</td>
<td>105</td>
<td>90</td>
<td>169</td>
<td>88</td>
</tr>
</tbody>
</table>

Source: IFS, * since t0=2000 for Algeria, t+10 is taken as the latest data available (2007).

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<thead>
<tr>
<th>Period</th>
<th>Algeria</th>
<th>Cameroon</th>
<th>Côte d’Ivoire</th>
<th>Ecuador</th>
<th>Gabon</th>
<th>Nigeria</th>
<th>Venezuela</th>
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<tr>
<td>t0</td>
<td>43%</td>
<td>63%</td>
<td>84%</td>
<td>66%</td>
<td>17%</td>
<td>4%</td>
<td>19%</td>
</tr>
<tr>
<td>t+5</td>
<td>39%</td>
<td>48%</td>
<td>85%</td>
<td>67%</td>
<td>17%</td>
<td>1%</td>
<td>18%</td>
</tr>
<tr>
<td>t+10</td>
<td>34%*</td>
<td>38%</td>
<td>63%</td>
<td>45%</td>
<td>14%</td>
<td>7%</td>
<td>8%</td>
</tr>
</tbody>
</table>

Source: UN COMTRADE * since t0=2000 for Algeria, t+10 is taken as the latest data available (2007).

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<tbody>
<tr>
<td>Côte d’Ivoire</td>
<td>42</td>
<td>39</td>
<td>38</td>
<td>37</td>
<td>38</td>
</tr>
<tr>
<td>Ghana</td>
<td>15</td>
<td>20</td>
<td>17</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Indonesia</td>
<td>12</td>
<td>12</td>
<td>13</td>
<td>14</td>
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</tr>
<tr>
<td>Nigeria</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
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<tr>
<td>Cameroon</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
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</tbody>
</table>

exports as a percent of total exports. These include pineapples, yams, handicrafts, canned and smoked fish, processed foods, and wood products. In 2008, the share of non-traditional exports reached 28 percent of total exports valued at US $1.3 billion (up from $400 million in 2000).

Real appreciation caused by the oil boom will hurt the traditional sectors, particularly cocoa producers. Inflation will have further negative implications for these producers. Applying the model developed by Corden to Ghana, we can assess the impact of oil-driven exchange rate appreciation on Ghana’s cocoa producers. As most of the agricultural products, cocoa is a tradeable good and vulnerable to Dutch Disease effects. To interpret this simple model to the daily life of Ghana, we know that the cocoa revenue is shared by the producers, government and the COCOBOD, with 70, 18, and 2 percent, respectively. Table 8 shows how producers are affected by inflation and real exchange rate appreciation. We assume that \( P_{cocoa} = \$3500/\text{ton} \), and the nominal exchange rate is 1$=1.45 Cedis. Therefore, while the farmer is earning 3552 Cedis per ton today, he will be receiving only 2565 Cedis with nominal prices in the presence of a 12 percent real exchange rate appreciation and a 15 percent of inflation, holding other factors constant. This would undoubtedly create more pressure on the government to increase the 70 percent share of the farmers by reducing government revenues. Table 8 provides illustrative calculations for farmers’ earnings in real terms from cocoa production based on different assumptions of domestic inflation and exchange rate appreciation.

Dutch Disease will also affect the balance between rural and urban wages, causing shifts in the output and production mix of the economy. With a boom in oil sector, the relative price of non-tradeables over tradeables will rise, resulting in a real exchange rate appreciation. The resource movement effect increases the demand for labor and raises the wages in the oil sector through real appreciation and, hence, labor would move out from the agricultural sector into the more capital-intensive booming sector. With this rise in demand for labor, the output of the processed good rises and that of the non-processed good falls. Therefore, profitability in the agricultural sector decreases. This is also seen in our simulation in Table 7. The key factor that determines the magnitude of the decrease in profitability is the share of labor in the production function. If the capital is more used as a factor, it improves profitability since real wages increase. In the case of Ghana, the economy is mainly labor-intensive, which implies that with the Dutch Disease there is a risk of real wage increases in the economy and output decreases in the agricultural sector. Another implication would be migration: as the labor demand in the booming sector increases, labor from rural areas would migrate to urban regions.

Oil revenues will result in enormous spending pressure on the government. As a result of the oil discovery, the government is likely to face a dilemma: infrastructure investments vs. short-term spending. As discussed in later in Section III, Ghana needs to improve its infrastructure in a way so as to enhance the competitiveness of its traditional sectors. Oil production will shift the production mix of the economy away from the traditional sectors to the non-tradeable (services) sector. Bearing in mind that the proven reserves will be temporary for Ghana, there is a significant possibility that the economy will return to its traditional traded goods when the oil production diminishes, but this time with higher real exchange rate, real wages and less competitiveness.

To mitigate the Dutch Disease effects, the government should be concerned with improving competitiveness as well as exports diversification and facilitation. Dutch Disease effects are linked to competitiveness loss through real appreciation of the exchange rate. The very first literature of Dutch Disease had a focus on developed countries such as Australia, the Netherlands and Britain, with the assumption of full-employment. However, developing or low-income countries already have significant problems with competitiveness and investment. Additionally, we cannot assume that their economies are in full-employment. Similar to our case, developing countries have various issues that create massive barriers in front of economic growth. Those issues, accompanied with

<table>
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<th>Inflation</th>
<th>5%</th>
<th>8%</th>
<th>12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>3%</td>
<td>3255</td>
<td>3160</td>
<td>3018</td>
</tr>
<tr>
<td>5%</td>
<td>3188</td>
<td>3095</td>
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</tr>
<tr>
<td>8%</td>
<td>3087</td>
<td>2997</td>
<td>2862</td>
</tr>
<tr>
<td>15%</td>
<td>2853</td>
<td>2769</td>
<td>2565</td>
</tr>
</tbody>
</table>

The Rybczynski theorem states that an increase in the endowment of labor increases the output of the labor intensive good and decreases that of the other good (capital intensive good).

TABLE 9. IMPACT OF REAL EXCHANGE RATE APPRECIATION ON COCOA PRODUCER EARNINGS

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Averting the Resource Curse: Policy Issues for Ghana at the Start of an Oil Era

2009-10
poverty, corruption, infrastructure shortages and high unemployment rates, would undoubtedly strengthen the pressure on the government to spend the revenue rather than investing in infrastructure. Ghana’s poor rating in the 2009 Global Competitiveness Report (114th out of 133 countries surveyed) (WEF 2009), it (WEF 2008), suggests a competitiveness loss even before the oil production starts (the country had ranked 102nd the year before). Those ratings reflect rather institutional, bureaucratic and infrastructural picture of the country in terms of competitiveness and as the oil exports start, the country will likely face further competitiveness loss through real exchange rate appreciation.

B. FISCAL IMPLICATIONS

This section examines what oil production will mean for the government’s efforts to smooth revenues and expenditures, as well as achieve fiscal and debt sustainability.

1. Implications of Oil Production on Debt Sustainability

Ghana’s debt management record has been compromised in the past decade and fiscal management is on shaky grounds as the new government deals with a two-thirds rise in fiscal deficit over the last year. As a result, there are concerns that Ghana may have difficulties in programming new resource growth within a sustainable debt-management framework.

The consequences of debt affect the development of the private sector, management of fiscal space, and the government’s ability to balance the budget. The size of debt and the growth rate of debt may lead to a deteriorating debt situation. This imposes constraints on the conduct of fiscal and monetary policies and weakens the government’s ability to meet social and developmental commitments. A high debt ratio of around 60 percent of GDP is expected in Ghana in the medium term and with the addition of new revenues from oil. If Ghana is unable to reign in its deficit before oil production begins, then oil revenues may be absorbed to finance the non-oil budget deficit and service pre-existing debt. At the extreme, this may lead to problems with solvency that limit the ability of the government to balance the budget in the future and may jeopardize funding from multilateral organizations such as the World Bank and the IMF.

On the monetary side, heavy borrowing to close the debt and fiscal gaps contributes to higher interest rates and worsens the ability of government to borrow. Investment by the private sector is lowered because of high rates of interest and also because the public sector “crowds out” the private sector in the credit market (Sowa 2002). Ghana may also be subject to the risk of hot inflows of foreign capital due to strong interest in the Jubilee oil fields and anticipated GDP growth.

Ghana’s debt outlook is moderate to stable during the medium term. According to the IMF’s 2009 Article IV Consultation, Ghana’s external debt dynamics remain subject to moderate risk of debt distress as in 2008; however, a more favorable baseline debt trajectory is supported by the prospect of significant oil production volumes by 2011. Standard and Poor and Fitch downgraded Ghana’s debt outlook in March 2009 to negative from stable citing that high interest rates, slumping external demand and faltering private remittances could lead to growth falling to 3-4 percent over the next two years (Apps 2009). Both rating agencies currently rate Ghana as B+ on its long-term and B on its short-term rating.

Both the primary deficit and domestic primary balance show that a structural deficit is not a major factor in the period forecasted. The expected primary balance shows that total revenue and grants adequately cover recurring expenditures from 2012 onwards; when domestic capital expenditures are deducted a domestic primary surplus is expected at approximately 1 percent of GDP (Table 9).

