

# IMF Working Paper

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## Fiscal Policy in Oil Producing Countries During the Recent Oil Price Cycle

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**IMF Working Paper Draft**

Fiscal Affairs Department

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**Abstract**

This paper presents a detailed analysis of the average fiscal policy responses of oil producing countries (OPCs) to the recent oil price cycle. We find that OPCs worsened their non-oil primary balances substantially during 2003–2008 driven by an increase in primary spending. However, this trend was partially reversed when oil prices went down in 2009. We also find evidence that fiscal policy has been procyclical and has hence exacerbated the fluctuations in economic activity. In addition, we estimate that a small reduction in oil prices could lead to very large financing needs in the near future. Finally, we show that long-term fiscal sustainability positions in OPCs have worsened.

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## I. INTRODUCTION

This paper presents a detailed analysis of the fiscal policy in oil producing countries (OPCs) during the recent oil price cycle. From the outset we emphasize that our main goal is to document facts. We structure the analysis around groups of countries clustered by income level and focus on two periods: the “boom” years of 2004–08 and the more recent “receding” of oil prices. We aim to capture broad fiscal policy trends for each of the groups through simple averages and the statistical median but the significant diversity of the OPCs in the sample has to be borne in mind and is highlighted when appropriate.

Our paper focuses on various dimensions of fiscal policy in OPCs, ranging from the short-term fiscal policy stance to long-term sustainability, which are more or less relevant to individual countries depending on their specific circumstances. We first go over the recent evolution of oil prices and examine the evolution of various fiscal indicators. We discuss the overall fiscal balance, the non-oil primary balance, the non-oil cyclically adjusted primary balance, expenditure growth, the composition of expenditure, and the “use” of “windfall” oil revenue. We will show that the most commonly used fiscal indicators need to be refined in order to better assess the fiscal policy stance. We find that there was a large fiscal expansion in “boom” years and a fiscal tightening in 2009. Fiscal expansions were basically the result of increases in primary spending, particularly capital spending. Increases in current spending played a more critical role in low-income OPCs.

We then assess the “stabilization” role played by fiscal policy and find evidence of procyclical fiscal policies across OPCs. We break down fiscal policy outcomes into “discretionary” and “automatic” components to examine whether fiscal policy contributed to dampen or magnify macroeconomic volatility. Using a methodology specially tailored to OPCs to adjust fiscal policy outcomes for the business cycle, we find that, on average, fiscal policy has been procyclical and, hence, exacerbated fluctuations in economic activity. Interestingly, we find that the degree of fiscal policy procyclicality has been, on average, negatively related to the income level.

Next we study the vulnerability of some OPCs to changes in oil prices and find that a relatively small fall in oil prices could lead to a substantial increase in net financing needs, absent fiscal or exchange rate policy responses. We estimate the effect of a US\$10 per barrel reduction in oil prices in government oil revenues on a subsample of mostly low- and middle-income countries that did not accumulate substantial financial buffers in the boom period and find that it would result in unusually high fiscal deficits and quite low international reserve coverage in a few of them.

Finally, we look at long-term fiscal sustainability issues by comparing the relative positions in 2003 to those in 2009 and show that, on average, OPCs recorded a deterioration in their sustainability position despite the substantial increase in oil prices (and in the net government wealth). The actual (cyclically adjusted) fiscal policy positions in 2003 and 2009 are compared to their respective “sustainable fiscal benchmarks” for each country in the sample. The sustainable fiscal benchmarks are calculated after estimating government intertemporal wealth and defining a sustainability criterion for the non-oil primary balance.

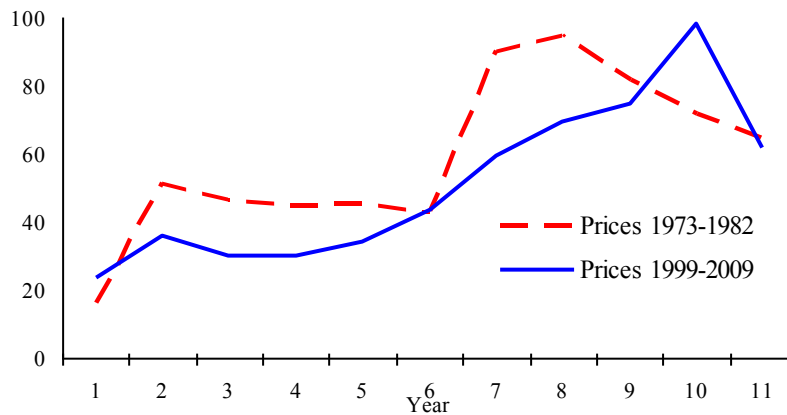
In this paper 2003 is taken as the starting point to analyze the recent “oil cycle”. Although oil prices started an upward trend in 1999 after bottoming out in 1998, when they fell to their lowest level in real terms since 1973, the choice of 2003 as starting point is motivated by two reasons. First, only after 2003 did oil prices in real terms surpass the cumulative average since 1970. This implicitly means that we would be focusing on the period where oil prices were substantially above a historical “long-term level” (e.g., a rolling ten-year average). Second, after the very low oil prices that prevailed in the mid- to late-1990s, many OPCs took some time to stabilize their public finances and restore some degree of normalcy. By 2003, most (if not all) countries in the sample would have been in a position to respond to the increases in oil prices rather than to preexisting conditions or needs.

The rest of the paper is organized as follows. Section II gives some background on recent trends on oil prices and the relevance of government oil revenues in OPCs. Section III discusses the evolution of the fiscal stance during the oil “boom” and section IV analyzes the fiscal stance during the oil “bust”. Section V goes over the cyclical behavior of fiscal policy. Section VI examines fiscal vulnerability to changes in oil prices and section VII studies fiscal sustainability.

## II. BACKGROUND

Oil prices have recorded sharp swings in the last few years. After a sustained and sharp recovery since 1999, which in some ways resembled the trend in 1973–82 (Figure 1), oil prices declined sharply in early 2009 but have since then partially recovered.<sup>2</sup> Nonetheless, oil prices for 2009 are projected to average almost 40 percent less than in 2008. Even though oil price prospects for 2010 and the medium-term would suggest a renewed upward trend, the recent pattern in oil prices including the 2009 “shock” can be discussed analytically as an oil price “cycle”, with a “boom” period between 2003 and 2008 and a downturn in 2009-10.

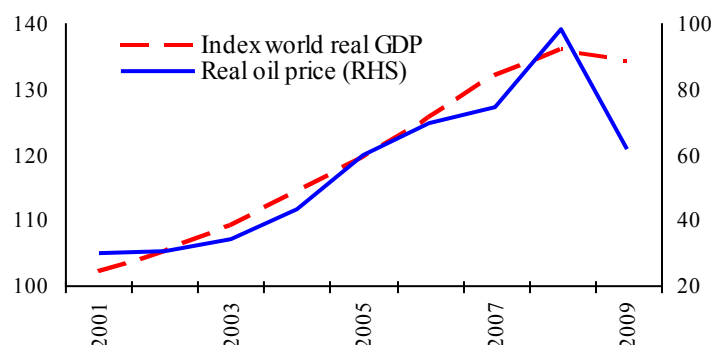
Figure 1. Real Oil Prices  
(US\$ per barrel at 2009 prices, IMF WEO basket)



The behavior of oil prices this decade has been correlated with global growth developments (Figure 2). World economic activity and trade flows displayed strong growth rates during most of this period. However, those trends were sharply stopped by the economic and financial crisis of 2008–09. Global economic activity is projected to fall by 1 percent in 2009 and to recover slowly and gradually over the next few years according to the October 2009 IMF World Economic Outlook (WEO).

