MEASURING FISCAL PERFORMANCE IN OIL-PRODUCING COUNTRIES

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Oil-producing countries face unique challenges in the conduct of fiscal policy with respect to both fiscal sustainability and macroeconomic stabilization. Concerning sustainability, complications arise from the fact that a significant part of the current revenue stream comes from exhaustible resources whose overall value is highly uncertain. The volatility of oil price also complicates fiscal management over the medium term. This paper defines and applies a simple "toolkit" for a broad-brush assessment of how oil-producing countries are coping with such challenges. The paper finds that the attainment of sustainable fiscal positions remains an issue in many countries, while a more mixed picture emerges with respect to the contribution of fiscal policy to stabilization.

1. Introduction

Oil-producing countries (OPCs) face unique challenges in the conduct of fiscal policy with respect to both fiscal sustainability and macroeconomic stabilization. Concerning sustainability, complications arise from the fact that a significant part of the current revenue stream comes from exhaustible resources whose overall value is highly uncertain. Assessing a country's oil wealth is difficult because of uncertainty concerning the quantity, quality and cost of extraction of oil reserves, as well as future oil prices. The volatility of oil price also complicates fiscal management over the medium term, since the impact of fluctuations in oil price can be as important – if not more important – than that of standard business cycles.[1]

This paper defines a simple toolkit for a broad-brush assessment of how OPCs are coping with such challenges. With respect to fiscal sustainability, the paper relies on necessary conditions and benchmarks derived from the government present value budget constraint (PVBC). The paper recognizes the limits of the approach – specifically, the impossibility to identify necessary and sufficient conditions for sustainability – and points out the advantages of analytical long term projections of the fiscal accounts in this respect. However, it warns that uncertainty

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[1] Other non-renewable resources pose similar problems, but the scale is different.

over oil wealth negatively affects the stability of long term projections. With respect to macroeconomic stabilization, the paper discusses the relative merits of various deficit/surplus measures as summary indicators of the impact effect of fiscal policy on aggregate demand. The paper argues that focusing on the overall balance alone can provide biased indications concerning the contribution of government budgets to macroeconomic stabilization and suggests to use the non-oil balance (*i.e.* the balance net of oil-related revenues) as a supplementary indicator.

The paper examines fiscal performance in two partly overlapping samples of 18 OPCs each, spanning, respectively, over 1980-2004 and 1992-2004. It finds evidence that the attainment of sustainable fiscal positions remains an issue for most countries in the samples, while a more mixed picture emerges with respect to the contribution of fiscal policy to macroeconomic stabilization.

The paper is organized as follows. Section 2 discusses necessary conditions for sustainability in the presence of oil. Section 3 focuses on summary indicators of the contribution of fiscal policy to macroeconomic stabilization. Section 4 provides the empirical analysis. Section 5 summarizes the main conclusions.

2. Sustainability

Whether a given fiscal policy is or is not sustainable ultimately depends on its effects on macro parameters such as the rate of interest and the rate of growth. "[T]he issue [...] is how interest service will affect the economy" (Musgrave and Musgrave, 1984, p. 689), and "the problem of the debt burden is a problem of an expanding national income. How can a rapidly rising income be achieved?" (Domar, 1944; p. 166).

Given analytical difficulties, however, fiscal sustainability is usually analyzed in a partial equilibrium framework, whereby interest and growth rates are given. In such a framework, debt dynamics is driven "mechanically" by the expected profile of primary balances over the relevant time horizon according to the standard equation:

$$d_t = (1+\gamma)^{-1}\, d_{t-1} - b_t = [(1+\rho)/(1+\gamma)]\, d_{t-1} - p_t \qquad \text{(1a)}$$

Where d is the debt to GDP ratio, γ the growth rate of GDP, ρ the interest rate and b and p the overall and primary balance to GDP ratio, respectively (a positive sign indicates a surplus). Equation (1a) can be solved forward to yield

$$d_T = [(1+\rho)/(1+\gamma)]^T\, d_0 - \Sigma_{t=1,T}\, \{p_t\, [(1+\rho)/(1+\gamma)]^{(T-t)}\} \qquad \text{(1b)}$$

In this context, sustainability is usually defined by a no-Ponzi game condition, but this turns out to be a rather loose constraint.[2] The no-Ponzi game

[2] Sustainability is different from solvency. The latter would require government debt to be repaid at some point in time, so that the following constraint holds:

$$\lim_{T\rightarrow\infty} d_T = 0 \qquad \text{(a)}$$

(continued)

condition requires that debt cannot be rolled-over in full in every period to cover both principal and interest[3]

$$\lim_{T\to\infty} d_T\,[(1+\rho)/(1+\gamma)]^{-T} = 0 \tag{2}$$

Equation (2) requires that the discounted value of the debt ratio converge to zero, which obtains *also with an ever growing debt ratio* (McCallulm, 1984). In fact, equation (2) is satisfied provided the debt ratio grows no faster than the discount rate – that is, no faster than the difference between the interest rate and the growth rate.[4] Discounting (1b) to time zero, taking the limit for $T\to\infty$ and using (2) gives the present value budget constraint (PVBC)

$$d_0 = \lim_{T\to\infty} \Sigma_{t=1,T}\,\{p_t\,[(1+\rho)/(1+\gamma)]^{-t}\} \tag{3}$$

Equation (3) says that sustainable policies, as defined by the no-Ponzi game condition, require that the present discounted value of the sum of future primary balances (as a share of GDP) must be equal to the current debt ratio (Blanchard *et al.*, 1990; p.12).

Feasibility considerations concerning the primary surplus reduce only in part the latitude allowed under the PVBC. Since the government cannot rise more revenue than the economy generates as income, it has been argued that the primary surplus should be bounded away from unity (Barro, 1989; Kremers, 1989). From (3), we see that this condition would bound the debt ratio as follows:

$$d_j < \lim_{T\to\infty} \Sigma_{t=j+1,T}\;[(1+\rho)/(1+\gamma)]^{-(t-j)} = (1+\gamma)/(\rho-\gamma) \qquad \forall\, j \tag{4}$$

Nevertheless, this still allows the debt ratio to reach very high levels. Assuming an interest rate of 10 per cent and a growth rate of 6 per cent, the bound of "sustainable" debt ratios would be 2.65 per cent, it would rise to 5.1 per cent for an interest rate of 4 per cent and growth rate of 2 per cent.[5] While the maximum

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or:

$$\lim_{T\to\infty} [(1+\rho)/(1+\gamma)]^{T}\, d_0 = \lim_{T\to\infty} \Sigma_{t=1,T}\,\{p_t\,[(1+\rho)/(1+\gamma)]^{(T-t)}\} \tag{b}$$

That is, initial debt compounded at a rate equal to the difference between the interest rate and growth rate must be matched by the sum of future primary balances compounded at the same rate. However, government debt need not be repaid. Moreover, there is no reason to believe that a positive, albeit "low," debt ratio should not be sustainable.

[3] This condition is also often presented without scaling the variables by GDP. This does not affect the results of the analysis (Chalk and Hemming, 2001).

[4] Several econometric tests have been developed to assess compliance of fiscal policy with the PVBC. They ultimately boil down to checking whether on average $(\Delta d/d)<(\rho-\gamma)$ holds true over the period subject to analysis. A general limitation is therefore their backward looking nature: compliance with the PVBC in the past gives no guarantee concerning the future. Balassone and Franco (2001) provide a concise review of the literature. Papers in Banca d'Italia (2001) provide applications of PVBC tests.

[5] In a similar vein, much earlier, Domar (1944) argued that sustainability requires that the cost of servicing the debt (as a share of GDP) should not grow indefinitely. He showed that this condition is satisfied by any policy which keeps the overall balance constant as a share of GDP (*i.e.* any $\underline{b}$ such that $b_t = \underline{b}\ \forall t$). From (1) in the main text, it follows that a constant overall balance imposes a bound to the debt ratio:

$$\lim_{T\to\infty} \mathrm{d}_T = \underline{d} = -\underline{b}\,(1+\gamma)/\gamma \tag{a}$$

(continued)

sustainable primary surplus is certainly much lower than 100 per cent of GDP, the choice of any specific value (and of the accompanying bound on the debt ratio) remains to be justified.

All this appears to provide little guidance for the assessment of fiscal sustainability in practice. Relying on convergence to zero of the discounted debt ratio – equation (3) – would provide no reassurance concerning sustainability. Equation (4) does suggest that the debt ratio should be bounded below some "prudent" level, consistent with the maximum fiscal effort that the economy can withstand, but this takes us full-circle to the initial statement that sustainability depends on the macro implications of fiscal policy.[6]

However, the PVBC delivers at least one general prescription for OPCs, *i.e.* that a policy implying a non-oil primary deficit is only sustainable if it also implies an overall surplus during the phase of oil exploitation. If current policies imply a non-oil primary deficit, *i.e.* a deficit in the primary balance net of oil related revenues, they will also imply a primary deficit once oil is exhausted. Therefore, before the exhaustion of oil, overall surpluses will be required for (3) to hold. This can be seen most easily by rewriting (3) as:

$$d_0 - \Sigma_{t=1,T} \{p_t [(1+\rho)/(1+\gamma)]^{-t}\} = \Sigma_{t=T+1,\infty} \{p_t [(1+\rho)/(1+\gamma)]^{-t}\} \qquad (5)$$

where T is the last period of oil revenues.[7] If $p_t < 0$ for $t > T$ – that is, if the primary balance is in deficit once oil is exhausted – the right-hand side of (5) will be negative and, for the equality to hold, the left-hand side of the equation will also have to be negative. The latter implies a positive net asset position at time T,[8] which can only be obtained if overall surpluses prevail over $t \in (1,T)$.[9]

However, (a) still begs the question of which deficit and debt ratios would be the maximum sustainable ones. Under the class of policies defined by (a), the primary balance converges to a finite surplus:

$$\lim_{T\to\infty} p_T = -\underline{b}\,(\gamma-\rho)/\gamma = \underline{d}\,(\rho-\gamma)/(1+\gamma) \qquad (b)$$

As discussed in the main text, p_T must be bounded away from one, in which case (b) reduces to (4).