The primary balance is expected to improve in the medium term but the non-oil primary balance is expected to be higher in the last two years of the forecast period. The primary deficit does not present an accurate assessment of the long-term debt management framework because growth in oil revenues may hide declines in non-oil income and growth in non-oil related expenditures. The non-oil primary balance is the key fiscal indicator in petroleum exporting countries because it is a reasonable indicator of domestic government demand, is a measure of injection of oil revenue into the economy, is a measure of fiscal effort and underlying fiscal policy stance and is a key input into fiscal sustainability. The non-oil primary deficit is 1 percent to 4.3 percent higher than the primary deficit throughout the projection period because growth in energy, utility, and related subsidies is greater than the growth of non-oil revenue. However, a non-oil budget deficit may actually be sustainable and pose no vulnerability concerns as long as the deficit is consistent with macroeconomic stability objectives.

The relationship between the fiscal deficit and the real exchange rate may increase as receipts from oil exports grow and oil revenues are programmed to balance the budget. Although Ghana’s non-oil real GDP is expected to grow by about six percent annually over the medium term, almost all revenue growth is attributable to oil receipts.
Table 10. Deficit Outlook, 2010 – 2014 (percentage of non-oil GDP)

<table>
<thead>
<tr>
<th></th>
<th>2010f</th>
<th>2011f</th>
<th>2012f</th>
<th>2013f</th>
<th>2014f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall balance</td>
<td>-6.0</td>
<td>-4.5</td>
<td>-2.8</td>
<td>-2.1</td>
<td>-2.1</td>
</tr>
<tr>
<td>Primary balance</td>
<td>-2.2</td>
<td>-0.9</td>
<td>0.1</td>
<td>-0.1</td>
<td>-0.1</td>
</tr>
<tr>
<td>Domestic* primary balance</td>
<td>-1.4</td>
<td>-0.5</td>
<td>1.0</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>Non-oil** overall balance</td>
<td>-6.0</td>
<td>-5.4</td>
<td>-3.9</td>
<td>-6.4</td>
<td>-5.6</td>
</tr>
<tr>
<td>Non-oil** (domestic) primary balance</td>
<td>-2.2</td>
<td>-1.8</td>
<td>-0.9</td>
<td>-4.4</td>
<td>-3.5</td>
</tr>
</tbody>
</table>

Source: IMF; independent analysis

* Domestic primary balance is the primary balance less domestic capital expenditure.
** Non-oil overall balance is the overall balance less oil sector direct taxes and nontax revenue and domestic capital expenditure paid with oil revenue.
*** Non-oil domestic primary balance is equal to the primary balance because domestic capital expenditures are subtracted from both calculations.

Table 11. Opportunities to Reduce the Cost of Servicing Debt

<table>
<thead>
<tr>
<th>Fundamentals</th>
<th>Description</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiscal and political stability</td>
<td>Reduce political instability, increase fiscal stability, consolidate nascent democratic institutions, and reduce government interference in the economy</td>
<td>• Expenditure smoothing&lt;br&gt;• Adopt a realistic framework for expenditure spending that targets infrastructure development&lt;br&gt;• Fiscal discipline can be improved with multi-year budgeting</td>
</tr>
<tr>
<td>Higher commodity prices and favorable liquidity conditions</td>
<td>Higher commodity prices and favorable liquidity conditions that lower risk and result in large capital flows</td>
<td>• Mitigate effects of Dutch disease and pursue policies to improve agricultural productivity in tandem oil sector development&lt;br&gt;• Liquidity should be enhanced but dollarization risk should be recognized</td>
</tr>
<tr>
<td>Developed capital markets</td>
<td>Develop capital markets, which help diversify production chain risks</td>
<td>• The introduction of oil revenues can provide a major boost in confidence for the domestic economy.&lt;br&gt;• Capital markets should be developed prudently with the correct controls in place</td>
</tr>
<tr>
<td>Sound macroeconomic policies</td>
<td>Sound macroeconomic policies that bring inflation under control (including through more independent monetary authorities), reduce output volatility, and significantly reduce public and external debt</td>
<td>• Increase credibility of the government to control overspending&lt;br&gt;• Increase communication by the Bank of Ghana</td>
</tr>
</tbody>
</table>

As a result, the fiscal deficit may be progressively more sensitive to real exchange rate volatility as the government relies more on oil income to balance the budget.

The public debt-to-GDP ratio is projected to stabilize throughout the medium-term oil production period rather than decreasing as expected with new oil income coming online. Under current projections, the addition of oil revenue will not close the projected budget deficit, ranging from 2 to 4 percent of non-oil GDP, because of higher interest payments and additional capital expenditures funded by oil revenue. In fact, total government debt is expected to remain around 63 to 64 percent of GDP, roughly the same level of debt as expected in 2009. Government revenue projections from the IMF from 2011-14 indicate that oil revenues will be a constant 10.48 percent of non-oil GDP per year. Oil revenues will not likely be used to pay down public debt substantially more than before unless substantial changes are made on the fiscal non-oil side. Is this cause for concern? If the deficit is driven not by growth in wages but in productive uses such as capital expenditures then infrastructure improvements will enable future economic development in the non-oil sectors. Moreover, there are many opportunities available for Ghana to decrease the cost of debt service in the era of oil production some of which are listed in Table 11. By exploring the fundamentals that influence debt servicing and using opportunities available during the period of oil extraction to reduce the cost, emerging market spreads can be tightened.

As the cost of servicing debt rises, more consideration should be given to reducing constraints affecting Ghana’s ability to service debt during the oil production period. The cost of sovereign debt as measured in basis points against US Treasuries is on the rise as well as long-term debt measured over a 1-year period. Beginning with the HIPC external debt relief in 2006, external debt has claimed an increasingly large proportion of public sector debt and this trend is expected to continue into 2011. Higher sovereign interest rates lead to higher interest payments and adversely impacts the debt-to-GDP ratio. Excessive foreign borrowing could lead to an external debt problem, depletion of foreign exchange reserves, and eventually to an exchange rate crisis. Table 12 looks at the factors affecting Ghana’s ability to service debt in the future.

<table>
<thead>
<tr>
<th>External Trade</th>
<th>Balance of Payments</th>
<th>Debt</th>
<th>Resource Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relatively static commodity structure (gold, timber, cocoa)</td>
<td>Domestic factors of production may not have the ability to be transformed into FX required for debt service and financing of imports</td>
<td>Difficult to know with a great deal of accuracy the size of the debt because of unfunded arrears, quasi-fiscal activity and district-level budgeting</td>
<td>Fiscal constraints such as the government’s capacity to tax and collect taxes</td>
</tr>
<tr>
<td>However, oil exports will help with diversification of exports but the negative effects of Dutch Disease is unknown.</td>
<td>Deficit on investment income is a reflection of the capital dependency of Ghana on the rest of the world and is unlikely to improve significantly in the foreseeable future.</td>
<td>External debt is a large and growing proportion of overall debt; averaging carrying cost of FX reserves in terms of the yield on loans and the rate of return on reserve assets is substantial</td>
<td>Government of Ghana has limited fungibility of resources because of disproportionate burden of earmarked funds to health care, education and local government programs</td>
</tr>
<tr>
<td>Exports of crude oil may help in the long run to bring in foreign currency</td>
<td>Political constraints on the allocation to debt service versus spending on social and poverty-related programs and infrastructure needs</td>
<td>The economic performance of Jubilee is critically dependent on the oil price, time to extraction, ultimate size of the oil field</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Risk of borrowing against expected oil income stream leading to even higher debt levels</td>
<td></td>
<td>Dependent on success of the integrated financial management system, BPEMS</td>
</tr>
</tbody>
</table>
Anticipated oil revenues may lead to higher levels of indebtedness. Under the new three-year arrangement under the PRGF, non-concessional financing will be limited to high return infrastructure and energy projects. The program would provide for guarantees for Ghana National Petroleum Company borrowing for oil and gas investments of up to US$300 million during 2009-10 (IMF 2009). Although the capacity to borrow is limited by constraints on non-concessional borrowing, there is growing concern that domestic debt levels may increase when the PRGF program expires at the end of three years. If the government turns to the domestic credit market, this may have a crowding out effect that can inhibit private sector development. Excessive domestic borrowing especially in Ghana’s underdeveloped capital market may lead to high real interest rates and carry trade risk, which through automatic debt dynamics may have a snowballing effect on public debt. Higher public debt would put pressure on the government to facilitate a proportionally higher GDP growth in order to stabilize the debt-to-GDP ratio.

Finally, Ghana may push back important reforms that are necessary for debt sustainability once oil revenues come online. Ghana’s debt management strategy is likely to be affected by oil dominance in the near and medium-term. The appearance of new income generated by the onset of oil production may weaken and delay any efforts to improve on the debt management framework as old revenue constraints are relaxed and more opportunities arise for spending rather than saving. Unlike natural gas, it is not expected that there will be major backward linkages from oil production. The public’s appetite for debt may also be bolstered by unrealistic projections of oil revenue and unsustainable expectations for higher levels of government services and programs.

However, as Ghana continues to grow, there is an even greater need for debt affordability reviews and implementation of best practices. New income growth can help clear away non-oil related debt and improve debt sustainability in the long haul. It is clear from the experiences of other low-income oil producing countries that an oil revenue stabilization fund is no substitute for sound fiscal management. Whatever progress is currently made towards effective debt management should increase as the temptation to spend on non-strategic projects grows with the size of oil income.