<sup>2</sup> For a comparison between the recent oil boom and previous oil shocks, see Box 1 in Ossowski, et.al., (2008). The IMF WEO basket of oil prices is a simple average of the prices for Brent, Dubai, and West Texas Intermediate grades.

Figure 2. World Real GDP and Real Oil Prices  
(2001-09)



Oil revenue is a critical source of fiscal revenue for a large set of countries.<sup>3</sup> There are at least 31 OPCs where fiscal oil revenue accounted for more than 25 percent of total fiscal revenue over 2005-08 and where sufficient information was available for meaningful analysis: Algeria, Angola, Azerbaijan, Bahrain, Bolivia, Brunei, Cameroon, Chad, Congo, Ecuador, Equatorial Guinea, Gabon, Indonesia, Iran, Kazakhstan, Kuwait, Libya, Mexico, Nigeria, Norway, Oman, Qatar, Russia, Saudi Arabia, Sudan, Timor-Leste, Trinidad and Tobago, UAE, Venezuela, Vietnam, and Yemen. This is a quite varied sample of countries, dispersed geographically, with differing trends in terms of oil production and fiscal revenue dependency, and with different levels of economic and institutional development (see Appendix Table 1). Based on the 2007 World Bank's country classification (nominal GNI per capita), we can group the sample of OPCs as follows (Table 1):

<u>Low income</u>	<u>Lower-middle income</u>	<u>Upper-middle income</u>	<u>High income</u>
Chad	Algeria	Gabon	Bahrain
Nigeria	Angola	Kazakhstan	Brunei
Vietnam	Azerbaijan	Libya	Equatorial Guinea
Yemen	Bolivia	Mexico	Kuwait
	Cameroon	Russia	Norway
	Congo	Venezuela	Oman
	Ecuador		Qatar
	Indonesia		Saudi Arabia
	Iran		Trinidad&Tobago
	Sudan		UAE
	Timor-Leste		

*Based on 2007 World Bank country classification (nominal GNI per capita)*

<sup>3</sup> Throughout this paper, the term "oil" is used as a substitute for the more encompassing terms "hydrocarbon" or "petroleum", because gas is also an important resource in several countries.

Fluctuations in global output and oil prices have an impact on the fiscal position of OPCs. However, besides the direct impact of international oil prices on fiscal revenues, the analysis of fiscal policy in OPCs needs to consider other channels, like changes in fuel-related subsidies, in non-oil revenue tax bases (e.g., consumption), and in intergovernmental transfers. In addition, governments in OPCs can respond explicitly to underlying economic conditions through discretionary fiscal measures.

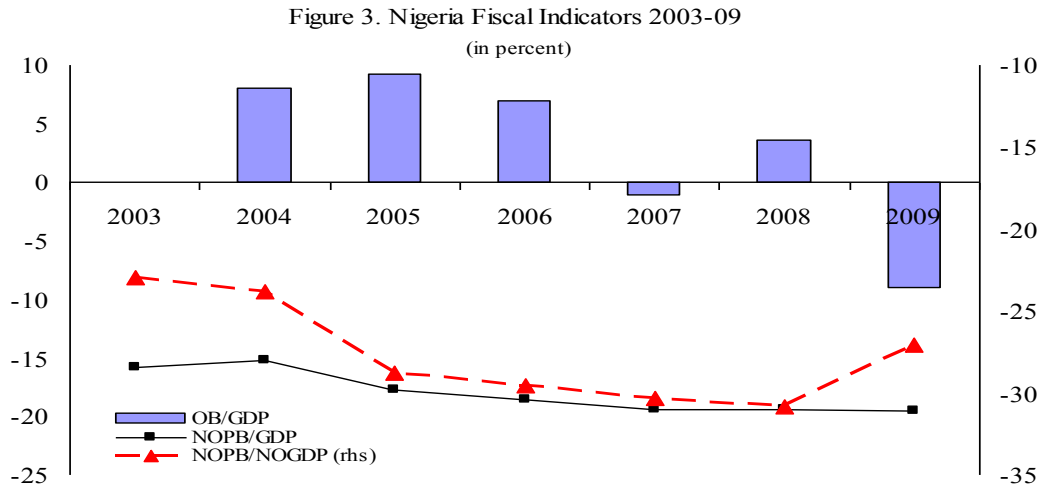
### III. THE FISCAL STANCE DURING THE 2003–2008 BOOM

A thorough analysis of the fiscal stance in OPCs should rely on a varied set of fiscal indicators, including the non-oil primary balance that is a key indicator in those countries.

- The *overall fiscal balance*, a widely used fiscal indicator, is useful to assess the government's net financing requirement (or accumulation of net financial assets) and fiscal vulnerability. However, it is not a good pointer for the impact of fiscal policy on domestic demand or the government's adjustment effort in OPCs. For example, with rising oil revenues a fiscal expansion through an increase in spending may be masked by an improving overall balance.
- The *non-oil balance*, by excluding net oil revenue is a better indicator of the impact of fiscal policy on domestic demand since oil revenue mainly originates from abroad in the countries in the sample and therefore does not subtract from the resources of the domestic private sector. This indicator (in practice always a deficit) is a reasonable measure of the injection/use of oil revenue in the economy, and the level of fiscal effort.
- The *non-oil primary balance* (NOPB) offers a further refinement by also excluding from the non-oil fiscal balance both interest receipts (typically associated with accrued financial savings in oil funds) and payments. Interest receipts and payments are not under the control of the government. The non-oil primary balance can also be a very informative indicator of fiscal sustainability through comparisons against long-term fiscal benchmarks based on intertemporal government wealth considerations.
- The *cyclically-adjusted non-oil primary balance*, by excluding the effect of the economic cycle on non-oil revenue and expenditures (i.e., the automatic stabilizers), this indicator allows to identify the portion of the fiscal position that would be the direct result of discretionary fiscal policy decisions.
- In terms of scaling, non-oil GDP should preferably be used in OPCs since total nominal GDP can be quite volatile due to fluctuations in oil prices; the latter means that ratios to total GDP can be quite unstable and misleading. For example, the non-oil primary balance could be worsening while the non-oil primary balance ratio to total GDP could be improving (in a context of rising oil prices that increase nominal GDP).
- Figure 3 for the case of Nigeria offers a practical example of the methodological issues described above. For example, the improvement in the overall balance in