6 In practice, the assessment of fiscal sustainability has tended to rely on *ad hoc*, "intuitive" notions of what distinguishes a sustainable from an unsustainable policy. For instance, Blanchard *et al.* (1990) suggest to look at the difference between the current primary balance and the primary balance that would stabilize the debt ratio – the "primary gap". They also propose an equivalent indicator – the "tax gap" – computed as the difference between the current tax ratio and the one that would stabilize the debt ratio.

7 While the analysis in the main text assumes that T is exogenous, in reality, the depletion rate of oil resources can be a policy variable. However, for any given T chose by the authorities, equation (5) would still hold.

8 From equation (1b) in the main text, it follows that:

$$d_T = [(1+\rho)/(1+\gamma)]^T \{d_0 - \Sigma_{t=1,T} \{p_t [(1+\rho)/(1+\gamma)]^{-t}\}$$

that is, the net asset position at time T is a multiple of the left-hand side of equation (6) in the main text.

9 Of course policies can be changed and sustainability could be restored after the exhaustion of oil by either decreasing expenditures or rising taxation. However, there are reasons to prefer a front-loaded adjustment. Over time expenditure patterns tend to become entrenched and difficult to reverse. It should also be mentioned that large changes in expenditure and/or revenues can entail macroeconomic costs, including the reallocation of resources to accommodate the changes in demand and relative prices. Finally, if tax collection is subject to increasing marginal costs, cost-minimization calls for tax-smoothing (Barro, 1979).

The question remains of how big the average surplus should be. Recommendations in this respect can only be obtained by supplementing the PVBC with additional normative criteria — e.g., welfare maximization, prudence, or intergenerational equity. One prominent example is the "permanent consumption" approach, whereby the introduction of an explicit welfare maximization objective, allows the selection of an "optimal" policy from the set of those consistent with the PVBC. The optimal policy consists of running a constant non-oil primary deficit equal to the return on the present discounted value of oil-wealth (see, e.g., Barnett and Ossowski, 2003).[10] Assuming that social welfare is a function of the primary non-oil balance as a share of GDP (p'_t), the government maximization problem can be written as:[11]

$$\text{Max}_p \ \Sigma_{t=1,\infty} \beta^{-t} U(p'_t) \tag{7}$$

$$\text{s.t.} \qquad \lim_{n\to\infty} \Sigma_{t=1,n} \{(p'_t + z_t) [(1+\rho)/(1+\gamma)]^{-t}\} = d_0$$

$$z_t = 0 \,\big|_{t>T}$$

where $\beta = (1+\rho)/(1+\gamma)$ and z_t indicates oil revenues as a share of GDP. First order conditions for (7) yield:

$$U'(p'_t) = U'(p'_{t+1}) \ \forall t \ \Rightarrow \ p'_t = \underline{p'} \ \ \forall t \tag{8}$$

And solving the PVBC for $\underline{p'}$:

$$\underline{p'} = (\beta - 1)\,(d_0 - \Sigma_{t=1,T}\ z_t\, \beta^{-t}) \tag{9}$$

That is, the "optimal" constant non-oil deficit is equal to the return on government net wealth – $(\beta-1) = (\rho-\gamma)/(1+\gamma)$ – defined as the difference between the present value of future oil revenues and the initial debt.[12]

A simple and intuitive benchmark for the assessment of the sustainability of fiscal policy is the "sustainable permanent expenditure level" (SPEL).[13] This is defined as the primary expenditure to GDP ratio which could be sustained indefinitely, without the need to increase the level of taxation in the non-oil sector after oil reserves are depleted, thanks to the return on accumulated financial assets (Figure 1). While similar in spirit to the permanent consumption approach, SPEL allows some "front-loading" of the deficit path, which may be more appealing to developing countries with significant investment needs. The SPEL should not be

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10 In fact, the "permanent consumption" rule is just an application of the familiar smoothing argument.

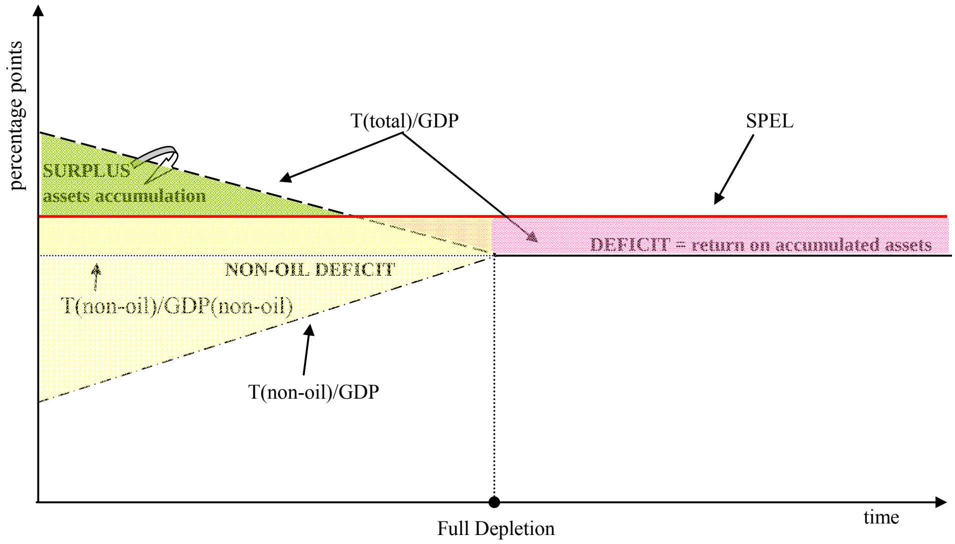
11 Assuming that welfare depends on the primary non-oil balance allows straightforward comparison with the rest of the analysis in the main text. If non-oil revenues are a constant share of GDP, the formulation used in the text is equivalent to one in which welfare depends on primary spending. Scaling by overall GDP (rather than non-oil GDP) also facilitates comparability and does not affect the qualitative results.

12 The rule identifies a constant primary non-oil deficit as the optimal policy only if the present value of oil resources is greater than initial debt. Note also that, since the "permanent consumption" rule is consistent with the PVBC, it will be the case that under such rule the primary balance and the overall balance will be in surplus while oil resources are exploited.

13 See Balassone, Harm and Takizawa (2006) for an application to Russia based on a neoclassical growth model.

Figure 1

Sustainable Permanent Expenditure Level (SPEL)



interpreted as an estimate of the "optimal" expenditure level, rather it should be used as an indicator of whether, *ceteris paribus*, current policies will or will not have to be adjusted once oil is depleted.[14]

The examples above clarify how indications on the appropriate size of the required fiscal surplus can only be based on estimates of oil-wealth. The latter are characterized by a high degree of uncertainty.[15] First, there is uncertainty about oil reserves, their quality and the cost of extracting them. Second, the future path of prices is highly uncertain; ultimately, technological advances could lead to alternative energy sources and make oil obsolete, or simply no longer cost-effective to extract.[16] Oil wealth uncertainty significantly complicates the computation of sustainability indicators and a full discussion of the issues involved is beyond the scope of this paper. However, the following general remarks apply: *ex ante*,

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14 In this respect, there is a clear analogy between the difference between the SPEL and the actual expenditure ratio and the tax gap indicator proposed by Blanchard (1990) and Blanchard *et al.* (1990).

15 See, for instance, the discussions in Bjerkholt and Niculescu (2004), and Davis *et al.* (2003).

16 One extreme way to deal with this uncertainty is to assume that there will be no future oil revenue. This is the rationale of the so-called "birds-in-hand" rule, which recommends targeting a non-oil deficit equal to the real return on financial assets accumulated by saving the proceeds of oil exploitation (see, e.g., Bjerkholt, 2002). This is a very conservative approach that can be viewed as an extreme form of precautionary saving. It has the practical advantage to do without estimates of oil wealth. Since 2001, a "bird-in-hand" rule regulates the use of oil revenues in Norway. However, the rule may not be the most appropriate solution for countries with significant needs in terms of basic infrastructures and investment in human capital.

projections will have to be accompanied by thorough sensitivity analysis; *ex post*, projections will have to be periodically reassessed, with special attention paid to the temporary/permanent breakdown in oil price shocks, as only permanent shocks alter oil wealth.

Technical difficulties notwithstanding, the number of studies assessing long-term sustainability in OPCs is increasing.[17] Long term projections can be a powerful instrument to increase the public's sensitivity to sustainability issues. In discussing the efforts made to build support for prudent fiscal policy in Norway, Skancke (2003) notes that the comparison of projections of net cash flow from petroleum and pension expenditure had the greatest impact even though "advocating fiscal restraint is not easy when the general government budget surplus is around 15 per cent of GDP" (p. 316). Long-term projections of both age-related spending and oil revenue have become a regular feature of fiscal policy documents in Norway.

3. Stabilization

This section examines summary indicators of the contribution of fiscal policy to economic activity. The section discusses how such indicators can be used to assess whether the public finances respond appropriately to changes in the macroeconomic environment. The section also briefly addresses issues related to the composition of such response. Specifically it focuses on the distinction between discretionary policy decisions and automatic reactions of the budget to changes in the macroeconomic environment.