2. Implications of Oil Production for Government Receipts and Expenditures

Relative revenue (and expenditure) stability is important to the government’s ability to develop a medium-term fiscal framework, pursue a path of fiscal consolidation, and promote broader macroeconomic stability. Table 13 shows the year-to-year change in key fiscal variables in Ghana. During the seven-year period starting in 2000, Ghana’s growth rate did not fluctuate drastically, growing at a pace between 3.7 percent and 6.4 percent. Fiscal aggregates, however, exhibited much greater year-to-year volatility. Growth in total revenues and grants ranged from 11.7 to 31.5 percent. Similarly, total expenditures growth ranged from -16.6 to 22.9 percent.

| TABLE 13. CENTRAL GOVERNMENT OPERATIONS, 2000-07 (Constant Prices, % Change from Prior Year) |
|-----------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                               | 2000  | 2001  | 2002  | 2003  | 2004  | 2005  | 2006  | 2007  |
| Real GDP Growth                               | 3.7%  | 4.2%  | 4.5%  | 5.2%  | 5.6%  | 5.9%  | 6.4%  | 5.8%  |
| Overall balance                               | 24.7% | -2.8% | -21.4%| -32.3%| -14.0%| -12.0%| 172.3%| 29.0% |
| Total financing                               | 26.6% | -28.5%| -12.3%| -15.0%| -14.9%| -34.0%| 256.6%| 22.0% |
| Total revenue and grants                       | 14.2% | 31.5% | -11.7%| 26.8% | 24.8% | 2.1%  | 0.2%  | 11.6% |
| Revenue                                       | 12.4% | 6.6%  | 3.8%  | 21.4% | 20.8% | 6.0%  | -2.1% | 9.8%  |
| Grants                                        | 31.6% | 240.1%| -52.5%| 58.2% | 42.4% | -12.7%| 10.4% | 18.6% |
| Total expenditure                              | 9.8%  | 22.9% | -16.6%| 16.0% | 22.1% | -2.2% | 18.9% | 15.0% |
| Recurrent expenditure                          | 17.0% | 11.9% | 4.9%  | 4.5%  | 11.3% | -5.1% | 24.6% | 10.8% |
| Capital expenditure                            | -2.4% | 45.4% | -50.0%| 53.7% | 46.2% | 2.7%  | 10.1% | 22.3% |
Analysis suggests that when the Ghanaian central government responds to short-term fiscal disturbances, it does so in the presence of short-term borrowing constraints. In 2002, for example, a sudden drop-off in outside grants assistance led to a sharp 11.7 percent drop in total government revenues. In response, total expenditures contracted by 16.6 percent, led by a 50 percent drop in capital expenditures. The following year, in 2003, a recovery in the government’s revenue position appears to have enabled a reversal of the prior year’s contraction in expenditures: total expenditures bounced back approximately to their 2001 level while, despite lumpiness in investment, capital expenditures grew 53.7 percent—an almost symmetric reversal of the prior year’s developments. Similarly, in 2006, as the pace of the economy picked up but total revenues and grants remained steady, an increase in credit available to the government enabled an increase in total expenditures of 18.9 percent.

For a non-diversified economy reliant on commodity exports, the range of the government’s viable policy options to stabilize revenue and promote macroeconomic stability depends on the size and nature of commodity price fluctuations and other country-specific characteristics. Government revenue is expected to be a function of a number of factors in addition to commodity price changes, including GDP growth, tax effort, donor support, the political business cycle, and IMF programs. However, in economies that are highly dependent on commodities, commodity price changes and related terms of trade shocks are expected to lead to a high degree of revenue fluctuation.

Compared to volatility due to macroeconomic cycles, revenue volatility due to commodity price fluctuations generally takes place over a much shorter time horizon, such as within the annual budget cycle. An analysis of the relationship between government revenue and cocoa prices between 1984-2008 suggests that commodity price changes are among the factors that have influenced year-to-year revenue fluctuations in Ghana (see Figure 6).

Though the discovery of oil provides a new source of revenue for Ghana, the innate volatility of this revenue represents a substantial fiscal challenge that must be appropriately managed. Oil is expected to quickly become one of Ghana’s chief export commodities, constituting up to a third of Ghana’s net exports by 2015 (Moss and Young 2009). According to projections, in the first years of production, oil will constitute up to 20% of total government revenue.

The innate volatility of oil prices presents a challenge for revenue stability. Table 14 provides a “counterfactual analysis” examining what oil would have meant for Ghana’s revenue situation had production started in 2000. Columns (1) and (2) of Table 14 show average annual oil prices for the period 2000-2009. The largest year-over-year increase in oil prices (42 percent) occurred in 2005, while the largest drop occurred in 2009 (39 percent). Columns (3) and (4) of the same table present the counterfactual scenario. Column (3), which uses World Bank oil extraction projections for Ghana from 2011-2020, shows the estimated revenue that would have accrued to the Ghanaian government had oil production instead started in 2000.

Due to a sharp drop in world oil prices in 2009, had Ghana become an oil producer earlier, the country would have seen its oil-based revenues halved. Since oil revenues are estimated to be approximately 20 percent of total government revenues, this would have amounted to a 10 percent reduction in total government resources, barring a large countervailing increase in revenues from the non-oil sector.

Irregular oil receipts have implications for the Ghanaian government’s ability to smooth expenditure payments and engage in effective short- and medium-term fiscal planning. If fluctuations in global oil prices result in revenue uncertainty, this may be transmitted to the broader economy through public expenditure volatility. Some research suggests that volatility of government expenditure has a negative effect on growth rate and investment, controlling for other country-specific growth correlates (Turnovsky and Chattopadhyay 1998; Furceri 2006). Empirical analysis suggests that Ghana has not been particularly successful in the past in smoothing expenditures in the midst of revenue fluctuations (see Figures 7 and 8).

6 Economy-wide impact of oil discovery in Ghana
7 The proportion of the value of output accruing to the Ghanaian government was imputed from data from the same source. In calculating these estimates we used exchange rate data from the Bank of Ghana and GDP deflator data from the IFS.
TABLE 14. COUNTERFACTUAL SCENARIO OF OIL REVENUE IN GHANA, 2000-09

<table>
<thead>
<tr>
<th>Year</th>
<th>Oil Price</th>
<th>Counterfactual: Total Government Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S. Dollars per Barrel*</td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>Year-over-year % Change</td>
</tr>
<tr>
<td>2000</td>
<td>$ 28.52</td>
<td>774</td>
</tr>
<tr>
<td>2001</td>
<td>$ 24.45</td>
<td>-14%</td>
</tr>
<tr>
<td>2002</td>
<td>$ 24.96</td>
<td>2%</td>
</tr>
<tr>
<td>2003</td>
<td>$ 28.88</td>
<td>16%</td>
</tr>
<tr>
<td>2004</td>
<td>$ 38.23</td>
<td>32%</td>
</tr>
<tr>
<td>2005</td>
<td>$ 54.42</td>
<td>42%</td>
</tr>
<tr>
<td>2006</td>
<td>$ 65.15</td>
<td>20%</td>
</tr>
<tr>
<td>2007</td>
<td>$ 72.47</td>
<td>11%</td>
</tr>
<tr>
<td>2008</td>
<td>$ 96.85</td>
<td>34%</td>
</tr>
<tr>
<td>2009</td>
<td>$ 58.68</td>
<td>-39%</td>
</tr>
</tbody>
</table>

Source: IMF; independent analysis

An overreliance on projected oil revenues may undercut fiscal stability. Economic volatility may result from sticky expenditure levels that do not adjust quickly enough to new, lower equilibrium revenue levels. Additionally, if oil prices unexpectedly drop, it can be difficult and costly to reduce expenditure levels and delay programs. Delays and interruptions in spending can be harmful to programs in particular sectors. A recent analysis of Zambia, for instance, found that unpredictable cash flows complicated planning and the use of budgetary resources (see Bevan 2006). Unpredictable revenues and expenditures in turn made it difficult for spending ministries to anticipate their cash flows. Non-wage and capital spending particularly suffered from this unpredictability (Bevan 2006). This analysis points to the need for revenue and expenditure smoothing mechanisms to facilitate effective oil management in the midst of price fluctuations.

Finally, the experience of other countries suggests that in the context of high oil revenue, policymakers may be pressured by constituents or other incentive structures to increase spending beyond budgetary frameworks. Political pressures may complicate Ghana’s efforts to expend funds in a manner consistent with a medium-term expenditure framework. Empirical research suggests that resource booms, including from newfound oil revenue, may skew political incentives in a way that distorts public spending, particularly in election years (Vergne 2009). As resource booms increase the value of rents, politicians may be prone to allocate more resources to influence the outcomes of elections and to increase resource misallocation in the economy more broadly (Vergne 2009). The mechanisms designed to smooth expenditures may be vulnerable to political pressures. The significant rents associated with resource exploitation may also fuel greater levels of corruption, which in turn has implications for growth and investment (Tanzi 1998).
3. Implications of Oil Production for Fiscal Space

Oil production provides the government with the potential opportunity to create “fiscal space,” defined as the non-wage discretionary budget available to a government without compromising its fiscal position, to increase the flexibility of its fiscal policy options or devote additional resources to priority expenditures, such as in the social sectors. Fiscal space, in combination with macroeconomic stability, can provide the government with flexibility to pursue expansive fiscal policy or additional discretionary fiscal stimulus in the presence of a negative economic shock (IMF 2009). In contrast, if the government has limited fiscal space, then given economic downturn it has limited alternatives to implementing tightening policies (IMF 2009).