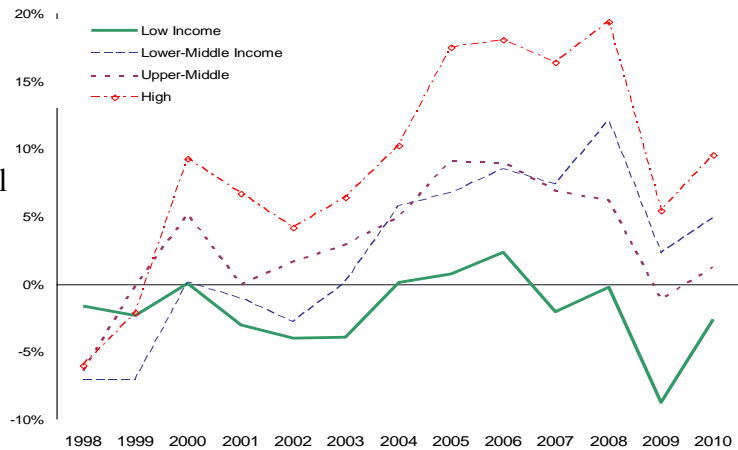
2004–05 hides the fact that spending financed by oil revenue increased in that period (as shown by the NOPB), while the sharp deterioration in 2009 did not show the fiscal adjustment undertaken that year. In addition, the NOPB ratio to total GDP fails to show the extent of the expansion in 2004–05 and the contraction in 2009 as the denominator (total GDP) also moves with the changes in oil prices.



Overall fiscal balances in OPCs improved significantly between 2003 and 2008 (Figure 4). The simple average overall surplus for the whole sample of countries rose from 2 percent of GDP in 2003 to 12 percent of GDP in 2008, with most of the change concentrated in the years 2004–06. This pattern was generally replicated when grouping countries by their

Figure 4. Overall Balance in percent of GDP, by Income Classification

income level, except for low-income OPCs which continued to run deficits for most of the period.<sup>4</sup> The average overall balance improved by 2½ percent of GDP in 2008, when oil prices jumped to close to US\$100 per barrel; however, about a dozen countries recorded a deterioration in their overall fiscal balances and three countries (Ecuador, Iran, and Yemen)



<sup>4</sup> The degree of oil revenue dependency does not help explain this behavior, as it is relatively similar in low income countries relative to lower-middle and upper-middle income ones (about 50-55 percent).

shifted from fiscal surpluses in 2007 to deficits in 2008.<sup>5</sup> OPCs “used”, on average, about half of the increased oil revenue during the period. As can be derived from the following equations, an increase in oil revenues (as during the recent “boom” in oil prices) could have been translated into two purposes: (i) increased (net) financial savings (the change in the overall balance), and (ii) an increase in government spending (not financed by increases in non-oil revenue). In symbols,

$$\text{Oil revenue (OR) + non-oil revenue (NOR) – spending (G) = overall balance (OB)}$$

Then,

$$\Delta\text{OB} = \Delta\text{OR} + \Delta\text{NOR} - \Delta\text{G}$$

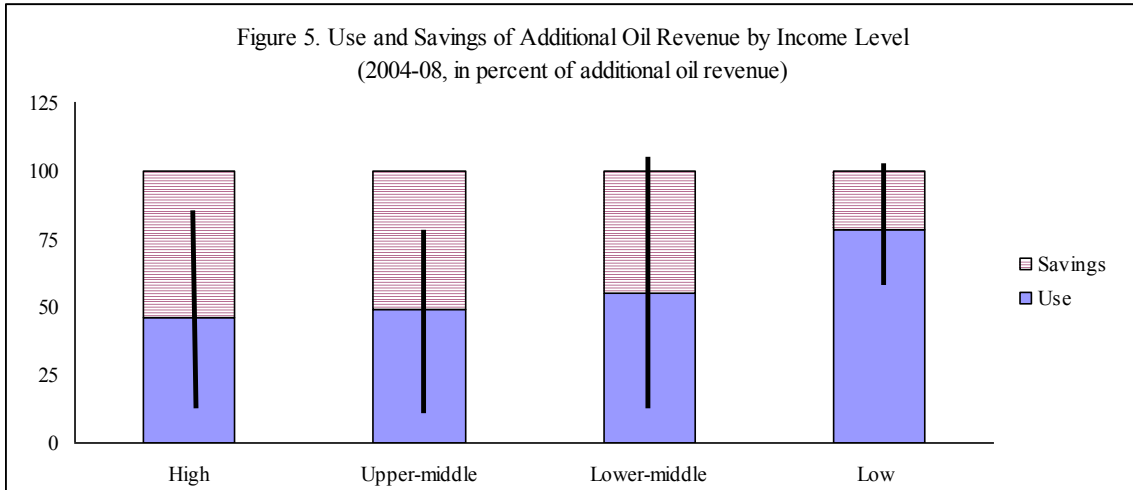
Rearranging,

$$\Delta\text{OR} = \Delta\text{OB} + (\Delta\text{G} - \Delta\text{NOR}) = \Delta\text{OB} - (\Delta\text{NOB}) = \text{savings} + \text{use}$$

Therefore, one way of measuring the extent of the use of additional oil revenue is by comparing the absolute change in the fiscal balance excluding oil revenue (the non-oil balance) relative to the increase in oil revenue. Between 2004 and 2008, the cumulative change in the non-oil primary deficit in nominal terms represented, on average, 54 percent of the cumulative change in oil relative to the 2003 level. However, there is a noteworthy negative correlation between such ratio and the OPCs income level (see Figure 5). The utilization rate for low-income countries was 78 percent compared to 45 percent for high-income countries. Of course, there was a broad range of fiscal policy responses as shown by the bolded lines in the figure above. Again, low-income countries displayed high “usage” of additional oil revenues across all the sampled countries. The latter can be partly explained by revenue earmarking and coparticipation provisions (e.g., Nigeria) and by increases in explicit fuel subsidies (Yemen).

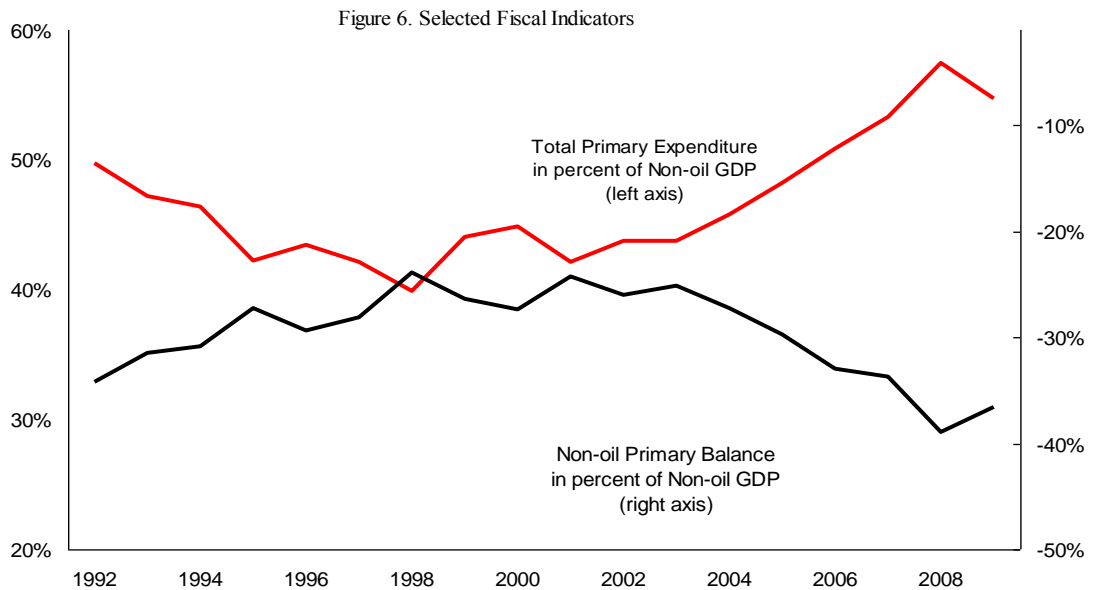
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<sup>5</sup> Indonesia and Mexico have consistently recorded small overall fiscal deficits, but also fairly stable non-oil balances, in recent years. Despite the significance of oil revenue for the fiscal accounts, they are highly diversified economies with relatively large domestic financial systems.