Summary indicators can only be about the impact effect of fiscal policy on economic activity. Only simulations of full scale macroeconomic models can shed light on the "final effects" of fiscal policy. "The early OECD indicators, suggested by Hansen at a time when macroeconomists were more confident about their understanding of the macroeconomy, were indeed about final effects. They weighed the different elements of the budget by the appropriate multiplier; that this was too ambitious and too model-dependent was eventually recognized by the OECD". (Blanchard, 1990; p. 8).

Among deficit/surplus measures, the actual overall balance – as a share of GDP – is arguably the most apt to gauge the impact effect of fiscal policy. Blanchard (1990) convincingly makes the point that any improvement on the [inflation adjusted] overall balance as an indicator of the impact effect of fiscal policy would involve estimating marginal propensity to consume, the degree of foresights of consumers (*i.e.* the role of expectations) and future paths of fiscal and macroeconomic variables.

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17 Examples – albeit methodologically diverse – are provided by Liuksila, Garcia, and Bassett (1994) – who analyze Egypt, Indonesia, Mexico, Nigeria, Saudi Arabia, and Venezuela –, Chalk (1998) – who studies Kuwait and Venezuela –, and Wakeman-Linn *et al.* (2004) – who focus on Azerbaijan.

The issue however arises of the appropriate measurement of the overall balance. The distinction between transactions "above the line" and those below it – *i.e.* between non-financial and financial transactions – has a direct bearing on the size of the measured balance and entails some unavoidable degree of arbitrariness. For instance, decisions concerning whether a capital injection into a state owned company represents a capital transfer rather than the acquisition of equity are, to a large extent, based on conventions. But since capital transfers are above the line while acquisitions of equity are below, such decisions will affect the measurement of the impact effect on fiscal policy on economic activity.[18]

In this respect, the special nature of oil-related revenues, suggests the use of the "non-oil balance" as a supplementary indicator in the analysis of fiscal policy in OPCs. Oil resources can be seen as government non financial wealth and oil-revenues can therefore be interpreted as the result of a swap of a non-financial asset (oil) into a financial one (cash).[19] As such, they should not be included among income items in the government budget. They should be considered as financing items to the extent that they are used to finance the excess of government spending over non-oil revenues. This use of oil resources represents a reduction of wealth and should be treated in the same way as sales of financial assets or issuances of bonds, *i.e.* it should be classified "below the line".[20]

The possibility of changes in oil taxation, introduces further complications and suggests the need to monitor a third indicator, the "balance at constant oil price". Pursuing further the analogy between oil and financial wealth, changes to oil taxation can be seen as determining changes in government wealth. By decreasing (increasing) tax rates on oil extraction the government is in fact making (receiving) a capital transfer to (from) the private companies who have acquired the right to extract and sell oil. Such "transfers" will have an impact on aggregate demand.[21] By definition, however, the non-oil balance is not affected by changes in oil taxation. The balance at constant oil price, on the contrary, will generally highlight revenue changes due to changes in legislation.

Nevertheless, the balance at constant oil prices provides very imprecise indications and should be used with care. The extent to which the balance at constant

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[18] For instance, this leads to the question of whether the borrowing requirement – which has all transactions in financial assets "above the line" – may be a better measure of the "overall balance" than net borrowing – which is computed by setting all transactions in financial assets "below the line" (see Blejer and Cheasty, 1993, for a general discussion of measures of the fiscal deficit and Balassone and Franco, 1996, for an analysis of the Italian experience with different budgetary indicators).

[19] The identification of oil revenues will depend on the specific arrangements in place in each country. In general, it should include all revenues from extractive industries: dividends coming from the governments' participation in the sector, profit taxes, royalties, and export duties.

[20] See IMF (2001) for a discussion of the treatment of non-financial assets in the context of an integrated statistical framework.

[21] If oil taxes depend on oil price, the share of oil wealth accruing to the private sector will be affected automatically by changes in price. This suggests the possibility to interpret both the "non-oil balance" and the "balance at constant oil price" as indicators of discretionary policy, which is discussed later in the main text.

oil prices is affected by changes in legislation on oil taxation is not invariant to the assumed reference price. In extreme cases, where new legislation only affects revenues if oil price is above a given threshold, the indicator may or may not signal a change in the impact effect of fiscal policy, depending on whether the assumed reference price is above or below that threshold. The "actual" capital transfer between government and the private sector due to the change in legislation will depend on the oil price prevailing at the time when the new legislation becomes effective.

Once a fiscal indicator is chosen, a reference macroeconomic variable is needed to assess the response of public finances to changes in the economic environment; a "natural" candidate would be the output gap. Stabilization policy is usually discussed in the context of standard business cycle theories, where output fluctuates more or less regularly around a well defined trend. In this context, a stabilization oriented policy would be expected to lead to an improvement (deterioration) in the selected summary indicator of the impact effect of fiscal policy whenever cyclical conditions, as measured by the output gap, improve (deteriorate).[22]

However, the output gap may be difficult to estimate in OPCs. These countries are subject to substantial and frequent shocks, for both endogenous and exogenous reasons, making it difficult to identify business cycles. With regard to the former, many OPCs are emerging markets, often embarking on major reforms that can change the structural characteristics and performance of the economy, making it difficult to assess whether buoyant activity reflects temporary or permanent factors. The exogenous factors are equally important, with exports concentration in the oil sector exposing OPCs to sustained shocks in the terms of trade (IMF, 2006).

Searching for references other than the output gap, one possibility is to gauge fiscal policy directly against output growth. After all, it could be argued that it is growth rates that policy makers are concerned about, rather than output gaps. Taking the growth rate of output as a reference would mean checking that the selected summary fiscal indicator improves (deteriorates) whenever growth accelerates (decelerates). However, if the trend-gap model is correct, such a policy may in fact imply fiscal contractions when the output gap is worsening and, symmetrically, fiscal expansion while the gap is improving (Figure 2).

Another possibility is to refer to oil prices, as they exert significant influence on macroeconomic developments in OPCs. The volatility of oil prices leads to corresponding volatility in government revenues and there is a strong macroeconomic case for decoupling public expenditure from oil revenues. Large and unpredictable changes in expenditure have significant costs. "They include the reallocation of resources to accommodate changes in demand and relative prices, real exchange rate volatility and increased risks faced by investors in the non-oil sector" (Barnett and Ossowski, 2003, p. 61).

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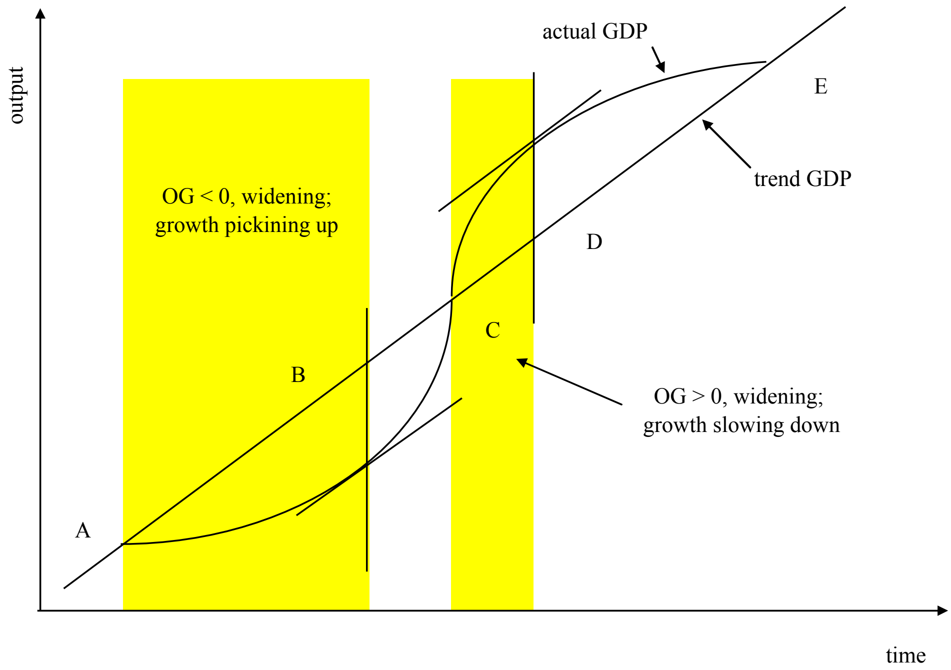
[22] The output gap measures the percentage difference between actual and trend output; a positive gap, therefore, indicates favorable cyclical conditions.

Figure 2

Output Gap and Growth Rate Over the Cycle



AB: output gap worsening; growth rate increasing
BC: output gap improving; growth rate increasing
CD: output gap improving; growth rate declining
DE: output gap worsening; growth rate declining

If oil prices are taken as a reference, then the contribution of fiscal policy to stabilization would be assessed by controlling whether the selected summary fiscal indicator improves (deteriorates) whenever oil price increase (decrease). The overall balance and the non-oil balance can be seen as providing complementary information in this respect. The change in the overall balance indicates whether the budget has provided any "sterilization" of the oil windfall (or cushion against an oil revenue shortfall), while the change in the non-oil balance indicates the extent of the sterilization/cushion provided by the balance.

A crucial issue, is the identification of the temporary and permanent component of oil price changes. Oil prices are subject to shocks with both a temporary and a permanent component. Macroeconomic stabilization would require that expenditure should not be influenced by the temporary price changes. A permanent price-shock, on the contrary, does alter oil wealth and, therefore, calls for a reassessment of sustainable expenditures. However, there is evidence that year-on-year fluctuations in oil price have a large temporary component and, therefore, only a minor impact on oil-wealth.[23]

Whichever way changes in fiscal impact are measured, a relevant question is to what extent they reflect discretionary policy; unfortunately, this question cannot be easily addressed through summary indicators in OPCs. With summary indicators the discretionary component of changes in fiscal impact is typically computed as a residual, after estimating the automatic effect of macroeconomic conditions.[24] While different measures of the discretionary component of changes in budget balances have been proposed, it turns out that they all rely on estimates of the output gap and output semi-elasticity of the budget. In fact, a broad equivalence holds among the "indicator of discretionary change" (Blanchard, 1990), the "fiscal impulse" (Heller, Haas and Mansur, 1986) and the "change in the cyclically-adjusted balance" (see Box). As discussed above, the estimation of trend output (and output gap) raises specific issues in the context of OPCs, which severely limit the applicability of summary indicators of discretionary policy.