Oil production contributes to Ghana’s ability to create fiscal space to the extent that it increases the discretionary spending resources available to the government. The amount of oil revenue that accrues to the government as discretionary resources will largely depend on the policy options the government pursues and the amount of oil revenue that is not subject to earmarks for specified purposes. The immediate impact of oil on Ghana’s revenue situation will depend on the country’s success in consolidating its fiscal position. If the country fails to successfully implement fiscal tightening measures, oil revenues may, at least in initial periods, be primarily consumed as deficit financing. Thus, for oil to contribute to fiscal space creation, it is imperative that the government remain committed to short- to medium-term measures to strengthen and consolidate its fiscal position.

At the same time, it is important that oil revenue not become a substitute for other fiscal space creation mechanisms. Given the expected decreases in official development assistance Ghana is expected to receive over the coming years, Ghana’s main new sources of fiscal space will come from its ability to mobilize greater domestic revenue, reprioritize and make more efficient its expenditures, reduce its fiscal deficit, and leverage additional sources of low interest or concessional financing.

The failure of many oil-rich countries in Africa to adequately foster non-oil revenue bases suggests that it is important for Ghana to sustain domestic tax efforts despite new oil resource availability. Particularly because the timeframe of oil production in Ghana is relatively short, oil revenue should not be seen as a replacement for domestic resource mobilization and other fiscal space creation efforts that are important for long-term fiscal sustainability. Ghana has already recently undertaken efforts to improve its tax policy and tax administration and has the potential to continue the momentum of such initiatives.

A well-designed and executed public expenditure management system will also be indispensable to Ghana in ensuring that its expenditure decisions align with a medium-term expenditure framework. Given the distortionary effect of tax, some research advocates greater reliance on expenditure adjustment mechanisms than taxation policy to create fiscal space and achieve a sustainable fiscal path (Berg et al. 2009; World Bank 2005). On the expenditure-side, recent developments suggest that Ghanaian policymakers are cognizant of the need to cut unproductive spending and improve public expenditure management, particularly given the country’s current economic situation. Recent promising initiatives in Ghana include efforts to improve cash and expenditure management through a “Single Treasury Account,” an improved budget management system; and broader public sector reform efforts to reduce the public sector payroll. Ghana has also implemented a public expenditure management system to increase expenditure efficiency.

Unfortunately, the implementation of the public expenditure management system has suffered from technological challenges and delays. As Ghana addresses this issue and undertakes measures to ensure its expeditious implementation, it should also re-evaluate the system to ensure that adequate sectoral protection measures are in place. Experience from other countries suggests that public expenditure management systems are not immune from political pressures. Even when expenditure-smoothing mechanisms are effectively in place, this does not necessarily mean that priority sectors, such as health and education, are adequately protected within the budget framework (Bevan 2006).

C. SUMMARY OF MAIN IMPLICATIONS

Table 15 summarizes the main monetary and fiscal implications of oil production as discussed in parts A and B of this section. As the table reflects, inflation is a key problem, not only due to its direct effects on the macroeconomic stability, but also because of its impact on dollarization, capital inflows and, to some extent, Dutch Disease. On the fiscal side, revenue growth, as well as potential revenue and expenditure volatility and the accrual of new debts are highlighted.
Table 15. Summary of Main Implications of Oil Production for Ghana

<table>
<thead>
<tr>
<th>Issue</th>
<th>Main Implications</th>
</tr>
</thead>
</table>
| **Inflation**                 | • The transmission of oil price increases to inflation will be different under oil-production.  
                               | • Government spending (following an increase in revenue and spending pressure) is expected to be the primary channel through which oil prices will be transmitted to price levels.  
                               | • There is a risk of rising inflation leading up to the onset of production as spending and borrowing may increase against the anticipated revenue. |
| **Dollarization**             | • The risks of dollarization including decreased effectiveness of monetary policy and systemic risks due to balance sheet effects may increase under oil production.  
                               | • Oil production may affect dollarization through three channels. If it increases inflation then a rise in the demand for foreign currency deposits might be expected. If the exchange rate appreciates, dollarization will likely decrease. And finally, an increase in net exports will cause firms to hold more dollars. |
| **Capital Flows**             | • Macroeconomic stabilization and capital account liberalization policies will play a key role in ensuring that capital account liberalization policies succeed in attracting more private capital flows.  
                               | • Although some capital controls for non-residents remain in place and do not seem to have put Ghana at a disadvantage vis-à-vis its neighbors, Ghana may face vulnerabilities associated with attracting capital flows that its controls may fail to address in the medium term.  
                               | • Ghana’s weak financial sector management, underdeveloped venture capital market, and high capital adequacy requirements may stifle the capacity of the private sector to access capital. |
| **Dutch Disease**             | • Oil production is likely to result in an appreciation in the real exchange rate.  
                               | • This would have three main implications. First, a loss in competitiveness of the traditional sectors; second, a decline in the output of those sectors and third, a movement of labor from the traditional sectors into the non-traditional ones.  
                               | • Ghana is world’s one of the most important cocoa producers and with the Dutch Disease effects, the production of this tradeable and traditional commodity will be hurt due to a loss in competitiveness, labor movement and output loss. |
| **Debt Sustainability**       | • The public debt-to-GDP ratio is projected to stabilize throughout the medium-term oil production period rather than decreasing as expected with new oil income coming online.  
                               | • The primary balance is expected to improve in the medium term but the non-oil primary balance is expected to be higher in the last two years of the forecast period (2013-2014).  
                               | • Both the primary deficit and domestic primary balance show that a structural deficit is not a major factor in the period forecasted.  
                               | • The relationship between the fiscal deficit and the real exchange rate may increase as receipts from oil exports grow and oil revenues are programmed to balance the budget. |
| **Government Receipts and Expenditures** | • Oil discovery will bring new challenges for Ghana since oil prices are volatile. Irregular oil receipts have implications on smoothing expenditure payments and engaging in effective short- and medium-term fiscal planning.  
                               | • Since oil will constitute up to 20% of government revenue, periods of low oil prices will exert pressure on the government’s resources.  
                               | • An increase in oil prices may put pressure on the government to increase spending beyond its long-run resources, compromising fiscal sustainability. |
| **Fiscal Space**              | • The ability of new oil revenues to create fiscal space will depend on the amount of revenue that accrues to the government as discretionary spending, as well as how successful the government is in reducing the fiscal deficit prior to oil production Ghana should sustain domestic tax efforts despite new oil resource availability. Therefore, oil revenue should not be seen as a replacement for domestic resource mobilization and other fiscal space creation efforts that are important for long-term fiscal sustainability. |
III. Avoiding the Resource Curse: Policy Recommendations

A. POLICY OPTIONS – LESSONS LEARNED FROM OTHER COUNTRIES

This section examines the revenue management policies of other African countries that have experience with oil extraction. This cross-country analysis suggests important lessons for management of future oil revenues in Ghana. The countries selected for this analysis are African (both Sub-Saharan and North African) oil producers: Algeria, Angola, Cameroon, Cote d’Ivoire, Gabon and Nigeria (see Appendix C for details). This is not an exhaustive list of oil producers; however, because these countries share some institutional features with Ghana their experiences are particularly relevant for Ghana as it becomes an oil producer.

**Oil Price Fiscal Rules (OPFR)**

Algeria, Angola, Gabon and Nigeria have implemented some version of OPFR where the government’s revenue estimates are based on a specified oil reference price. The reference price is normally at the conservative end of oil price projections and any excess revenue resulting from higher actual oil prices is channeled into special funds.

**Lessons Learned:**

- A specific oil price in the budget is easy to explain to the public, and it provides an effective and transparent way of limiting policy-makers’ discretion.
- Implementing OPFRs can help improve fiscal discipline, de-link expenditures from oil revenues, reduce public debt and increase foreign exchange reserves.
- Empirical evidence suggests that it is difficult to specify the long-run prices and assess whether an oil price shock is permanent or temporary.
- Political competition over windfall revenues may make it difficult to keep expenditures low during periods of high oil prices.

**Stabilization Funds**

Angola and Algeria have established stabilization funds that absorb excess oil revenue. One of the main issues subject to debate is whether the stabilization fund should be used to pay off debt, be earmarked for spending in priority areas such as agricultural development or infrastructure investments, or could also be used to absorb government deficit. In Algeria, deficit financing was initially prohibited, but was allowed later under the condition that reserves exceed a certain threshold.

**Generation Funds**

The purpose of generation funds is to preserve a portion of oil revenues for the use for future generations. The Gabon’s Fund for Future Generations (FFG) is conceived as a perpetual reserve fund and the law explicitly bars the use of the resources to finance government spending. Contributions and reinvestment of interest income depend on whether the minimum contributions have been reached.

**Lessons Learned:**

- Reducing government debt rather than accumulating deposits in future generation funds while financing deficits with expensive debt may leave future generations better off.
- There may be a trade-off between investing interest revenues domestically versus abroad. Investing at home has immediate growth effects and contributes to higher long-term per capita income, while investing abroad may yield higher returns.