The sizable increase in non-oil primary deficits observed during the recent upturn in oil prices was more than fully explained by a rise in primary spending levels.

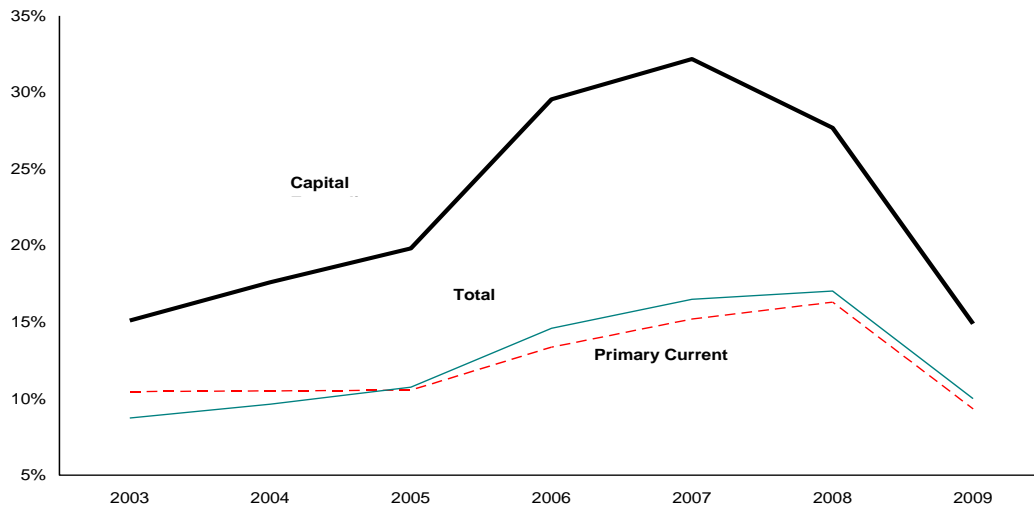
- The simple average non-oil primary deficit, which had fluctuated around 27 percent of non-oil GDP since the mid-1990s, increased sharply to about 40 percent of non-oil GDP by 2008 (Figure 6). The deterioration was much sharper in Libya and Timor Leste: excluding them, the average deterioration would have been 8 percentage points of non-oil GDP.



- The fiscal expansions were basically the result of increases in primary spending. In fact, primary spending rose by an average of 14 percentage points of non-oil GDP between 2003 and 2008 (from 44 to 58 percent), and by 9 percentage points of non-oil GDP if Libya and Timor-Leste are excluded.

- An important factor behind this trend was the expansion of capital spending (Figure 7). Investment expenditures grew by 9 percentage points of non-oil GDP for the whole sample and by 5 percentage points of non-oil GDP excluding Libya and Timor-Leste. The increase in total government spending in real terms accelerated between 2003 and 2008. The three-year moving average annual growth rates of spending increased from 9 percent in 2003 to 17 percent in 2008 (not very different when excluding Libya and Timor-Leste). The same growth rates calculated for capital expenditure show an acceleration from 15 to 28 percent over the same period.

Figure 7. Total, Primary Current and Capital Expenditure  
(Rate of growth in real terms, three-year moving averages)



Sources: IMF country documents and Fund staff estimates.

Increased current spending was the key driving factor in low income OPCs, in contrast to other groups of countries. While investment outlays accounted for the larger primary spending in high and lower-middle countries, current spending had that role in low income countries (and to some extent in upper-middle income countries) as capital spending ratios remained basically flat (Table 2). As mentioned earlier, the prevalence of current spending in low-income countries is partly explained by sizable revenue coparticipation provisions (for instance, while subnational governments receive more than 50 percent of the oil-related revenue in Nigeria, there is no estimate of the fraction of their spending that is allocated to capital projects) and explicit fuel subsidies (Yemen).

	High	Upper-middle	Lower-middle	Low
Primary spending	7.4%	5.9%	11.9%	7.1%
o/w capital spending	6.3%	1.7%	8.6%	-1.0%
o/w current primary spending	1.2%	4.1%	3.3%	8.2%

#### IV. THE FISCAL STANCE DURING THE 2009 DOWNTURN

The fall in oil prices from the heights in 2008 has been dramatic. The IMF WEO projects a decline in average annual oil prices from US\$97 per barrel in 2008 to US\$62 per barrel in 2009. Oil prices hovered around US\$40 per barrel for a couple of months early in the year, which led to a lot of concerns in finance ministries throughout OPCs, and liquidity problems in some of those countries.

Not surprisingly, overall fiscal balances (measured in percent of GDP) are projected to worsen substantially in 2009. The average overall surplus for the whole sample of countries would fall 10 percentage points of GDP to 2 percent of GDP in 2009, getting back to the level recorded in 2003. The fiscal position is projected to shift from surplus to deficit in twelve countries in the sample. The deterioration is more or less the same across country groups by income level, but more dramatic for high income countries, including GCC countries (14 percentage points of GDP).