An alternative interpretation of the non-oil balance is possible, which would cast it among indicators of discretionary policy. The argument is similar to the one which suggests focusing on the primary cyclically-adjusted balance (CAB) – as opposed to overall CAB – since interest spending is not controlled by the fiscal authorities. If oil revenues react automatically to changes in oil prices and oil prices are not controlled by policy, by excluding oil revenues from the computation of the balance, the analysis focuses on items subject to discretionary action. However, the "adjustment" made by excluding oil revenue is obviously partial (as a minimum, a "non-oil CAB" should be used). Moreover, such an adjustment would only be correct if the structure of oil taxation is not subject to changes, otherwise, reference to the balance at constant oil price would be more appropriate.[25]

4. Evidence

Based on the discussion above, this section turns to the assessment of fiscal performance in a sample of OPCs. Concerning sustainability, the section will examine OPCs' overall balance record to assess whether it is consistent with the necessary condition for sustainability derived from the PVBC; it will also compare

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[23] See, for instance, Barnett and Vivanco (2003). *Inter alia*, they point out that future price data imply data about 60 per cent of any given price shock is expected to be reversed within the following year. It should also be considered that the costs of expenditure volatility and the uncertainty surrounding the temporary/permanent breakdown in oil price changes suggests that any expenditure adjustment should be undertaken only gradually, so as to avoid overshooting. Moreover, large and sudden adjustments, "…could strain the government's institutional capacity for planning, executing, and monitoring expenditures, resulting in substantial waste" (Wakeman-Linn ***et al.*** (2004, p. 21).

[24] This approach is not uncontroversial as factors other than discretionary policy and macroeconomic conditions can affect the budget. See IMF, 1998 and 2006, and Hagemann, 1999 for discussions of the issues.

[25] As pointed out earlier in the main text, the balance at constant oil price has its own shortcomings.

Box
Indicators of Discretionary Policy

The cyclically-adjusted balance (*cab*) is obtained by removing the cyclical component of the budget – the product of the output gap (ω) by the output semi-elasticity of the budget (ε) – from the overall balance (b):

$$cab_t = b_t - \varepsilon\, \omega_t$$

Correspondingly, the change in *cab* is given by:

$$\Delta cab = \Delta b - \varepsilon\, \Delta\omega \tag{1}$$

The output gap is defined as the difference between actual and trend output (y and y^*, respectively) as a share of trend output: $\omega_t = (y_t - y^*_t)/ y^*_t$. The budget semi-elasticity (ε) is defined as: $\varepsilon = \eta_R\ \tau_t - \eta_G\ g_t - b_t$, where revenue and expenditure to GDP ratios ($\tau_t=R/y$ and $g_t=G/y$) are multiplied by their respective elasticities ($\eta_R = (\Delta R/\Delta y)\ (y/R)$ and $\eta_G = (\Delta G/\Delta y)\ (y/G)$).

The indicator of discretionary change (*idc*) is computed by comparing the balance that would have prevailed in the current year if unemployment had been the same as in the previous year ($\hat{b}$), with the balance actually recorded in the previous year. Blanchard (1990) points out that "adjustment for movements in unemployment [should be made] using Okun's Law coefficients for the relation between output and unemployment and a set of elasticities of the different components of the budget with respect to output" (p. 12). Therefore the *idc* is given by:

$$idc_t = \hat{b}_t - b_{t-1} = b_t - \varepsilon\, [(y_t - \hat{y}_t)/y_t] - b_{t-1} = \Delta b - \varepsilon\, [(y_t - \hat{y}_t)/\hat{y}_t] \tag{2}$$

where $\hat{y}_t$ is the output that would have obtained at time t if unemployment had been the same as at time t–1. Based on Okun's Law, the assumption of constant unemployment rate implies a constant output gap (Okun's coefficient is the ratio of the difference between actual and natural unemployment rates to the percentage difference between actual and trend GDP; see, e.g. Case and Fair, 1999). It follows that $\hat{y}_t$ is the output that would have obtained at time t had output growth (γ) been equal to trend growth (γ^*), that is: $\hat{y}_t = (1+\gamma^*)\ y_{t-1}$. Therefore $[(y_t - \hat{y}_t)/\hat{y}_t] = (\gamma - \gamma^*)/(1+\gamma^*) \cong \Delta\omega$ and:

$$idc_t \cong \Delta b - \varepsilon\, \Delta\omega = \Delta cab_t \tag{3}$$

The "fiscal impulse" (*fi*) identifies the change in the discretionary component of government balance by comparing the actual balance with an *ad hoc* counterfactual. The counterfactual assumes that the revenue-to-GDP ratio and the expenditure-to-trend GDP ratio (g^*_t) remain constant at the levels recorded in a given benchmark time $t=0$ (Heller, Haas and Mansur, 1986), that is

$$fi_t = \Delta b - \Delta[\tau_0 - g^*_0\,(y^*_t/y_t)] = \Delta b + g^*_0\ \Delta(y^*/y) \tag{4}$$

Since $y^*/y = (1+\omega)^{-1}$, it follows that:

$$fi_t = \Delta b - g^*_0\, \Delta\omega \tag{5}$$

An approximate equivalence holds also between the fiscal impulse, on the one hand and the change in cab and the idc, on the other. The average of available estimates of ηR and ηG for European and OECD countries are close to 1 and 0, respectively (see, for instance, Bouthevillain *et al.*, 2001 and Van den Noord, 2000). From the definition of ε, it follows that if $\eta R = 1$ and $\eta G = 0$, then the output semi-elasticity of the budget is equal to the expenditure to GDP ratio, that is $\varepsilon \cong g_{t-1}$. Therefore, from (1), (3) and (5), assuming $g^*0 \cong g_{t-1}$ we have:

$$idc_t \cong \Delta cab_t \cong fi_t \tag{6}$$

A special case of the fiscal impulse, also known as "Dutch fiscal impulse" (Chand, 1993), occurs if the benchmark year is $t-1$, in which case:

$$fi_t \cong \Delta b - g^*_{t-1}\, \Delta\omega$$

and the condition for the equivalence result in (6) is:

$$g^*_{t-1} \cong g_{t-1}$$

actual expenditure to GDP ratios to estimates of "sustainable permanent expenditure levels" (SPELs). Concerning stabilization, the section will examine the reactions of both overall and non-oil balances to changes in oil prices and growth rates.

The analysis mainly refers to a data-set covering 18 countries over 1992-2004.[26] For most of the countries included in the sample oil revenues amount to about 20 per cent of GDP and about 60 per cent of overall revenues on average over the period considered (Figure 3). However, there is significant variation in the sample. Average oil revenues are as low as 4 per cent of GDP in Cameroon and Indonesia and 15 per cent of overall revenues in Russia. They reach a maximum of 45 per cent of GDP in Kuwait and 76 per cent of overall revenues in Saudi Arabia. Occasionally, evidence from a deeper sample (1980-2004), covering a different, but partly overlapping, set of countries, will also be discussed.[27] Data on oil revenues are not available for this second sample.

4.1 Sustainability

Many oil-producing countries have failed to maintain medium term fiscal positions consistent with long run sustainability. In the shorter of the two samples considered, primary non-oil deficits averaged at 14.2 per cent of GDP, resulting in

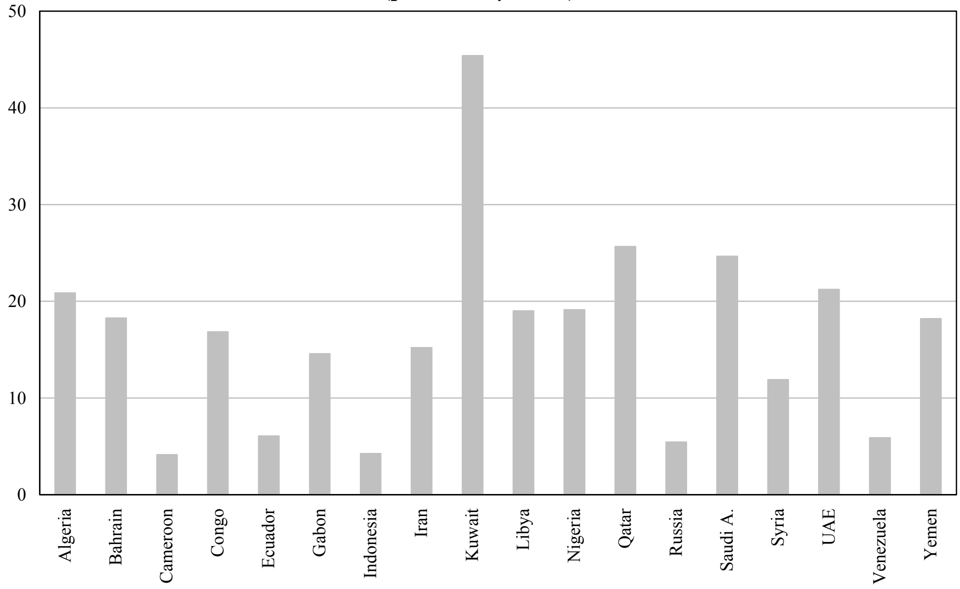
[26] Data were provided from IMF Country Desks and the World Economic Outlook database.

[27] Data are from the World Economic Outlook database.