**Public Finance Reforms and Increased Transparency**

Some countries pursued policies to increase the transparency in oil revenue and wealth management, for example through e-governance (Angola). Others have enacted reforms to improve public financial management (Cote d’Ivoire), but in general the structural and administrative reforms necessary to ensure effectiveness of OPFR and oil funds have been slow.
Lessons Learned:
- To stabilize and reduce the non-oil deficit, non-oil revenues need to increase and fiscal policy has to be anchored against non-oil fiscal indicators.
- Greater progress in taxation and public financial management are needed to ensure that excess oil revenues are not used to finance non-oil fiscal deficits.
- Although progress has been made to enact laws that aim at increasing non-oil revenues, results have been slow to materialize.

Establishment of Oil Committees
Cote d’Ivoire formed an oil committee to monitor the management of oil and gas flows and the taxation of petroleum products became based on import parity prices.

Lessons Learned:
- Coordination between inter-ministerial committees remains a challenge.
- Strict auditing and reporting guidelines may have contributed to the significant delayed timely monitoring and information sharing.

B. RECOMMENDATIONS FOR GHANA

The onset of oil production provides Ghana with the opportunity to spur growth but may also lead to pronounced macroeconomic volatility and destabilization. Long-term growth can be sustained by engaging in effective governance, paring down the non-oil debt overhang and managing fiscal resources through strategic planning. However, the unpredictability of government revenue and expenditure due to highly volatile commodity prices combined with undiversified revenue and export factors are significant threats to fiscal stability despite a wider resource base (Budina 2008). Together, this may translate into macroeconomic instability and a highly volatile real exchange rate that can jeopardize inflation targeting efforts and policies that resist dollarization.

Our recommendations aim at providing concrete tools to manage oil revenues, while also addressing general macroeconomic and fiscal policies, which need to be put in place to make such mechanisms efficient. This structure is based on the premise that transparency, accountability, public finance management, quality institutions, and governance are fundamental characteristics that must be met if efforts to improve domestic resource mobilization and enhance macroeconomic stability are to succeed. The policy recommendations outlined below are not meant to be prescriptive but to underline critical concepts to be considered by policy makers in the development of Ghana’s medium-term fiscal strategy.

1. Encourage effective fiscal management policies
- Ensure that policies and procedures to promote effective expenditure smoothing are credibly implemented before oil production begins including the establishment of clear guidelines and procedures on how to address overruns and mechanisms to de-incentivize overruns in the short-to-medium term.
- Continue to engage in concerted efforts in improving tax policy and revenue administration that promotes the government’s growth agenda while also addressing poverty alleviation concerns.
- Maintain prudent fiscal measures in the non-oil sector and use non-oil fiscal indicators for budgeting cycles. Establish forward-looking guidelines that reduce the non-oil primary deficit/debt.
- Ensure that priority expenditures remain adequately reflected in expenditure frameworks. Ghana should explore strategies, including multi-year budgeting to better ensure that development activities are adequately funded and prioritized.
- Put in place mechanisms to ensure transparency of oil revenue including adherence to the Extractive Industries Transparency Initiative (EITI).
- Consider instituting an “oil price fiscal rule” whereby oil revenues are calculated at a pre-agreed price per barrel on a 3-5 year oil price moving average. Deposit funds that accrue as the difference between the market price and the budget price into an extra-budgetary account.

2. Ensure broader macroeconomic stability
- Encourage gradual and sustainable de-dollarization. BoG should promote deepening of local financial markets and adopt currency-sensitive banking regulation that induces banks and firms to internalize the currency risk posed by higher dollar demand.
- Modify the 2006 Foreign Exchange Act to require better monitoring and data of capital flows, require more stringent reporting guidelines, and work with commercial banks to improve banks’ risk management systems.
- Encourage quality reporting on capital flows by modifying the 2006 Foreign Exchange Act.
• Engage in preemptive measures to mitigate the harmful effects of real exchange rate appreciation on the export competitiveness of goods in the non-oil sector through stronger export promotion policies.

• Encourage higher infrastructure investments by easing constraints on private investments. Some portion of oil revenue should be used for infrastructure investments, such as roads, irrigation, and R&D (e.g. new technologies in agriculture and manufacturing), as well as productivity enhancing investments in education and labor.

3. Establishment of an Oil Stabilization Fund
Finally, it appears increasingly likely that Ghana will adopt some variation of an oil stabilization fund as momentum builds for strategic allocation of resources for future generations. The objective this fund is to stabilize the economy, act as repository for the government’s oil-related savings and support good management practices for the country’s oil wealth. Below paragraphs discuss the critical elements of the oil fund and discuss the impacts and efficiencies of each.

• **Opportunity cost:** Reducing government debt rather than accumulating deposits in future generation funds while financing deficits with expensive debt may leave future generations better off.

• **Rigidity:** A fund with tools that are too rigid may impede Ghana’s ability to address its large infrastructure and development challenges (e.g. poverty, unemployment) and other macroeconomic concerns, such as inflation.

• **Investments:** There may be a trade-off between investing interest revenues domestically versus abroad.
  
  - **Abroad:** Investing abroad may yield higher returns and be a less risky option if domestic markets are particularly unstable. If the government prioritizes higher medium-term returns then it may make sense to invest the fund abroad.
  
  - **Domestic:** Investing at home has immediate growth effects and contributes to higher long-term per capita income.

• **Timing:** A fund may be premature until oil revenues actually accrue to the government and also requires an understanding of government absorptive capacity.
  
  - **Early:** The government will be prevented from exhausting resources early on and will have higher savings over the lifetime of the fund.
  
  - **Late:** Accurate estimates of absorptive capacity and the size of the oil income may only be available at a later stage. However, new debt may accrue if short-run expenditures for oil related development is not funded by new income.

• **Fund Management:** One of the main considerations includes whether the fund should be left to the discretion of the government or should be overseen by an independent legal or regulatory oversight body, for example mandated by Parliament.
  
  - Given fiscal responsibility law may not be in place prior to oil production and related uncertainties, Ghana has to be careful in developing a base of stakeholders that are well-informed and involved in monitoring oil revenue from the onset of production. Special fiscal institutions can help manage oil wealth, but are most effective in countries that demonstrated fiscal prudence even before these institutions were created.
  
  - External fund managers can provide expert financial advice and knowledge resources unavailable to domestic fund managers but may charge higher fund management fees and take advantage of government officials who lack experience in complex financial management.
  
  - Independent oversight of oil revenue would address concerns of transparency but is susceptible to corruption and may limit the flexibility of policy makers to respond to revenue volatility.
  
  - If independent government body is sanctioned with oversight, it may have more authority than external NGOs or IFIs. This body could be independent of government but mandated by parliament and include civil society stakeholders
In response to oil price volatility and competing fiscal pressures, there are a number of options governments can pursue to stabilize revenue and encourage macroeconomic stability. Although international experience with revenue stabilization funds has been mixed, there are examples of oil revenue stabilization funds and savings schemes providing an effective way to improve fiscal management and support a sustainable long-term fiscal position in the presence of oil price volatility. Funds defuse spending pressures by channeling a significant portion of oil revenue away from the budget, thereby making expenditure less driven by immediate revenue availability (Fasano 2000). In this way a stabilization fund helps fiscal policy be more time-consistent (Wagner and Elder 2005). Breisinger et al. (2009), in assessing alternative allocation options for future oil revenues in Ghana, argue that designing a fiscal rule and an oil fund to smooth out the use of oil revenues for productivity-enhancing investments is crucial to achieve growth and macroeconomic stability.

For a stabilization fund several “architectural elements” are important for ensuring that it operates as intended. These features include the size of the fund and the rules for withdrawal and deposit of revenues (Fasano 2000). Much of the existing literature on revenue stabilization and expenditure smoothing is concerned with determining the optimal size of “rainy day funds” for coping with pro-cyclical variation in government revenues in the presence of a balanced budget constraint. In the U.S. domestic context, where most states are required to balance budgets, state budgeting officials have been operating under the rule of thumb that the size of the rainy day fund should equal approximately 5% of government expenditures (Joyce 2001).

However, there may be several reasons why this model is not applicable to Ghana. Joyce doubts the applicability of a one-size-fits-all revenue rule because revenue patterns differ among governments (Joyce 2001). Furthermore, the objective of rainy day funds is fundamentally distinct from the purpose of commodity price stabilization funds. The purpose of rainy day funds is to stabilize state revenues over the course of the macroeconomic cycle. While the stabilization fund, such as the fund proposed for Ghana, may be directed towards stabilizing cyclical fluctuations in government revenues, its key purpose is to stabilize government revenues in the context of oil price fluctuations—which have a much shorter frequency and much greater volatility than macroeconomic cycles. Finally, in the capital-constrained environment of a developing economy, the opportunity costs of maintaining resources in a fund are greater than for a developed country.

Devlin and Titman (2004) argue that the effectiveness of a stabilization or savings fund depends on the relation between a country’s initial oil revenues and its investment needs, and whether oil price changes are temporary or permanent. Market-based instruments such as swaps, futures, and options may help a country hedge against adverse shocks. However, few developing economies use market-based instruments to manage oil price risk. One reason is that global markets for long-term financial instruments are shallow. Claessens and Varangis (1994) find that in oil futures and options markets liquidity is concentrated in contracts for periods less than one year. Another reason for underutilization of financial instruments for oil price risk management is the reluctance of government officials to engage in potentially risky financial activities. Certainly, in conversations with Ghanaian government officials this type of aversion to risk is often expressed.