In contrast, the non-oil primary balance (measured in percent of non-oil GDP) is projected to improve in lower income countries. While high income countries on average would expand their non-oil deficits, lower-middle income and low income countries would contract their deficits by an average of 4½ percent of non-oil GDP, again probably linked to insufficient savings and/or lack of financing. Most of the fiscal adjustment (about 4 percent of non-oil GDP) would come from a reduction in current expenditure, which would fall by 8 percent in real terms in 2009 (Table 3). Part of the reduction in current expenditure would be somehow endogenous, i.e., through a reduction in explicit fuel subsidies given lower international fuel prices (e.g., Bolivia, Iran, Yemen) and reduced oil revenue coparticipation across various levels of government (e.g., Nigeria, Sudan, Venezuela), but qualitatively different. In fact, the latter should involve “real” cuts in spending by subnational governments. However, capital expenditure in lower income countries would rise on average by 2 percent in real terms.<sup>6</sup>

**Table 3. OPCs: Expenditure ratios by income groups  
(changes 2008-09, in percent of non-oil GDP)**

	High	Upper-middle	Lower-middle	Low
Primary spending	1.5%	-1.4%	-4.1%	-7.0%
o/w capital spending	3.3%	-1.1%	-0.6%	-0.6%
o/w current primary spending	-1.8%	-0.3%	-3.5%	-6.4%

Prospects for 2010 are positive based on more recent future oil prices. The IMF WEO is projecting a recovery in the average annual oil price for 2010 to US\$77 per barrel based on observed future prices. Preliminary projections for 2010 based on those prices suggest a

<sup>6</sup> The case of Mexico, an upper-middle income, is worth mentioning because Mexico avoided a sharper fiscal adjustment because it could prefinance larger gross borrowing requirements and hedged oil export revenue in 2009 at US\$70/barrel through a put option (that protects against downside risks). Its hedging program has been in place since 1991. This particular operation cost the government US\$1.5 billion. There is no counterparty risk as this operation is collateralized by US Treasuries.

recovery of the overall fiscal balance by 4 percent of GDP on average. This improvement would be more marked for high and low income OPCs. Most of the improvement would come from higher oil revenue, but non-oil revenue ratios would also recover slightly in higher income countries together with global economic activity. Primary spending ratios to non-oil GDP would, on average, fall slightly relative to 2009 levels. However, this would assume some reshuffling within current expenditure items as intergovernmental transfers and fuel subsidies would rise together with oil prices.

## V. FISCAL POLICY IN OPCs OVER THE ECONOMIC CYCLE

The analysis of fiscal policy over the economic cycle has become more critical following the global financial and economic crisis, with worldwide calls for counter-cyclical fiscal policies. These calls are particularly appealing in OPCs as most of them have quasi-fixed exchange rate regimes which, coupled with high international capital mobility, limit the role of monetary policy. Hence, fiscal policy is the main policy tool that the authorities can use for short-term macroeconomic management.

Fiscal policy in OPCs has often been defined as expansionary/contractionary when the change in the non-oil primary balance (NOPB) is negative/positive. However, even without any fiscal policy measures, the change in the NOPB will automatically be negative/positive when the change in the output gap is negative/positive. This is because non-oil revenues are more sensitive than non-oil expenditures to changes in the output gap: as the output gap changes, several tax bases (e.g., income, consumption) change.

So changes in the NOPB can be broken down in changes in the cyclical non-oil primary balance (CNOPB) and changes in the cyclically adjusted (or structural) non-oil primary balance (CANOPB). In symbols,

$$\Delta \text{NOPB} = \Delta \text{CNOPB} + \Delta \text{CANOPB}$$

The change in the cyclically adjusted non-oil primary deficit is usually known as fiscal impulse (FI) and the change in the cyclical non-oil primary deficit is called automatic stabilizer (AS). We now redefine fiscal policy in OPCs as expansionary/contractionary when the change in the CANOPB is negative/positive. This definition focuses on fiscal policy changes that are more under the control of policymakers.

Expansionary/contractionary fiscal policy when the change in the output gap is positive/negative is called procyclical. In this case fiscal policy would be exacerbating cyclical fluctuations in the economy. Expansionary/contractionary fiscal policy when the change in the output gap is negative/positive is called countercyclical. Now fiscal policy would be dampening cyclical fluctuations in the economy.

We will next estimate the change in the output gaps and the fiscal impulses during the boom of 2003-2008 and contrast it with the downturn of 2009. The output gap (OG) is defined as the difference between actual non-oil real GDP ( $Y$ ) and potential non-oil real GDP ( $Y_p$ ) in percent of potential non-oil real GDP ( $Y_p$ ). In symbols,

$$OG = (Y - Y_p) / Y_p$$

To estimate output gaps we first estimate potential non-oil real GDP using an HP filter.<sup>7</sup> To estimate fiscal impulses we follow Horton, Kumar and Mauro (2009) and Fedelino, Ivanova, and Horton (2009) as changes in the cyclically-adjusted non-oil primary deficit measured in relation to potential (non-oil) output.<sup>8</sup>

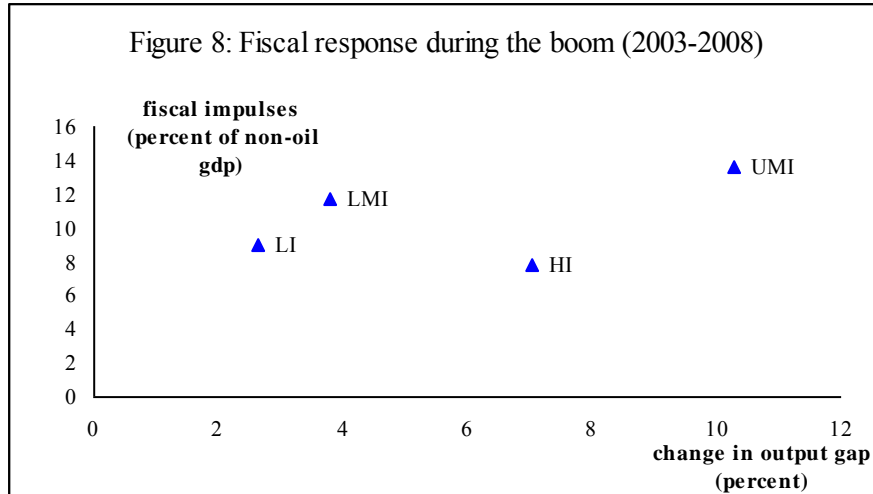
Fiscal policy was generally procyclical during the boom period. Figure 8 shows the median change in the output gap and the fiscal impulses for each subgroup of countries during 2003-2008. We see that the change in the output gap was positive in all subgroups but was more pronounced in upper middle income (UMI) countries. This fiscal impulses were also positive in all subgroups and especially large in the case of UMI countries. The combination of positive changes in output gaps with positive fiscal impulses implies a procyclical fiscal policy response. The degree of procyclicality (measured by the ratio of the fiscal impulse and the change in the output gap) is higher for low income (LI) countries and lower for high income (HI) countries.

One important remark is that in this paper we follow the literature on the cyclical behavior of fiscal policy, which implicitly assumes that output shocks drive fiscal policy. However, some authors (e.g., Rigobon (2004)) claim that fiscal policy shocks drive output and not the other way around, suggesting that the conventional wisdom of procyclical fiscal policy in developing countries might not be well founded. These reverse causality considerations might be particularly relevant in some OPCs where non-oil economic activity is dominated by government spending. However, Ilzetzki and Vegh (2008) rely on a battery of econometric tests to show that causality goes in both directions. In addition, they show that the evidence of procyclical fiscal policy in developing countries is robust to endogeneity considerations.