Figure 3

Selected Oil-producing Countries: General Government Oil-revenues (Averages over 1992-2004)

(percent of GDP)



(percent of Total Revenues)

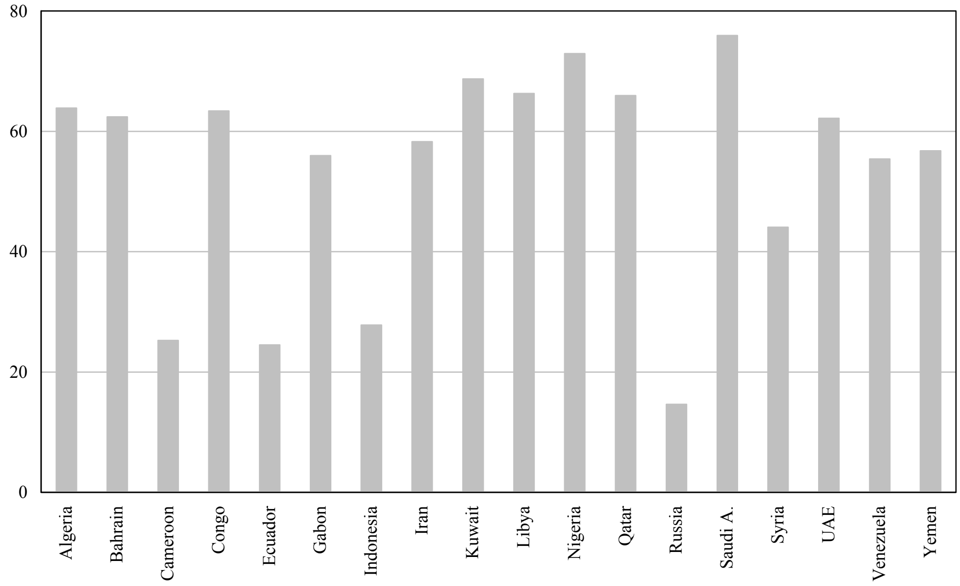
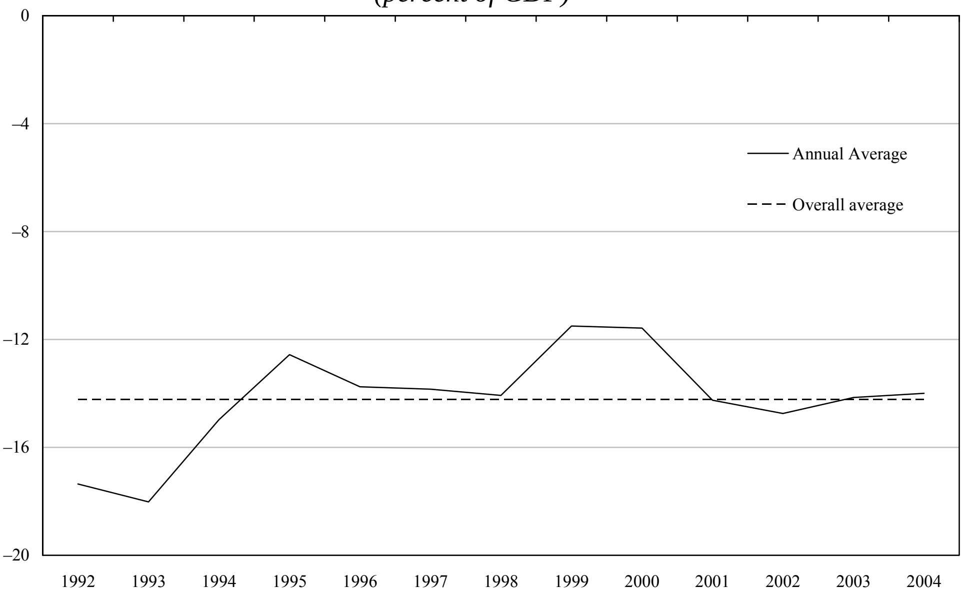


Figure 4

Selected Oil Producing Countries:
General Government Non-oil Primary Balance
(percent of GDP)[1]



[1] Simple average. Countries included: Algeria, Bahrain, Cameroon, Congo, Ecuador, Gabon, Indonesia, Iran, Kuwait, Lybia, Nigeria, Quatar, Russia, Saudi Arabia, Syria, United Arab Emirates, Venezuela, Yemen.

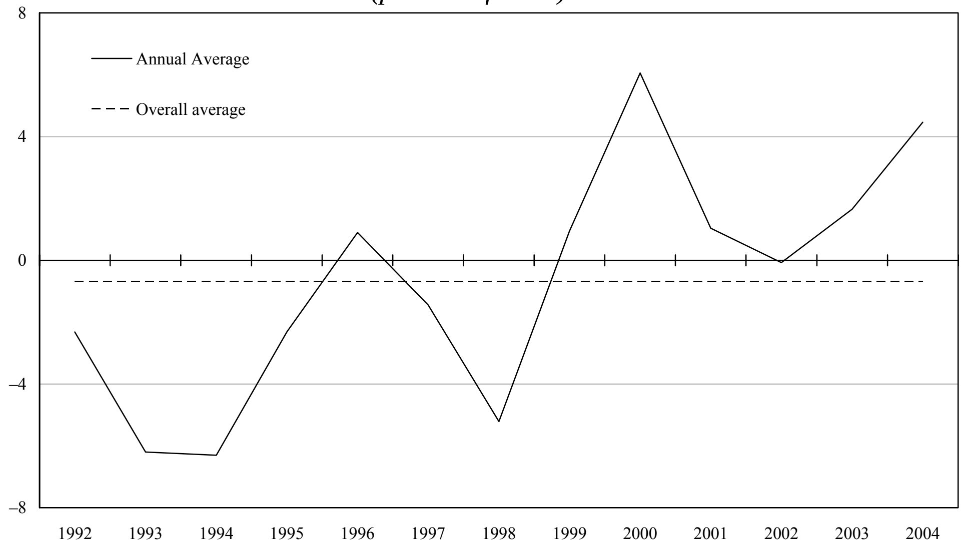
an average overall deficit of 0.7 per cent of GDP (Figure 4 and 5). Only four countries in the sample ran overall average surpluses, ranging between 0.9 per cent of GDP in Algeria and 14.8 per cent in Kuwait (Figure 6 and Table 1).

Evidence over a longer time span confirms widespread difficulties in ensuring long-term sustainability. In the sample covering 1980-2004, primary balances recorded an average surplus of 0.3 per cent of GDP (Figure 7). This implies a significant non-oil primary deficit (the average amount of oil revenues is likely to have exceeded 0.3 per cent of GDP), resulting in an overall average deficit of 2.4 per cent of GDP (Figure 8). Also in this sample, only four countries ran overall surpluses on average, ranging between 0.4 per cent of GDP in Nigeria and 6.0 per cent in Norway (Figure 9 and Table 2).

Weighing this evidence against the expected duration of oil reserves does not alter the picture. The lack of sustained surpluses would be less worrying if it were confined to countries which are relatively far from depletion of their reserves. However, the correlation between overall balance positions and years to depletion of oil reserves is close to zero in the longer sample and even positive (0.52) in the shorter one (Figure 10).

Figure 5

Selected Oil-producing Countries: General Government Overall Balance
(percent of GDP)(1)



(1) See footnote to Figure 4.

Figure 6

Selected Oil-producing Countries: General Government Overall Balance
(Average over 1992-2004)
(percent of GDP)

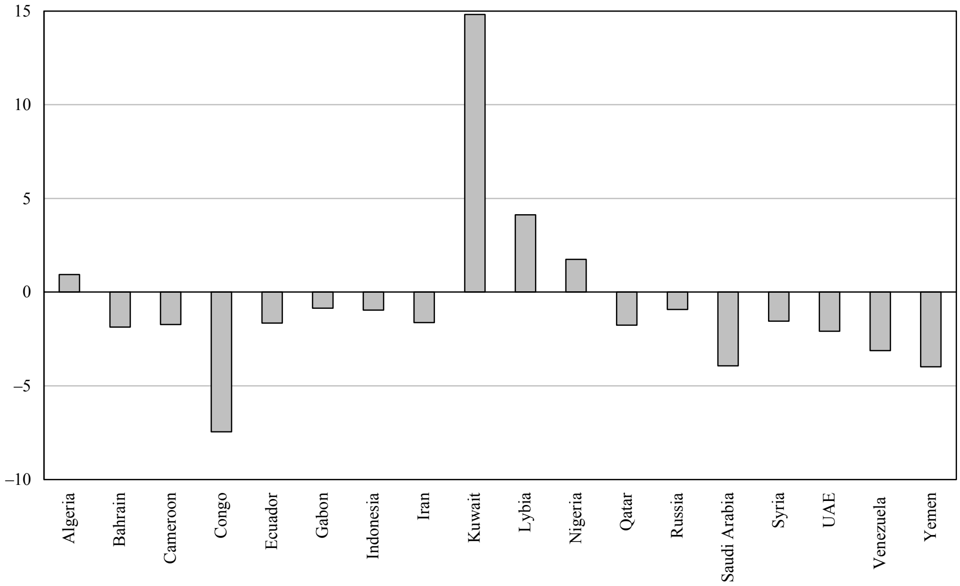
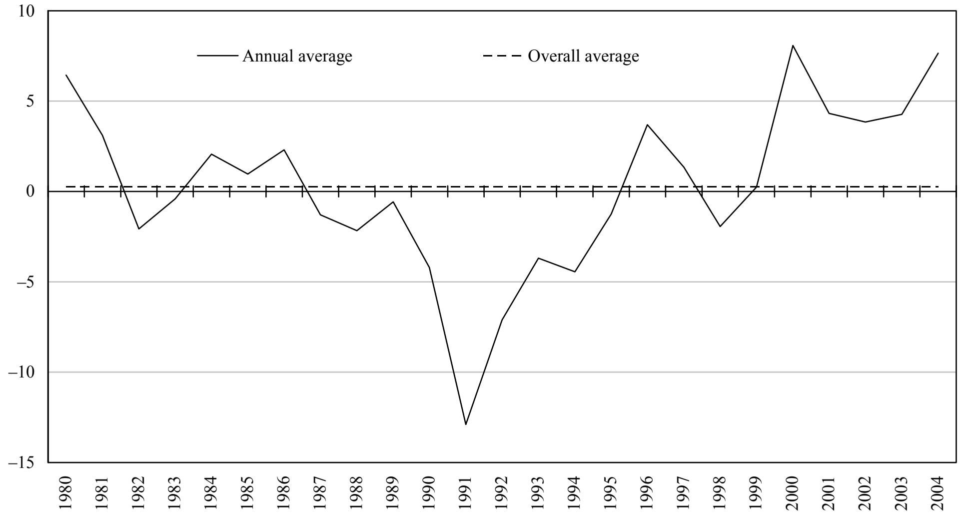