Bartsch has estimated the optimal size of the oil stabilization fund for Nigeria (Bartsch 2006). He has asked the question we are presently asking for Ghana: “how much is enough: what level of assets should the government have in a stabilization fund to give assurance that it can maintain a stable fiscal policy?” (Bartsch 2000). Using a set of assumptions on the behavior of oil prices, Bartsch has estimated the probability that the Nigerian government will exhaust its stabilization resources given the size of the fund. Based on this analysis, he suggests that in 2004 a stabilization fund of $16 to 18 billion would have been adequate for Nigeria, which in that year would have equaled 75% of oil revenues or 19% of overall GDP.

Our analysis has benefited from the work of Bartsch but we depart from his analysis in key aspects of methodology and purpose. First, our goal is to develop a “rule of thumb” for estimating the size of a fund required to stabilize a given revenue stream. We want this rule of thumb to be easily adaptable to different revenue patterns and simple enough to be accessible to a wide array of policy professionals.

Second, our analysis makes slightly weaker assumptions about the stochastic properties of oil prices. Using oil price data over the period 1861-2004, Bartsch has modeled oil prices as an AR(1) process and applied Monte Carlo simulations on randomly-generated oil prices to estimate the probability the resources of the fund will be exhausted given a certain size of the fund. We assume that oil prices are normally distributed over short periods of time and prefer to work with a shorter history of oil price data, covering the period 2000-2009. We justify this approach by noting that oil prices have demonstrated structural breaks in mean and standard deviation (Bartsch

**Appendix A: A Theoretical Framework for Revenue Stabilization**

In response to oil price volatility and competing fiscal pressures, there are a number of options governments can pursue to stabilize revenue and encourage macroeconomic stability. Although international experience with revenue stabilization funds has been mixed, there are examples of oil revenue stabilization funds and savings schemes providing an effective way to improve fiscal management and support a sustainable long-term fiscal position in the presence of oil price volatility. Funds defuse spending pressures by channeling a significant portion of oil revenue away from the budget, thereby making expenditure less driven by immediate revenue availability (Fasano 2000). In this way a stabilization fund helps fiscal policy be more time-consistent (Wagner and Elder 2005). Breisinger et al. (2009), in assessing alternative allocation options for future oil revenues in Ghana, argue that designing a fiscal rule and an oil fund to smooth out the use of oil revenues for productivity-enhancing investments is crucial to achieve growth and macroeconomic stability.

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2000) and may experience breaks in the future. Adaptability to breaks in oil price mean and variance is a desirable property of the fiscal rule determining the size of the stabilization fund. Adaptability to structural breaks in oil price trends also allows the user of the rule of thumb to estimate the optimal size of the fund given his or her own assumptions about the stochastic properties of future oil prices. For example, a policymaker may want to assess the adequacy of the size of the fund under the scenario of a 50% increase in oil price volatility.

Third, unlike previous work on revenue stabilization, we do not view complete elimination of volatility in the stream of revenue as necessarily the goal of the stabilization fund, as we do not view full stabilization to be optimal under all conditions. As mentioned previously, in a developing country there will be a stronger tradeoff between stabilization and investment.

We view the optimal proportion of the revenue stream that is to be contributed to the fund as a value that minimizes the sum of two costs: the cost of expenditure instability and the opportunity cost of maintaining money in the fund. The tradeoff between these two costs can be specified in a fiscal loss function:

\[ L(e, S) = \alpha_1 (e^* - e)^2 + \alpha_2 (S^* - S)^2 \]

Where \( e \) is expenditure, \( S \) is the size of the stabilization fund and \( \alpha_1 \) and \( \alpha_2 \) are policy variables representing the relative weight (costs) of expenditure variability and opportunity cost of foregone investments. We can express both expenditure and size in terms of revenues:

\[
\begin{align*}
\hat{e} &= \bar{r} \\
e &= (1 - \beta) r \\
S &= \beta \bar{r} \\
S^* &= \beta^* r
\end{align*}
\]

Where revenue \( r \) is a stochastic variable with distribution \( r \sim N(\bar{r}, \sigma^2) \) and \( \beta \) is the proportion of revenue contributed to the stabilization fund. The fiscal loss function can be rewritten as:

\[
L(r, \beta) = E[\alpha_1 (\bar{r} - (1 - \beta) r)^2] + E[\alpha_2 (\beta r - \beta \bar{r})^2]
\]

By minimizing the fiscal loss function in terms \( \beta \) of we can obtain an estimate of the optimal proportion of revenue that must be contributed to the fund in order to minimize the expected loss from expenditure volatility and opportunity cost (see derivation below):

\[
\beta = \frac{\alpha_1 \ast \text{VAR}(r)}{\alpha_1 \ast \text{AVERAGE}(r^2) + \alpha_2 \ast \text{VAR}(r)}
\]

When the policy priority of expenditure smoothing is low (\( \alpha_1 \) is close to zero) the proportion of revenue that must be contributed to the stabilization fund is also close to zero. Furthermore, the lower the opportunity cost of the stabilization fund (the closer \( \alpha_2 \) is to zero) the higher the contribution ratio \( \beta \). This result incorporates the right intuitions regarding the relationship between expenditure volatility costs, fund opportunity costs and the optimal size of the stabilization fund. This formula is easy to apply in practice, as long as the first and second moments of revenue are available. Armed with the above formula we can use the fiscal projections from Section III (Table 14) to estimate the average of the square of revenue, the variance of revenue and derive the optimal \( \beta \).

At this stage two questions become important. The first question is what to do about the policy variables? It is possible to estimate \( \alpha_2 \) as the difference between the internal rate of return on potential investments and the interest rate on fund deposits. \( \alpha_1 \) can also be estimated—as adjustment costs associated with expenditure volatility. We leave these estimations as extensions for future research. However, these estimations are beyond the scope of this work and we leave them as extensions for future research.

In the meantime, we can work with two reasonable sets of values for the alphas. First, we can see what happens if we set \( \alpha_2 \) to 0 and \( \alpha_1 \) to 1. In this scenario we estimate beta as 6.3% of total government revenue in Ghana. This estimate is an “upper bound” for the size of the fund. This specification is appropriate only if the opportunity cost of stabilization is low, as for example, if the moneys allocated to the fund are invested in high-yielding instruments. Next, we can estimate beta based on equal weighting of expenditure stabilization and opportunity cost of deviation from optimal fund size. Based on this scenario we obtain beta of 5.9%—which is lower than the first estimate, as we would expect.

These estimates are derived from revenue estimates from the counterfactual scenario presented previously (Section III, Table 14) which is based on historical data on revenues in the non-oil sector, historical oil prices and estimates of future oil production. For a theoretical treatment of derivation of revenue volatility in an economy with an oil and a non-oil sector please see the below subsection on obtaining measures of revenue volatility.

The second important question before fiscal policymakers is to determine the revenue stream that ought to be stabilized. Should policymakers stabilize total government revenues or just revenues from oil, which are presumably subject to much stronger fluctuations? Given the extent of historical revenue
volatility in Ghana, even before the advent of the oil era (Section III, Table 13), there is a strong case for focusing on total revenue.

We conclude by noting that although stabilization funds have been successful in some countries, they cannot be a substitute for prudent overall fiscal management. Funds have been more successful in countries with fiscal discipline, sound fiscal management, and a well-defined set of rules as to how the fund will be used (Fasano 2000). Effective expenditure implementation also requires political commitment and good institutions. Ghana may benefit from the fact that, unlike many other oil producing countries, it has stable institutions and a well-established democratic system at the start of the new oil era.

Deriving the Optimal Allocation Ratio

Definitions

\( r^* \) — average revenue
\( r \) — realized revenue (stochastic variable)
\( e \) — expenditure
\( e^* \) — optimal expenditure
\( S \) — size of the stabilization fund
\( S^* \) — optimal size of the stabilization fund
\( \alpha_1 \) — relative cost of fiscal volatility
\( \alpha_2 \) — relative opportunity cost of stabilization
\( \beta \) — “allocation ratio”—proportion of revenue deposited into the stabilization fund

Other assumptions:
\( r \) is a normally distributed random variable \( r \sim N(\bar{r}, \sigma_r^2) \)

Deriving the optimal allocation ratio:
Fiscal loss function:
\[
L(e, S) = \alpha_1 (e - e^*)^2 + \alpha_2 (S - S^*)^2
\]

\[
e^* = \bar{r}
\]
\[
e = (1 - \beta) r
\]
\[
S^* = \beta \bar{r}
\]
\[
S = \beta r
\]

Substituting:
\[
L(r, \beta) = E[\alpha_1 (\bar{r} - (1 - \beta) r)]^2 + E[\alpha_2 (\beta r - \beta r)^2]
\]

Minimizing \( L \) in terms of \( \beta \):
\[
\frac{\partial L(\beta)}{\partial \beta} [\alpha_1 E(2(\bar{r} - r + \beta r)(r))] + \alpha_2 E(2(\bar{r} - r)) = 0
\]

Solving for \( \beta^* \):
\[
\beta^* = \frac{\alpha_1 E[(\bar{r} - r)^2]}{\alpha_1 E[r^2] + \alpha_2 E[(\bar{r} - r)^2]}
\]

Estimator of \( \beta \):
\[
\hat{\beta} = \frac{\alpha_1 * \text{VAR}(r)}{\alpha_1 * \text{AVERAGE}(r^2) + \alpha_2 * \text{VAR}(r)}
\]