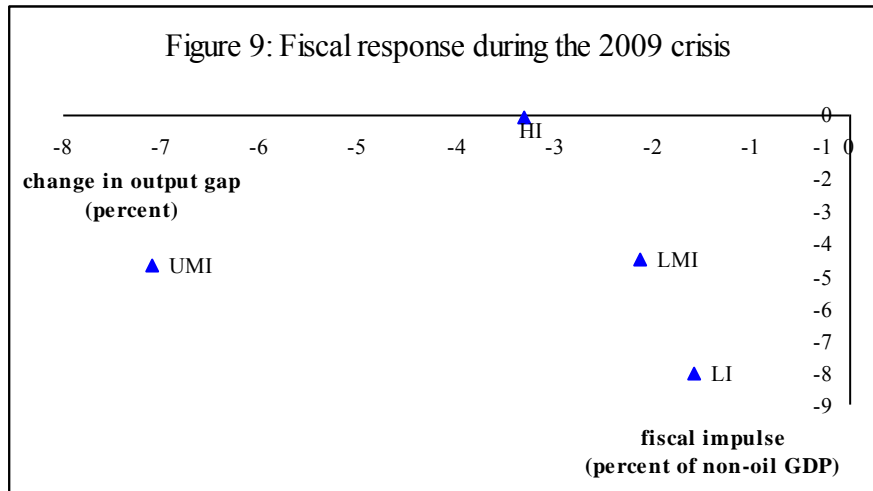
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<sup>7</sup> When we apply the HP filter we follow the literature and use a smoothing parameter  $\lambda = 100$  for all countries. To reduce the sensitivity of potential output to the projected output in 2009 (end-point problem) we use IMF WEO output projections until 2014.

<sup>8</sup> We assume that the elasticities of non-oil revenue and non-oil primary expenditure with respect to the output gap are one and zero, respectively.



Fiscal policy in OPCs remained procyclical, on average, during the 2009 downturn. Figure 9 shows the median change in the output gap and the fiscal impulses for each subgroup of countries during 2009. We see that the change in the output gap was negative in all subgroups but was more substantial in UMI countries. The fiscal impulses were negative in all subgroups except in HI countries, where on average fiscal policy was neutral. Again, negative changes in output gaps coupled with negative fiscal impulses imply a procyclical fiscal policy response.



The degree of procyclicality is again higher for LI countries. Table 4 shows again that the degree of fiscal policy procyclicality is higher in LI countries both in the boom and during the crisis. Moreover, the procyclical response of LI countries during 2009 was stronger than the procyclical response during 2003-2008. In contrast, the procyclical response in the rest of the subgroups was stronger during 2003-2008 than in 2009.



Table 4. Degree of Fiscal Policy Procyclicality.

	2003-2008			2009		
	$\Delta$ OG	FI	FI/ $\Delta$ OG	$\Delta$ OG	FI	FI/ $\Delta$ OG
HI	7.0	7.8	1.1	-3.3	0.0	0.0
UM	10.3	13.6	1.3	-7.1	-4.6	0.7
LM	3.8	11.7	3.1	-2.1	-4.5	2.1
L	2.6	9.0	3.4	-1.6	-8.0	5.1

$\Delta$ OG = change in output gap (in percent); FI = fiscal impulse (in percent of non-oil GDP)

Preliminary projections for 2010 suggest a procyclical fiscal policy stance for all country groups, with some fiscal policy tightening accompanying negative changes in output gaps. However, in contrast to previous years, all country groups would display relatively similar degrees of procyclicality in 2010.

## VI. OPCs VULNERABILITY TO DECLINES IN OIL PRICES

Given the observed large volatility of oil prices, it is important to undertake sensitivity analysis to assess the fiscal vulnerability of some OPCs to falls in oil prices. As discussed earlier, on the basis of oil futures, the IMF WEO is projecting an upward path in oil prices over the medium term. However, the generally poor predictive power of future prices, the sharp volatility of oil prices in the last two years (from a peak of almost US\$150 per barrel to US\$35 per barrel), and the fact that the global recovery is still tentative and could falter, cannot be ignored. Furthermore, not all OPCs accrued sizable financial assets during the “boom” years that could be tapped to smooth any needed adjustment to lower oil prices. In addition, the availability of financing from international financial markets might be relatively limited following the global financial crisis.

A fiscal vulnerability exercise for OPCs should focus on the estimation of the direct impact of oil price changes on the overall fiscal balance.<sup>9</sup> A simplified approach is to do a linear adjustment of oil revenue and oil GDP in the 2009 projections, keeping non-oil revenues and total spending ratios to non-oil GDP unchanged. This approach helps to isolate the specific impact of changes in oil prices, but has some obvious drawbacks as it assumes local linearity between oil prices and fiscal oil revenue (i.e., it does not account for different effective rates of taxation across oil prices) and abstracts from policy responses to lower oil prices (e.g., through depreciation of the currency, increases in non-oil revenue, cuts in government spending, automatic reductions in intergovernmental transfers arising from oil revenue sharing provisions, and reductions in fuel subsidies).<sup>10</sup> Despite these shortcomings, this

<sup>9</sup> This is equivalent to the government’s net financing needs. In light of refinancing constraints during the recent global crisis, gross financing needs could be deemed as a better indicator. However, and with a few exceptions like Mexico, debt rollover needs are somewhat limited, mainly because of relatively low public debt.

<sup>10</sup> Admittedly, an automatic reduction in coparticipated oil revenue would just transfer the adjustment to lower oil prices to other sectors of the public sector or of the society (e.g., Nigeria, Sudan). However, the extent to which this is effective depends on the ability of the government to resist pressures for offsetting transfers and the ability of other beneficiary public entities to adjust to lower transfers. Regarding fuel subsidies, information

(continued...)

simple approach is useful to roughly quantify the magnitude of a shock and the resulting financing and/or adjustment that would be needed in response.

Based on this linear oil revenue adjustment approach, the overall fiscal balance in a subsample of OPCs would fall on average by 3½ percent of GDP in response to a US\$10 per barrel lower price than in the baseline.<sup>11</sup> This fall is similar across OPCs by income level. Starting from the 2009 projected figures, 18 out of the 21 countries in the analyzed subsample would record overall fiscal deficits. The average deficit would increase to 7 percent of GDP, an even larger deficit than the one recorded in 1998, when oil prices in real terms recorded their lowest level in the period since 1973 (US\$17 per barrel at 2009 prices). The sizable increase in primary spending over the period 1998-2009 would more than offset the relatively limited rise in oil revenue ratios (after the assumed shock, about 2½ percent of GDP) in the context of strong nominal non-oil GDP growth and the appreciation of the currency in real terms (i.e., reduced domestic purchasing power of oil revenue).

Financing sizable fiscal deficits could lead to sharp reductions in international reserves and government foreign assets. As external financing could be more scarce following the recent global financial crisis, one possible vulnerability assessment would be to assume that the estimated fiscal deficits must be financed out of the country's international reserves and savings in oil funds.<sup>12</sup> This assumption might be extreme for some countries with more developed domestic financial markets or sustained access to global financial markets, but can be deemed as quite illustrative.<sup>13</sup> On average, the 18 OPCs in the sample recording overall fiscal deficits would have to use about half of their stock of international reserves plus foreign assets held in oil funds projected to be available at the end of 2008. Furthermore, the import coverage of international reserves would fall below 3 months of imports in 5 countries.<sup>14</sup> If there was no fiscal adjustment and/or a depreciation of the currency and oil prices were to remain low for an additional year, reserve coverage would fall below the 3 month import coverage threshold in half the countries in the subsample.