Figure 7

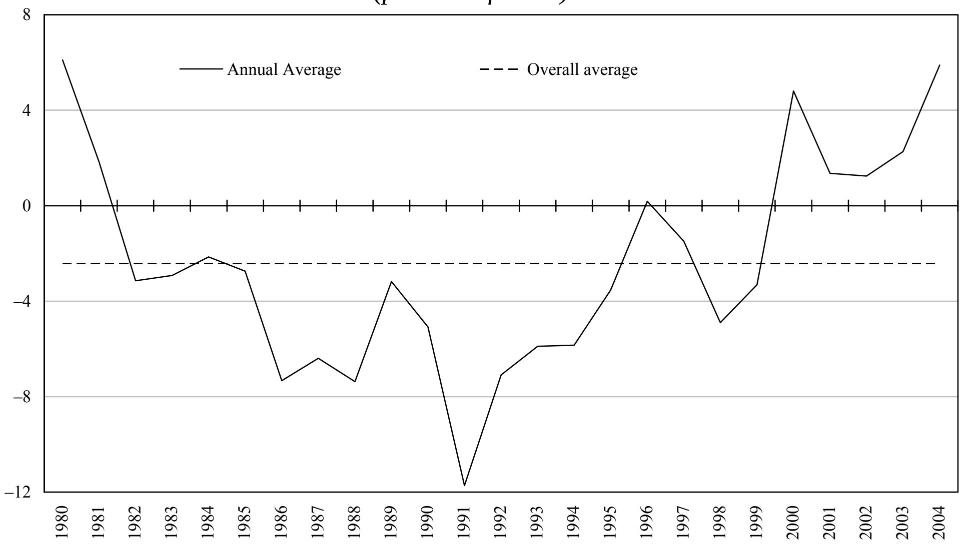
Selected Oil-producing Countries: General Government Primary Balance
(percent of GDP)[(1)]



[(1)] Simple average. Countries included: Angola, Azerbaijan, Ecuador, Indonesia, Iran, Kazakhstan, Kuwait, Lybia, Malaysia, Mexico, Nigeria, Norway, Oman, Quatar, Russia, Saudi Arabia, United Arab Emirates, Venezuela.

Figure 8

Selected Oil-producing Countries: General Government Overall Balance
(percent of GDP)[(1)]



[(1)] See footnote to Figure 7.

Figure 9

Selected Oil-producing Countries: General Government Overall Balance (Average over 1980-2004)
(percent of GDP)

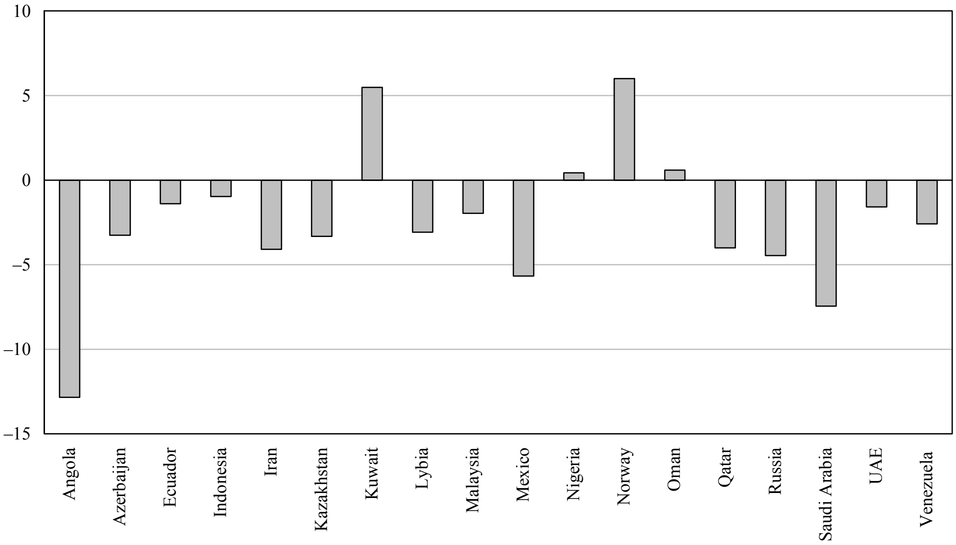
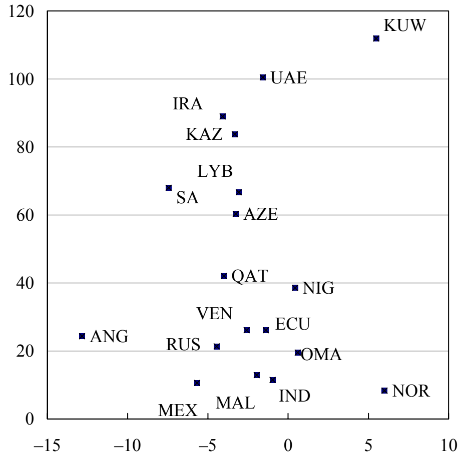


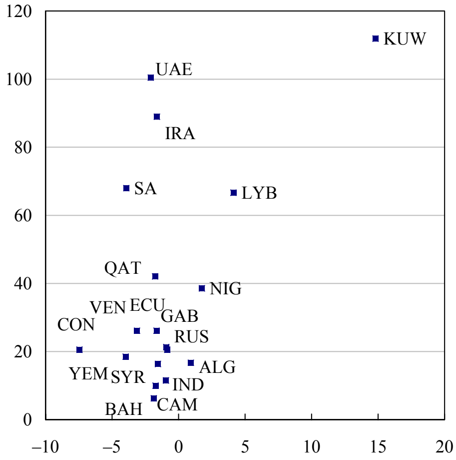
Figure 10

General Government Overall Balance and Years to Depletion of Oil Reserves[1]

1980-2004



1992-2004



[1] Simple averages.
Years to depletion as of 2005, computed on the basis of data on proven reserves and daily production from the 2005 BP Statistical Review of World Energy, available online at http://www.bp.com/statisticalreview

Table 1

Selected Oil Producing Countries:
General Government Primary Non-oil and Overall Balances
(percent of GDP)

Country	Non-oil Primary Balance			Overall Balance		
	1992-99	2000-04	1992-04	1992-99	2000-04	1992-2004
Algeria	–16.9	–17.0	**–16.9**	–2.0	5.6	**0.9**
Bahrain	–18.3	–19.9	**–19.0**	–3.9	1.4	**–1.9**
Cameroon	–1.1	–1.2	**–1.1**	–3.5	1.1	**–1.7**
Congo	–15.0	–13.8	**–14.5**	–11.7	–0.7	**–7.5**
Ecuador	–4.7	–0.6	**–3.1**	–3.0	0.5	**–1.7**
Gabon	–10.5	–6.7	**–9.1**	–4.0	4.2	**–0.9**
Indonesia	–2.6	–2.7	**–2.7**	–0.5	–1.8	**–1.0**
Iran	–17.2	–16.1	**–16.7**	–3.6	1.5	**–1.6**
Kuwait	–29.5	–22.4	**–26.7**	9.1	24.0	**14.8**
Lybia	–11.9	–18.0	**–14.2**	0.1	10.6	**4.1**
Nigeria	–10.4	–19.2	**–13.8**	1.5	2.2	**1.8**
Qatar	–29.8	–15.2	**–24.2**	–7.9	8.1	**–1.8**
Russia	–4.3	–2.1	**–2.9**	–6.6	2.5	**–0.9**
Saudi Arabia	–25.0	–24.2	**–24.7**	–6.9	0.8	**–3.9**
Syria	–11.3	–15.5	**–12.9**	–1.7	–1.3	**–1.5**
United Arab Emirates	–24.9	–20.8	**–23.3**	3.3	–10.7	**–2.1**
Venezuela	–2.9	–8.9	**–4.9**	–3.1	–3.1	**–3.1**
Yemen	–18.1	–22.0	**–19.6**	–7.1	1.0	**–4.0**
Average	–14.5	–13.7	**–14.2**	–2.7	2.6	**–0.7**

With oil price rising rapidly, fiscal positions improved significantly in OPCs over recent years, but even taking 2005 as the benchmark, many countries are still running expenditure above their estimated "sustainable permanent level" (Table 3).

This is all the more cause of concern considering that pressures for spending more of the oil windfall may still have to make their way through the political process in many countries. Moreover, countries where expenditures are higher than SPELs are generally closer to depletion of their reserves than countries where expenditures are lower than SPELs.[28]

[28] Table 3b provides an indication of the robustness of estimates with respect to the assumed oil price.