Deriving Measures of Revenue Volatility

Definitions

Price of oil: \( p \)
Quantity of oil produced: \( q \)
Firm profits in the non-oil sector: \( \pi \)
Tax rate: \( t \)
Government revenues: \( r \)
Proportion of oil sector in total economy: \( \omega_{oil} \)
Proportion of nonoil sector in total economy: \( \omega_{nonoil} \)
Oil price elasticity of government revenue from the oil sector: \( \epsilon_{oil} \)
Oil price elasticity of government revenue from the non-oil sector: \( \epsilon_{nonoil} \)

Identities:
Government tax revenue from the non-oil sector:
\[
r_{nonoil} = \epsilon_{nonoil} \pi_{nonoil}
\]
Government tax revenue from the oil sector:
\[
r_{oil} = t_{oil} * p * q
\]
Government revenue identity: \( r = r_{total} = r_{oil} + r_{nonoil} \)
GDP identity: \( \omega_{oil} + \omega_{nonoil} = 1 \)
Oil price elasticity of total government revenue (from all sectors):
\[
\epsilon = \omega_{oil} * \epsilon_{oil} + \omega_{nonoil} * \epsilon_{nonoil}
\]

Assumptions:
Oil price elasticity of government revenue from the oil sector: \( \epsilon_{oil} = 1 \)
Oil price elasticity of government revenue from the non-oil sector: \( \epsilon_{nonoil} \) can be estimated
Estimating \( \epsilon_{nonoil} \):
\[
\ln(r_{nonoil}) = a + b * \ln(r_{nonoil}) + \epsilon_{nonoil} * \ln(p) + \theta
\]

Derivation:

Note: a dot above a variable indicates the variable denotes percent change, e.g.:
\[
\dot{x} = \Delta x \]
Percentage change in government revenue in response to percentage change in oil prices:
\[
\dot{r} = \dot{p} \epsilon = \dot{p} \epsilon_{oil} \omega_{oil} + \omega_{nonoil} \epsilon_{nonoil}
\]

Extrapolating government revenue:
\[
r_t = (1 + \dot{r}) r_{t-1}
\]

Variance of government revenue:
\[
\sigma_t^2 = \text{var}(r)
\]
## Total Exports of Refined Petroleum Products for Selected Countries (Thousand Barrels Per Day)

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<th>Year</th>
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<th>Angola</th>
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<th>Cameroon</th>
<th>Côte d'Ivoire</th>
<th>DRC</th>
<th>Ecuador</th>
<th>Gabon</th>
<th>Iran</th>
<th>Kuwait</th>
<th>Mexico</th>
<th>Nigeria</th>
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</table>
Iran, t0=1996

Mexico, t0=1991

Kuwait, t0=1995

Russia, t0=2000

Nigeria, t0=1996

Venezuela, t0=1996
Methodology to Calculate Period Values:

<table>
<thead>
<tr>
<th>t(-10)</th>
<th>SUM[(t-11);(t-15)] / 5</th>
</tr>
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<tbody>
<tr>
<td>t(-5)</td>
<td>SUM[(t-6); (t-10)] / 5</td>
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<tr>
<td>t(0)</td>
<td>SUM[(t-5);(t-1)]/5</td>
</tr>
<tr>
<td>t(+5)</td>
<td>SUM[(t+1);(t+5)] / 5</td>
</tr>
<tr>
<td>t(+10)</td>
<td>SUM[(t+6);t(+10)] / 5</td>
</tr>
</tbody>
</table>
### Algeria

- **Onset of oil production:** 1957
- **Size of oil sector:** 30.81% (Average btw 1993 and 2005).
- **Length of oil production:** Initially oil revenues were expected to last 24 years based on a 5% annual extraction pace and restricting usable oil revenue to 12% of the GDP. Algeria’s proven reserves are 12.2 billion barrels. Estimate on years not found.

  - **Monetary target:** Exchange Rate (Composite)
  - **Exchange rate regime:** Managed Float

- **Monetary effects:**
  - **Inflation** averaged 10.9%, and fluctuated substantially (standard deviation = 10.42); on average inflation declined by 0.42% per annum.
  - **Dutch disease effects:** Oil constitutes on average 95% of all exports, but exchange rate targeting has minimized negative effects of long-term exchange rate appreciation. Promotion of agricultural and industrial production to diversify government revenue is a major constraint.
  - **Dutch disease effects:** Oil constitutes on average 95% of all exports, but exchange rate targeting has minimized negative effects of long-term exchange rate appreciation. Promotion of agricultural and industrial production to diversify government revenue is a major constraint.

- **Fiscal effects:**
  - **Oil revenue** accounts for 64% (93-05) of government revenue.
  - **Fiscal policy:** Data suggests strong pro-cyclical fiscal policy and little expenditure smoothing. Difficulties to resist spending pressures for reconstruction and social needs due to political constraints and short- and medium-run objectives to ensure economic growth.

### Angola

- **Onset of oil production:** 1960 but a real acceleration in oil production began in 1996, the starting year for the balance of this analysis.
- **Size of oil sector:** 58.2% of total GDP; 70% of total exports. Government revenue from oil is 37.2 percent of GDP; oil represents 80% of the government’s budget.
- **Length of oil production:** 50 years, ongoing oil production

  - **Monetary target:** Exchange Rate Anchor
  - **Exchange rate regime:** Conventionpeg (USD)

- **Monetary effects:**
  - **Growth:** During the 10 years after the peak of oil production in 1996, the average annual real GDP growth rate was 8.49%.
  - **Inflation:** Average inflation from 96 to 00 was over 1000% but fell substantially to 85.24% annually on average in the subsequent five years.
  - **Private capital inflows:** FDI (% of GDP) increased to 14.06% 5 yrs after peak production, declined to 8.76% btw 01 to 05. Btw 03-05, portfolio investments declined by 422.9% of GDP.
  - **Dollarization** of the economy declined in the period between 02 and 05. Foreign currency as a share of total deposits dropped from 83% to 66% in 05.
  - **Dutch disease effects:** Non-oil exports declined from 56.7% of GDP in 96 to 43.8% of GDP in 99, whereas oil exports increased from 37.8 to 51.9%. TOT improved between 96 and 99, from 23.5% to 44.0%. Oil exports averaged 2.58% of GDP (96-06).