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on them is not readily available for most countries, partly because in some OPCs they tend to be implicit (e.g., subsidies are netted out from the oil-related payments received by governments).

<sup>11</sup> The countries considered for this exercise were: Algeria, Angola, Azerbaijan, Bolivia, Cameroon, Chad, Congo, Ecuador, Equatorial Guinea, Gabon, Indonesia, Iran, Kazakhstan, Mexico, Nigeria, Russia, Sudan, Trinidad and Tobago, Venezuela, Vietnam, and Yemen. Countries with quite substantial foreign assets were excluded from this analysis. In fact, the excluded subsample is projected to record a sizable overall surplus in 2009 compared to a deficit of about 3½ percent of GDP for the 21 countries mentioned above.

<sup>12</sup> In some countries savings in oil funds are already included in the stock of international reserves.

<sup>13</sup> In many OPCs, government deposits are the main counterpart of international reserves in the balance sheet of central banks.

<sup>14</sup> This calculation does not take into account the effect on total imports of reduced fuel-related imports. This is particularly important for countries that are close to become net oil importers, like Vietnam. On the other hand, the vulnerability of foreign reserves would be greater in countries with non-fuel private savings-investment deficits, like Chad, Congo, Ecuador, and Sudan.

## VII. EVOLUTION OF FISCAL SUSTAINABILITY POSITIONS

The analysis of fiscal sustainability is another dimension that deserves attention. In OPCs, this analysis should incorporate explicitly the exhaustibility of oil reserves. Obviously, this issue is more relevant for some countries than for others. Based on British Petroleum oil and gas proved reserves' figures (British Petroleum, 2009), 10 countries at various income levels in our sample had a ratio of total proved reserves to (current) production of less than 25 years by end-2008.<sup>15</sup> The analysis of fiscal sustainability also needs to consider the net financial position of OPCs governments, as in other countries.

Fiscal sustainability exercises are fraught with uncertainty and face difficult issues regarding intertemporal welfare choices, even in non-OPCs.

- Uncertainty in OPCs arises from a number of factors, including oil reserves, oil prices and volumes, costs of production, and even the government take. The high degree of uncertainty regarding the statistical properties of the oil price is obviously the most critical element. However, other factors can also be important; for instance, the sale of proven gas reserves depends on agreements with potential buyers and the signature of long-term contracts and the construction of associated transport infrastructure; these might or not take place.
- The analysis of fiscal sustainability in OPCs is usually expressed in terms of intertemporal welfare choices regarding how much oil revenue to consume now versus how much to save for consumption by future generations. The literature has typically relied on the construction of sustainable fiscal benchmarks based on alternative variants of the permanent income hypothesis (PIH) and some sort of consumption smoothing over time.<sup>16</sup> Alternative approaches or assumptions can lead to different consumption/savings paths, with no obvious best. Nevertheless, those exercises, if properly designed and with due consideration of the specific circumstances of each country, can constitute useful benchmarks for fiscal policy analysis (and even formulation) in a longer term perspective.

In this paper, a standardized and simple approach to estimate an “sustainable fiscal benchmark” for the whole sample to facilitate fiscal sustainability assessments across countries and over time is used. The fiscal positions (as measured by the cyclically-adjusted

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<sup>15</sup> Angola, Brunei, Congo, Ecuador, Equatorial Guinea, Mexico, Norway, Trinidad and Tobago, Norway. BP does not include figures for Cameroon, but this country also faces the impending exhaustion of its oil reserves.

<sup>16</sup> Similar judgments about intertemporal welfare choices are made in the debt sustainability analysis (DSA) for other countries but are usually not made explicit. See Barnett and Ossowski (2003) for a formal derivation, Maliszewski (2009) and van der Ploeg (2008) for comparative assessments, and Carcillo et.al. (2007) for a specific application.

non-oil primary balance) in 2003 and 2009 are compared to “sustainable fiscal benchmarks” calculated for each country in the sample for each of those years.<sup>17</sup>

The first step in the estimation of sustainable fiscal benchmarks is the calculation of the government net wealth, which is the present value of projected future oil revenues (evaluated at the oil prices prevailing in the respective year of analysis (e.g., 2003 oil prices for the 2003 sustainability benchmark) plus the value of (known) net government financial assets (as many OPCs have already converted their physical oil wealth into financial wealth). The second step is the derivation of a consumption (or spending) path of the government wealth (i.e., the NOPD) relying on a somewhat arbitrary selection of a sustainability criterion.

In this paper we choose to estimate the long-term or benchmark NOPD for 2003 and 2009 as an *annuity* over the remaining production period (the reserves to production ratio in number of years) plus 15 years. This fiscal sustainability criterion differs from the usual practice of estimating the benchmark NOPD as a perpetuity (i.e., an annuity in an infinite horizon) but should give similar results when the intertemporal discount rate is not very low.

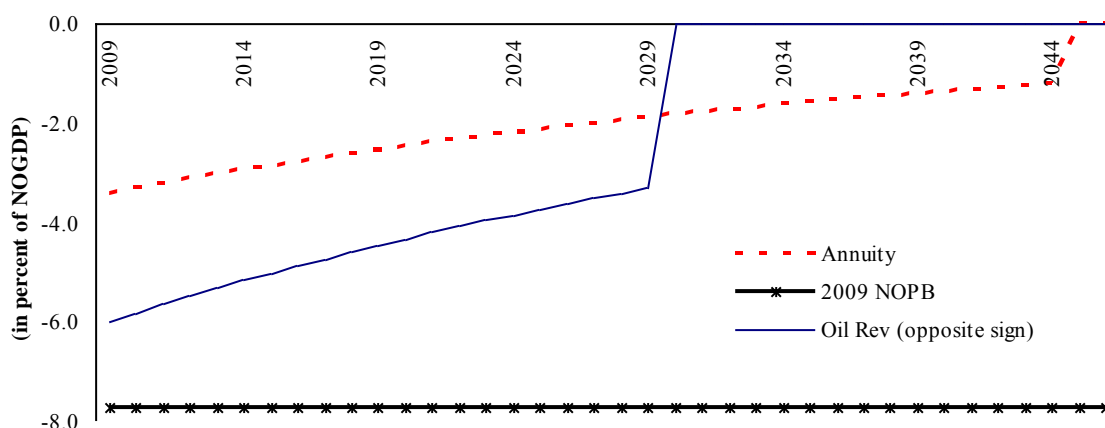
While applied to all countries, this formulation is more appropriate for the few countries in the sample with short oil production horizons (i.e., lower than 25 years), where spreading the consumption of oil-related wealth too far into the future would require large savings by current (probably poorer) generations. The methodology in this paper implies that for those countries the existing government wealth would be totally consumed over 1 generation (35-40 years), including almost half a generation (15 years) to adjust for the oil exhaustion (see simulation for a representative OPC in Figure 10).<sup>18</sup> A sharp fiscal adjustment would have to take place immediately after the end of such generation.