Table 2

Selected Oil-producing Countries:
General Government Primary and Overall Balances
(percent of GDP)

Country	Primary Balance				Overall Balance			
	1980-89	1990-99	2000-04	1980-04	1980-89	1990-99	2000-04	1980-04
Angola	–8.8	–12.8	–1.0	**–8.8**	–8.8	–21.1	–4.5	**–12.8**
Azerbaijan	n.a.	–4.0	–0.1	**–2.2**	–2.6	–4.8	–0.4	**–3.3**
Ecuador	–2.2	1.7	5.2	**0.8**	–2.2	–1.8	1.1	**–1.4**
Indonesia	0.7	1.7	2.0	**1.4**	–0.9	–0.3	–2.3	**–1.0**
Iran	–7.4	–3.4	1.7	**–4.0**	–7.5	–3.4	1.5	**–4.1**
Kazakhstan	n.a.	–5.3	2.8	**–1.7**	–3.1	–5.9	1.8	**–3.3**
Kuwait	21.8	–16.8	27.3	**7.5**	21.8	–21.0	25.8	**5.5**
Lybia	n.a.	2.9	9.8	**5.2**	–14.3	1.8	9.7	**–3.1**
Malaysia	n.a.	3.4	–2.4	**0.5**	–4.0	0.6	–5.0	**–2.0**
Mexico	3.9	4.6	0.6	**3.5**	–10.1	–2.5	–3.1	**–5.7**
Nigeria	n.a.	1.4	6.0	**4.3**	1.0	0.0	0.6	**0.4**
Norway	5.0	0.6	9.5	**4.1**	6.5	2.7	11.5	**6.0**
Oman	n.a.	–0.2	8.6	**2.7**	0.0	–2.1	7.2	**0.6**
Qatar	n.a.	–4.7	9.3	**0.3**	–5.2	–7.8	6.1	**–4.0**
Russia	n.a.	–6.3	4.9	**–2.5**	–3.1	–9.3	2.5	**–4.5**
Saudi Arabia	–7.6	–5.3	4.7	**–2.4**	–10.4	–8.9	0.8	**–7.4**
United Arab Emirates	–5.7	–3.1	10.7	**–1.4**	–5.9	–3.4	10.7	**–1.6**
Venezuela	–0.8	1.8	1.7	**1.5**	–5.0	–2.4	–2.0	**–2.6**
Average	0.8	–3.0	5.6	**0.3**	–2.7	–4.9	3.1	**–2.4**

Table 3a

Primary Expenditures: SPEL and Actual Level
(percent of GDP)(1)

Country	Actual Level	SPEL	Difference	Years to Depletion
Yemen	39.4	20.5	18.9	19
Bahrain	22.9	9.3	13.6	6
Algeria	31.2	19.7	11.5	17
Syria	31.7	20.6	11.2	16
Nigeria	30.7	21.6	9.1	39
Congo	23.0	18.4	4.6	21
Iran	24.1	21.2	2.9	89
Saudi Arabia	24.7	23.3	1.4	68
Venezuela	17.3	19.0	–1.7	70
Russia	35.3	38.5	–3.2	21
UAE	21.0	24.5	–3.5	100
Libya	33.6	44.4	–10.8	67
Kuwait	29.6	52.9	–23.3	112

(1) For all countries, SPEL are computed assuming gradual convergence to a steady state where real interest rate is 4 per cent, real growth rate is 2 per cent and so is the GDP deflator.

Table 3b

SPEL: Sensitivity Analysis
(percent of GDP)(1)

Country	Expenditures: Actual Level	SPEL (US$60 pb)	difference	SPEL (US$40 pb)	difference	SPEL (US$80 pb)	difference
Yemen	39.4	20.5	18.9	19.4	20.0	21.5	17.9
Bahrain	22.9	9.3	13.6	9.0	13.9	9.6	13.3
Algeria	31.2	19.7	11.5	18.5	12.7	20.9	10.3
Syria	31.7	20.6	11.2	20.0	11.7	21.0	10.7
Nigeria	30.7	21.6	9.1	18.5	12.2	24.6	6.1
Iran	24.1	21.2	2.9	17.6	6.5	24.8	–0.7
Saudi A.	24.7	23.3	1.4	17.8	6.9	28.8	–4.1
Venezuela	17.3	19.0	–1.7	16.8	0.5	21.2	–3.9
UAE	21.0	24.5	–3.5	20.6	0.4	28.4	–7.4
Russia	35.3	38.5	–3.2	37.7	–2.4	39.5	–4.2
Libya	33.6	44.4	–10.8	35.4	–1.8	53.4	–19.8
Kuwait	29.6	52.9	–23.3	42.4	–12.8	63.5	–33.9

(1) For all countries, SPEL are computed assuming gradual convergence to a steady state where real interest rate is 4 per cent, real growth rate is 2 per cent and so is the GDP deflator.

4.2 Stabilization

On average, both primary and overall balances display a tendency – albeit weak – to react in a stabilizing way to changes in oil price. Both indicators tend to improve (deteriorate) when oil prices increase (decrease). During 1980-2004 the correlation with real oil price is 0.32 for primary balances and 0.46 for overall balances (Figures 11 and 12).

The primary non-oil balance does not appear to be significantly influenced by developments in oil prices during 1992-2004 (Figure 13); the correlation coefficient is 0.12. The different behavior of the overall balance and the non-oil balance confirms the importance of using both indicators.

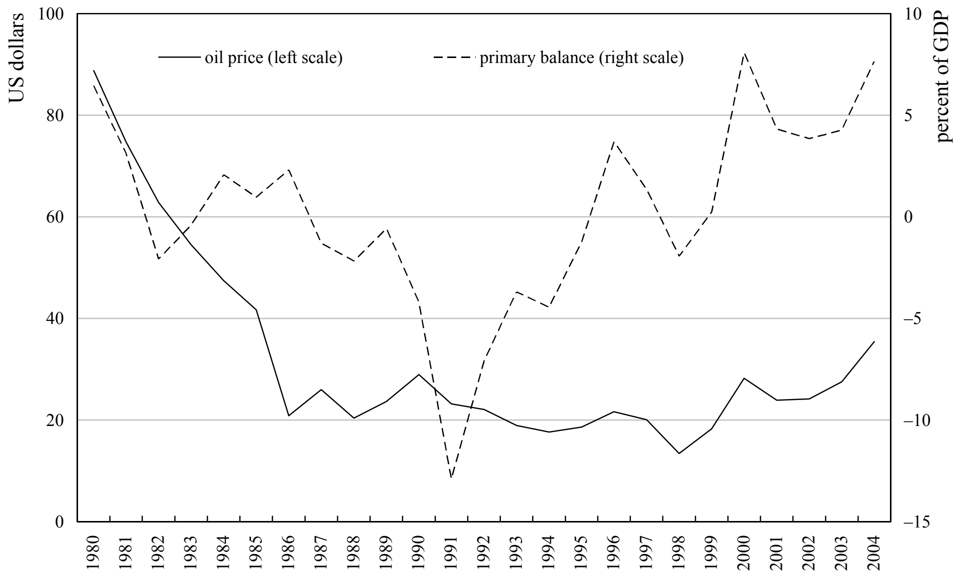
However, the behavior of the average non-oil balance hides significant cross country variation. Three broad groups can be identified (Table 4). In the first group, the smallest, the correlation between oil prices and primary balances is mildly positive (between 0.2 and 0.5); in the second, the largest one, the correlation is low (ranging between –0.2 and +0.2); and in the third, which includes one third of the countries, the correlation is negative (between –0.3 and –0.6). Therefore, while in a minority of countries (the first group), the primary non-oil balance tends to provide a mild stabilizing impulse with respect to changes in oil prices, in about one third of the countries in the sample, the primary non-oil balance appears to impart a pro-cyclical impulse.[29]

Analysis with respect to GDP growth provides a similar picture. Primary and overall balances are also positively correlated with output growth. Over 1980-2004, the correlation is almost 0.5 for both primary and overall balances (Figure 14). Much as was the case with oil prices, average non-oil balances appear not to have any strong systematic relation with GDP growth. The correlation coefficient between real GDP growth and primary non-oil balances over 1992-2004 is negative (–0.19), suggesting, if anything, a pro-cyclical bias (Figure 15). Also in the case of GDP growth, there is significant cross-country variation. Again, three broad groups can be identified (Table 5): in the first group, the correlation between growth rates and primary balances is strong and positive (between 0.4 and 0.8); in the second, the correlation is weak (between –0.2 and +0.2); and in the third the correlation is strong and negative (between –0.3 and –0.8). There is some broad consistency between the grouping of countries in Tables 4 and 5. The rank correlation, while not very high, is positive (0.30). Only one country falls in groups at the opposite ends of the spectrum in the two tables, while six fall in the same group in both tables and the remaining eleven fall in adjacent groups.

[29] See IMF (2006) for a discussion of the political economy reasons which may cause such behavior.