- **Fiscal effects:**
  - The overall budget deficit (commitment basis) declined from -15.8% in 1996 to -9.0% in 2000. However, the primary balance increased during the same period from -1.5 to -3.4% of GDP.
  - In 2005, the overall balance improved and a surplus of 7.3% of GDP was recorded. The primary surplus was 9.2% of GDP.
  - The improved fiscal outlook is a result of higher revenues and lower expenditures. During 2002-2005, non-oil revenue declined as a percentage of GDP from 9.0% to 7.1% while oil revenues increased from 29.4% to 32.3%. Expenditures decreased during the same period from 49.9% to 33.3% of GDP.
  - External debt declined during the period 2002-2005 from 82.4% to 39.9% of GDP.
<table>
<thead>
<tr>
<th><strong>Cameroon</strong></th>
<th><strong>Cote d'Ivoire</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Onset of oil production:</strong> 1976</td>
<td><strong>Onset of oil production:</strong> First offshore oil reserves were discovered in the 1970s</td>
</tr>
<tr>
<td><strong>Size of oil sector relative to economy:</strong> Oil consists half of the total exports and around 10% of the GDP.</td>
<td><strong>Size of oil sector relative to economy (oil exports as percentage of GDP):</strong> 4.63% in 1996, 8.18% in 2001, and 11.33% in 2006</td>
</tr>
<tr>
<td><strong>Length of oil production:</strong> The initial expectation was around 20 years but production still continues. Daily production is about 80 thousand bbl.</td>
<td><strong>Length of oil production:</strong> 40 years</td>
</tr>
<tr>
<td><strong>Exchange rate regime:</strong> Member of the Bank of the Central African States (BEAC), the Central Africa CFA franc is pegged to the euro.</td>
<td><strong>Monetary target:</strong> The BCEAO’s main operational instrument is its policy rate.</td>
</tr>
<tr>
<td><strong>Inflation:</strong> While inflation was 8.20% at the peak year, it fell to an average of 3% and 2% in five and ten years following onset of peak oil production. In 2008, it jumped to 5%.</td>
<td><strong>Inflation rose from an average of 2.89% to 3.21% between in the five and ten years following onset of peak oil production.</strong></td>
</tr>
<tr>
<td><strong>Private capital inflows:</strong> Following to the peak year, Cameroon attracted more FDI and portfolio investments.</td>
<td><strong>Private investment rose by almost 6% of GDP between 1993 and 1998, the oil and gas drilling sectors being one of the key benefiting sectors.</strong></td>
</tr>
<tr>
<td><strong>Dutch disease effects:</strong> The share of non-oil exports in total exports fell dramatically from 64% in t₀ to 48% in t+5 and 38% in t+10.</td>
<td><strong>Dutch disease effects: The real exchange rate appreciated from 88.79% to 99.59%. However, real GDP contracted from 5.75% in 1998 to 1.5% in 1999 and gross domestic investment fell from 16% to 12.5% of GDP.</strong></td>
</tr>
<tr>
<td><strong>Debt:</strong> The debt-to-GDP ratio fell to 5% of GDP in 2006 (t+10) from 50% in the previous year as a result of HIPC and MDRI. Debt relief was also crucial to create more fiscal space.</td>
<td><strong>Debt sustainability: By 1997, arrears resulting from unrecorded off-budget spending and DENOs (dépenses engagées non ordonnancées – spending committed for which payment orders have not been issued) accumulated, and increased from 3.8% of GDP in 1998 to 11.2% of GDP in 2000. Total nonreschedulable external arrears amounted to CFAF 222 billion, or 3.3% of GDP.</strong></td>
</tr>
<tr>
<td><strong>Fiscal balance:</strong> Aided by large oil revenue inflows and improved budget management, the overall fiscal balance has been in surplus. But the non-oil primary balance has deteriorated over the past decade because domestically financed primary spending has expanded faster than non-oil revenues.</td>
<td><strong>Public sector deficit:</strong> The primary surplus declined from 1.9% of GDP in 1998 to 1.4% of GDP in 1999, and the overall deficit rose from 2.4% in 1998 to 2.9% in 1999. Public external debt peaked at 155% of GDP in 1996 and fell to 101% in 2000.</td>
</tr>
<tr>
<td><strong>Oil:</strong> Around 30-40% of the government revenue is from oil. The economy remains vulnerable to commodity shocks, especially from oil. Cameroon still relies heavily on commodities for its foreign exchange earnings and fiscal revenues, making it vulnerable to a decline in demand and prices for these products.</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Onset of oil production: First Discovery in 1979</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Gabon</td>
<td>Size of oil sector relative to economy: 80% of export receipts; 65% of government revenue, 30-35% of total GDP</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Onset of oil production: First discovered in 1956, production started in 1958, substantial increase in 1960s-early 1970s and new peaks in 2004</td>
</tr>
<tr>
<td>Country</td>
<td>Policies to Manage Oil Revenue</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Algeria</td>
<td>• FRR (Revenue Stabilization Fund): As of 2000, all public investments are made within strict budgetary confines and are fed by the oil revenue regulating fund, which shelters additional revenues in excess of $19/barrel (adjusted in 08 to 37/barrel). &lt;br&gt;• Size: As of 2007, the fund held USD45.6 billion, so there is a lot of fiscal space created through windfalls. The bigger question is how to use them. &lt;br&gt;• Use of the fund: Revenues are used to support reforms, the agricultural and fishing sector, local development, infrastructure and human resource development. Also used for discretionary spending, for example response to natural disasters and to repay debt. &lt;br&gt;• Financing the deficit: initially, the fund could not be used to finance non-oil deficits directly. This was changed in 2006 under two conditions: oil price must be sufficiently high and total reserves must remain above $10billion.</td>
</tr>
<tr>
<td>Angola</td>
<td>• Angola ranks low on public financial management, and lacks quality institution and governance. There is no medium-term expenditure framework. &lt;br&gt;• Angola uses an oil price rule where a specific oil price is predetermined by the government, based on prudent assumptions, and is budgeted in the sense that the oil income is based on this amount and used to develop budget plans. &lt;br&gt;• In 2007, the Council of Ministers adopted an extra-budgetary reserve fund for oil where the difference between the world price for Angola’s oil and the reference oil price (US$45 in 2007) is automatically channeled. However, Angola does not currently have a future generations oil fund, a repository of government’s oil related savings. &lt;br&gt;• Governance of oil wealth is non-traditional, not a participant in the EITI &lt;br&gt;• Policies to enhance revenue transparency enacted since 01: publication of monthly petroleum receipts and detailed expenditure reports and revised budgets on Ministry of Finance Website.</td>
</tr>
<tr>
<td><strong>Cameroon</strong></td>
<td><strong>Cote d’Ivoire</strong></td>
</tr>
<tr>
<td>--------------</td>
<td>------------------</td>
</tr>
</tbody>
</table>
| • Stabilization fund: No data available on a stabilization or wealth fund.  
• IMF: As a result of decreased oil revenues in the late 80s and early 90s, the government signed a letter of intent with the IMF in 1994 and promised for structural reforms including the banking and insurance sectors, raising revenue from non-oil sources, bringing inflation down and reducing the budget deficit. In 1995, trade in the cocoa, coffee and timber markets were liberalized. | • Non-oil sector: Despite reforms in tax and customs administrations, nonoil revenues stagnated as a share of nonoil GDP. Only concessional debt was contracted and budgetary surpluses were used to reduce domestic debt.  
• Public enterprise reform: Take actions to reduce government participation in public enterprises and improve services.  
• Infrastructure: Spending on infrastructure increased. The government is taking steps to strengthen the judiciary and fight corruption.  
• Subsidies: Reforms to lower subsidies are underway.  
• Taxes: Government has implemented 2 tax reforms in 1994 and 1999 to create fiscal space. However, there are still issues with indirect taxes. |
| • Set domestic petroleum prices above international prices: Between 1999 and 2001, the petroleum sector accumulated a deficit of CFAF 42 billion due to delays in adjusting domestic retail prices to the increases in international oil prices and the strengthening of the U.S. dollar. Once the authorities set domestic petroleum prices above international prices, they used the positive differential to finance the deficit.  
• Public expenditure management framework: In early 1999, a new public expenditure management framework was adopted, which unified current and investment expenditures in line with WAEMU directives on public finance.  
• Oil committee: In 2007, an oil committee was formed to monitor the management of oil and gas flows and the taxation of petroleum products became based on import parity prices. A reserve price stabilization fund was once in place to manage agricultural revenue fluctuations but the same has not been done for oil. | • The political crisis triggered by the 1999 coup and the 2002 civil war polarized the country, deteriorated consumer confidence, and weakened economic activity. Little progress was made on strengthening public finance management and tax administration. However, the political and security situation has improved since March 2007 with the new peace accords, and has allowed the government to take measures to ensure transparency in public resource mobilization, budget procedures and budget execution.  
• The government intends to create fiscal space by improving revenue collection and reducing non-essential spending. Thus far, the government has made progress with tax administration, non-oil revenue mobilization, the clearing of domestic arrears, and fiscal transparency. |
Gabon

- Gabon set up the Fund for Future Generations (FFG) in 1998 and has contributed a proportion of above budget oil revenue since 2003. The FFG is conceived as a perpetual reserve fund with a minimum capital of CFAF 500 billion. The 1998 law explicitly bars the use of the resources in the FFG to finance government spending.
- Until minimum capital is reached, following contribution rules apply: 1) 10% of projected revenues, using a baseline projection that is determined in the annual budget law; 2) 50% of oil revenues exceeding the baseline projection contained in the budget law; and 3) reinvestment of all the interest income from the FGF.
- Once the minimum capital is reached, contributions would be made as follows: 1) all the oil revenues exceeding the baseline projection set out in the budget law; and 2) reinvestment of one fourth of the interest income from the FGF (the remaining three quarters of interest income is paid into the general resources of the government).
- The FFG is held in a special account at the regional central bank (BEAC). While originally not remunerated, since January 2005 the BEAC pays interest on the outstanding balance at a rate of 1.7 percent per annum. In practice, the government has not made the contributions to the FGF as outlined in the 1998 law, and at end-2004, the outstanding balance of the FGF stood at CFAF 55 billion (1.43 percent of GDP).
- The most recent IMF assessment of the FFG (in 2005) concludes that while the FFG does shift benefits from current to future generations, it falls well short of achieving intergenerational equity. It also suggests, given the secular decline in oil production, that at least in the next few years, reducing government debt rather than accumulating FFG deposits may be the optimal use of Gabon’s oil revenues. The justification for doing this is that setting aside part of oil revenues while financing non-oil deficits with expensive debt would not leave future generations better off, as net wealth declines. Thus, revenue should only be set aside after first financing the non-oil deficit.
- A major question in setting up the fund is whether oil revenues should be invested domestically or abroad. The IMF states that as long as private investment is more productive than public investment, resources should be kept domestically and channeled to private investment. The IMF argues that keeping resources domestically has immediate growth effects and contributes to higher long-term per capita income. The Gabonese government has argued that the experiences of countries that opted to set up funds for future generations within their local banking systems are mixed. It states that those countries that opted to invest through internationally reputable portfolio managers are not reaping in high financial returns that contribute to their capital account surpluses.

Nigeria

- In 2004 Nigeria began an explicit expenditure smoothing policy. The new budgetary framework consists of the following elements: 1) flexible exchange rate mechanism, 2) an oil price fiscal rule (OPFR), whereby expenditures are based on much lower oil price (and revenue) than currently projected, and 3) target for the non-oil deficit: whereby non-oil deficit is “geared toward a sustainable overall balance based on oil prices in a range of $25–35 a barrel”. So far the policy appears to be working: “Adopting an OPFR in the 2004, 2005, and 2006 budgets has been an important step in improving fiscal discipline since 2004, and Nigeria has been able to accumulate sizable foreign exchange reserves, while net public debt virtually disappeared.” The government of Nigeria has not been able to hold a firm line on the non-oil deficit and accumulating arrears—additional improvement in this area of fiscal management is necessary.
- Political Economy Considerations: “voracity effect” whereby different political groups compete for windfall revenues during periods of high oil prices (and try to push off adjustment costs to others during periods of low prices) have been proposed as an explanation for why governments of oil-rich countries are quick to increase expenditure in good times but slow to curtail expenditure in bad times.
References


Joyce, Philip (2001). “What’s so magical about five %? A nationwide look at factors that influence the optimal size of state rainy day funds.” Public Budgeting and Finance, 21:2.