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<sup>17</sup> This sustainability analysis has a “static” dimension in that it focuses on the fiscal position in one specific year at a time. A sustainability gap can be closed in future years in various ways, including increased non-oil revenue, reductions in spending, or changes in the fiscal regime of the oil sector. These factors can only be captured explicitly in a dynamic setting.

<sup>18</sup> Other assumptions include the use of annual estimates of proved oil reserves from BP; constant real oil prices at the level observed in each particular year for which the analysis was carried out; 4-year average government take from oil production; an interest rate of 3 percent in real terms (the historical average of long-dated U.S. treasury bonds) to discount future oil revenue flows and to calculate the annuities.

Figure 10. Fiscal Sustainability Simulation.



Our results suggest that most OPCs recorded a deterioration in their sustainability position between 2003 and 2009, mainly because of a larger expansion in their NOPD relative to the increases in government net wealth. The results are expressed through a summary indicator called “fiscal sustainability ratio”, which was computed as the ratio of the implied sustainable or long-term primary expenditure relative to actual primary expenditure (Figure 11).<sup>19</sup> These results are somewhat surprising given that between 2003 and 2009 the oil price almost doubled in real terms and many countries accrued sizable financial assets (or reduced their debts) thanks to fiscal surpluses (and debt relief in a few cases). However, these factors were, on average, more than offset by the increased NOPD discussed earlier, the reduced domestic purchasing power of higher oil revenue due to appreciations of the currency in real terms, and the reduced size of the oil wealth relative to a growing non-oil sector.

Figure 11 also shows a non uniform deterioration in fiscal sustainability across income levels.

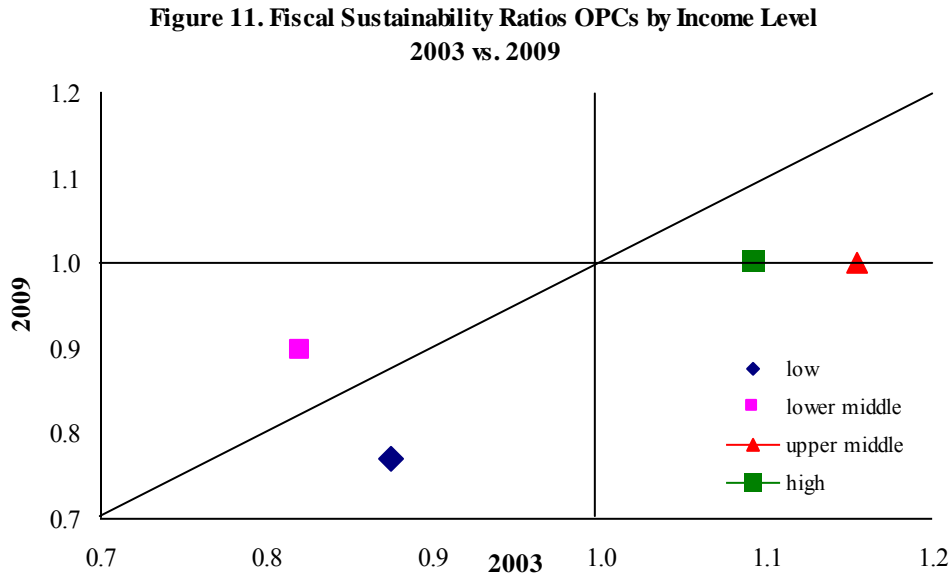
- Lower income countries, on average, were short of their sustainability benchmarks in both years (south-west quadrant in Figure 11). The position deteriorated in low income countries (below the 45 degree line in Figure 11), but improved in lower-middle income countries.<sup>20</sup> The results for lower income countries need to be kept in mind, but do not necessarily mean trouble provided that governments are able to reap sufficient fiscal dividends (through higher non-oil revenue from higher non-oil

<sup>19</sup> Countries recording a fiscal sustainability ratio lower than 1 would have to adjust to reach the sustainable benchmark. Countries that are above the 45 degree line improved their fiscal sustainability position between 2003 and 2009, while countries that are below such line recorded a deterioration.

<sup>20</sup> The improvement recorded in lower middle income countries between 2003 and 2009 is explained by the Republic of Congo, which experienced sizable increases in proved oil reserves and financial assets, together with sizable debt relief. Excluding the Republic of Congo, lower middle income countries would have shown an unchanged fiscal sustainability position.

growth) from the higher government spending. This should be theoretically the case because meeting large needs in lower income countries should lead to sizable increases in the stock of human and physical capital and in productivity levels. However, this will also critically depend on the quality of policies, institutions, and decision making.

- Higher income countries' fiscal stances were in line with the implied sustainability benchmark in 2009 (just at the horizontal axis), but deteriorated between 2003 and 2009 (below the 45 degree line).



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Appendix Table 1. Selected Oil Producing Countries						
	Oil revenue	Oil GDP	Oil production	R/P	Income	
	(% fiscal revenue) 1/	(% total GDP) 1/	(bill. boe, 2008)	(2008) 2/	level 3/	HDI 4/
Algeria	77.8	45	1.298	32	Lower middle	Medium
Angola	80.4	58	0.684	20	Lower middle	Low
Azerbaijan	54.3	52	0.431	35	Lower middle	Medium
Bahrain	80.1	26	0.422	-772	High	High
Bolivia	27.8	8	0.092	51	Lower middle	Medium
Brunei	91.4	67	0.144	24	High	High
Cameroon	34.1	10	...	...	Lower middle	Medium
Chad	60.5	46	0.046	19	Low	Low
Congo	83.4	66	0.091	21	Lower middle	Medium
Ecuador	26.7	15	0.187	20	Lower middle	Medium
Equatorial Guinea	89.0	78	0.132	13	High	High
Gabon	62.8	51	0.086	37	Upper middle	Medium
Indonesia	28.3	10	0.826	30	Lower middle	Medium
Iran	69.0	26	2.346	142	Lower middle	Medium
Kazakhstan	38.0	32	0.767	68	Upper middle	Medium
Kuwait	73.2	58	1.101	103	High	High
Libya	92.2	79	0.779	69	Upper middle	Medium
Mexico	39.5	7	1.515	10	Upper middle	High
Nigeria	82.3	37	1.023	69	Low	Low
Norway	29.0	26	1.551	17	High	High
Oman	83.5	49	0.424	28	High	High
Qatar	61.8	59	1.009	194	High	High
Russia	30.7	23	7.578	48	Upper middle	High
Saudi Arabia	88.7	55	4.474	70	High	High
Sudan	58.5	17	0.175	38	Lower middle	Medium
Timor-Leste	88.8	70	...	...	Lower middle	Medium
Trinidad&Tobago	57.2	46	0.314	13	High	High
UAE	75.9	37	1.419	99	High	High
Venezuela	48.9	34	1.144	115	Upper middle	Medium
Vietnam	26.0	...	0.168	50	Low	Medium
Yemen	73.4	33	0.111	53	Low	Medium
1/ Average 2005-08						
2/ Proved reserves to production ratio. Source: British Petroleum (2009)						
3/ Based on the 2007 World Bank's country classification (nominal GNI per capita).						
4/ Human Development Index (2007)						