Figure 11

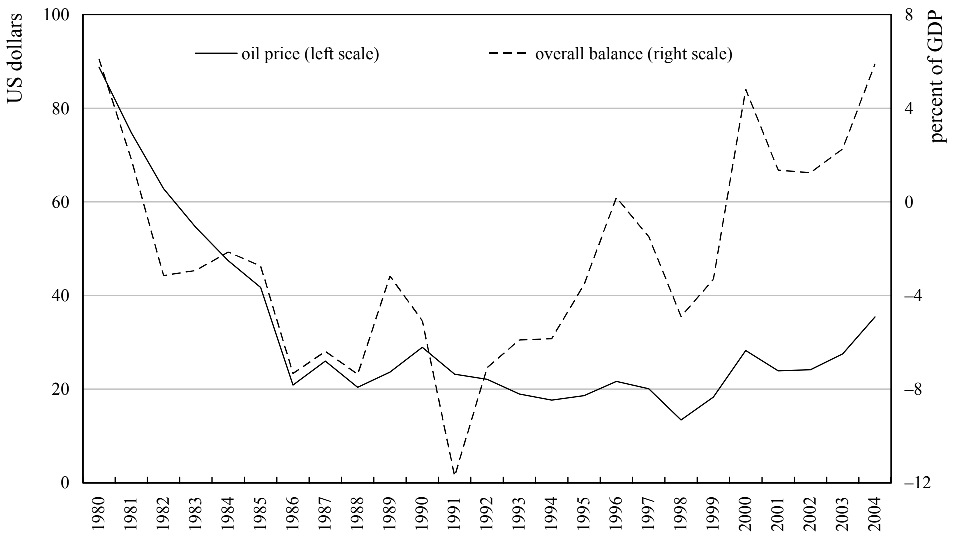
Real Oil Prices and General Government Primary Non-oil Balance[1]



[1] Oil price: simple average of three spot prices (Dated Brent, West Texas Intermediate and the Dubai Fateh), US$ per barrel at constant 2000 prices. See footnote to Figure 7 for the list of countries considered.

Figure 12

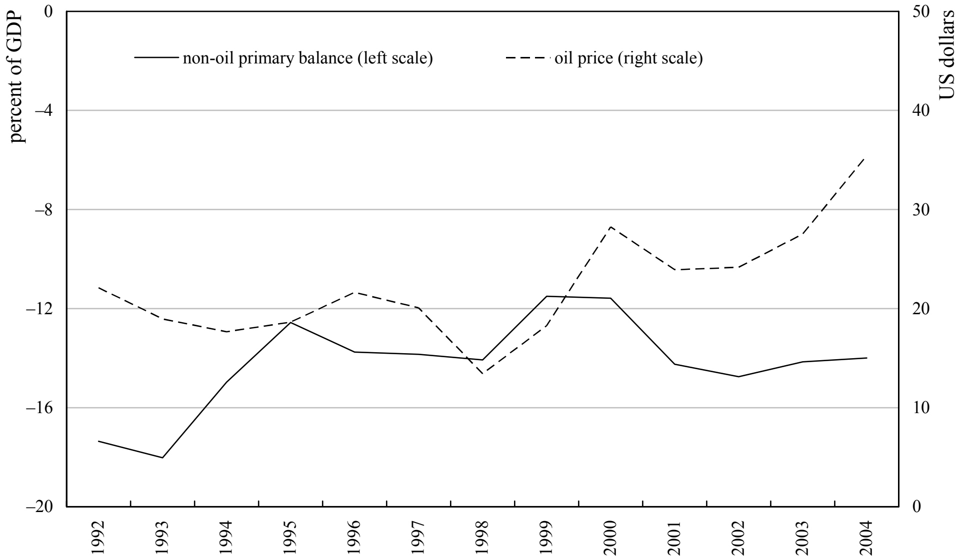
Real Oil Prices and General Government Overall Balance[1]



[1] See footnote to Figure 11.

Figure 13

Real Oil Price and General Government Primary Non-oil Balance[1]

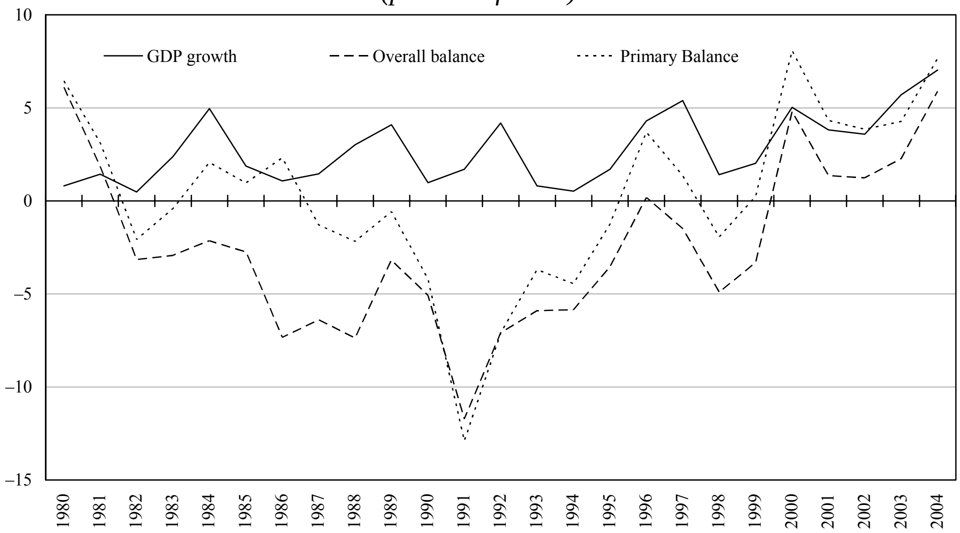


[1] See footnotes to Figure 11.

Figure 14

Real GDP Growth and General Government Primary and Overall Balances[1]

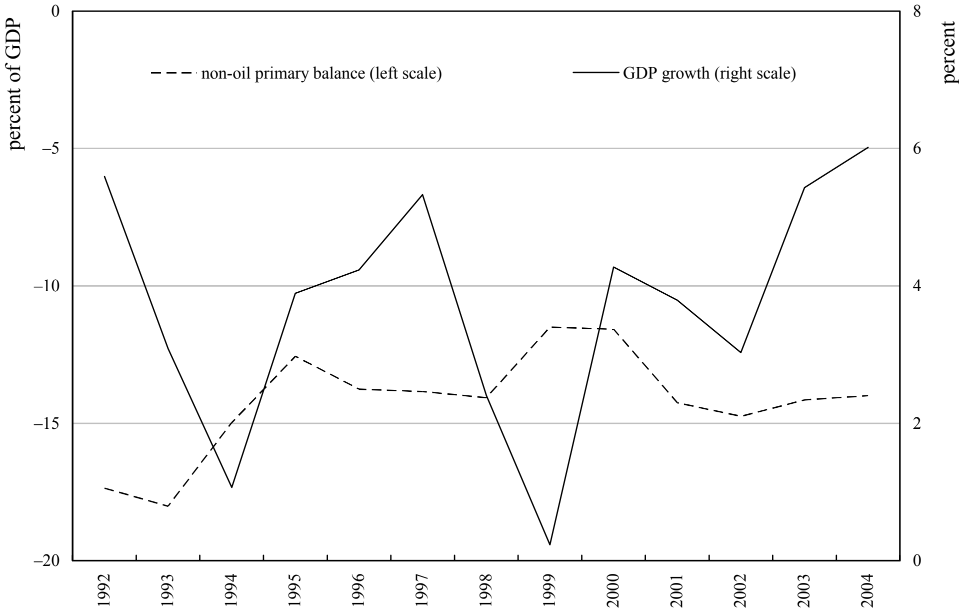
(percent of GDP)



[1] See footnote to Figure 7 for the list of countries considered.

Figure 15

Real GDP Growth and General Government Primary Non-oil Balance[(1)]



[(1)] Simple averages. For the countries considered, see footnote to Figure 4.

5. Summary and conclusions

The assessment of fiscal performance, by no means a straightforward matter in general, faces specific complications in OPCs. The uncertainty concerning the quantity, quality and cost of extraction of oil reserves, as well as future oil prices negatively affects the reliability of estimates of long-term sustainable policies. The volatility of oil price also complicates the assessment of the contribution of fiscal policy to macroeconomic stabilization. The special nature of oil revenues calls for supplementing the overall balance with other indicators of the impact effect of fiscal policy.

This paper defines a simple toolkit for a broad-brush assessment of how OPCs are coping with the challenges they face in the conduct of fiscal policy, with respect to both sustainability and stabilization. The toolkit includes necessary conditions for sustainability derived from the government present value budget constraint; estimates of "permanently sustainable" expenditure ratios; and the joint examination of overall and non-oil balances reactions to changes in oil prices and growth rates. While this is a fairly "compact" toolkit, its application provides valuable insights.

Table 4

General Government Non-oil Primary Balance and Real Oil Price: Correlation Coefficients for Selected Countries (1992-2004)

UAE	0.47
Qatar	0.31
Algeria	0.23
Gabon	0.19
Iran	0.10
Congo, Rep.	0.06
Ecuador	0.02
Kuwait	–0.04
Indonesia	–0.05
Nigeria	–0.07
Cameroon	–0.16
Saudi Arabia	–0.29
Bahrain	–0.35
Lybia	–0.36
Syria	–0.46
Yemen	–0.52
Venezuela	–0.61

Table 5

General Government Non-oil Primary Balance and GDP Growth: Correlation Coefficients for Selected Countries (1992-2004)

Cameroon	0.78
Algeria	0.58
Iran	0.45
UAE	0.42
Yemen	0.36
Indonesia	0.35
Congo, Rep.	0.22
Ecuador	0.19
Qatar	0.17
Syria	0.05
Saudi Arabia	0.01
Venezuela	–0.09
Bahrain	–0.11
Nigeria	–0.18
Gabon	–0.33
Lybia	–0.56
Kuwait	–0.82

The paper finds evidence that the attainment of sustainable fiscal positions remains an issue for many OPCs. In contrast with the necessary condition for sustainability, most OPCs ran average overall deficits both over 1980-2004 and over the shorter and more favorable 1992-2004 period. This applies to countries with still large oil reserves as well as to countries which are much closer to the depletion of their stock of oil wealth. Even in most recent years, with rising oil prices, many countries are running primary expenditure to GDP ratios which exceed the level that would be permanently sustainable.

Concerning stabilization a more mixed picture emerges. Primary balances generally appear to move so as to provide a stabilizing impulse with respect to changes in oil price. However, this does not come from the underlying non-oil primary balance. Indeed, in many countries the non-oil primary balance deteriorates when the oil price improves.

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