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Fiscal Sustainability in Heavily Indebted Countries Dependent on Nonrenewable Resources: The Case of Gabon

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African Department

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Abstract

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This paper proposes a framework for assessing fiscal sustainability in heavily indebted countries dependent on exhaustible resources, with reference to Gabon. It finds that fiscal sustainability could be achieved by: (i) developing a fiscal rule for the non-oil primary fiscal balance compatible with an objective for reducing the debt-to-non-oil GDP ratio; (ii) introducing a constant oil-based income transfer per capita allowing intergenerational equity; and (iii) building up an oil savings fund. Long-term simulations show that Gabon's fiscal position is fragile and that a fiscal policy path consistent with the proposed framework could help achieve comfortable levels of net wealth.

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I. INTRODUCTION

This paper proposes a simple framework to assess fiscal sustainability in heavily indebted countries, dependent on exhaustible resources, with a particular application to Gabon. Gabon's oil sector, which contributes over 30 percent to real GDP, some 75 percent to exports, and 60 percent to government revenue, is projected to decline by 50 percent in terms of output over the next five years and to be depleted over the next 30 years. At the same time, Gabon faces a heavy debt burden that will continue to absorb about 40 percent of government revenue during the remainder of the decade. In view of these trends, it is necessary to assess Gabon's long-term fiscal sustainability.

This research was prompted by the fact that the traditional concept of primary balance gaps—with regard to the primary fiscal balance required to stabilize the debt-to-GDP ratio—entails two major caveats. First, the analysis of fiscal sustainability based on the stabilization of the existing debt-to-GDP ratio is limited by the fact that it does not necessarily imply that the debt-to-GDP ratio would in fact be stabilized at an optimal or desirable level.² Second, the very nature of exhaustible resources implies an unavoidable reduction in government revenue stemming from these resources, thus the inability to maintain a regular stream of government revenue on a sustainable basis. Therefore, the underlying “sustainable” levels of government fiscal balance and debt (defined using the traditional concept) are misleading for countries dependent on nonrenewable resources. The proposed framework aims at addressing these issues; it extends the traditional approach by targeting a normative (desirable) debt-to-non-oil-GDP ratio and by taking into account the need to substitute the declining revenue derived from nonrenewable resources, so as to help preserve total net wealth.

The paper is organized in two sections. The first section applies to Gabon the relation between primary fiscal balances and debt-to-GDP ratio developed by Blanchard and others (1990) and Buiter (1997). On the basis of a quantitative measure for the *primary balance gaps* (over the 1991-2002 period), that is, the fiscal efforts necessary to stabilize the debt stock for each year, the paper suggests that Gabon has made progress towards fiscal sustainability, particularly since 1994. The section also extends the analysis of fiscal sustainability by introducing a *normative (desirable) debt-to-GDP ratio*—much lower than today's level and to be reached in a number of years. It derives the fiscal adjustment effort needed to reach the following objectives: (i) achieve such a lower debt-to-GDP ratio target in a given number of years; and (ii) stabilize the debt-to-GDP ratio at that level thereafter.

The second section further deepens the traditional fiscal and debt sustainability analysis by taking into account the expected decline in nonrenewable resources. It emphasizes that a

² Reinhart, Rogoff, and Savastano (2003) have recently shown how conventional sustainability analyses are not likely to be meaningful or useful in the case of a debt intolerant country since the current debt may already exceed “what history suggests is that country's tolerable debt burden.”

forward-looking fiscal policy entails a rule on the non-oil primary balance, consistent with the following points: (i) an *equitable intergenerational distribution* of the existing oil wealth given the objective of ensuring that future generations benefit from this oil wealth;³ (ii) a relatively stable path for the primary fiscal balance aimed at reducing the debt-to-non-oil GDP ratio to sustainable levels (so that future generations are not saddled with a heavy debt burden); and (iii) investing part of the oil revenue thereby contributing to the reconstitution of the total government net wealth after the exhaustion of oil reserves. If enacted, such a long-term policy framework would help insulate government spending from volatile oil revenue, and allow for a relatively smooth path for real exchange depreciation which is required to help replace declining oil resources by non-oil tradable production over time. The section uses a long-term projection and simulation model to project the non-oil economy, oil revenue, and the fiscal accounts during the period 2003–33. The model describes the path of *an oil savings fund* (the Fund for Future Generations, or FFG), as well as the transfers of oil revenue made to it and the income transfers made to the budget by this fund.⁴ The central idea is to ensure two issues: (i) a relatively constant oil-based income stream per capita over time which would ensure intergenerational equity while shielding the economy from the volatility of oil revenues; and (ii) sustained progress toward the reconstitution of total net wealth position (oil-based assets minus non-oil financial debt) for the future, say over the next 30-year period.

The simulations make a set of assumptions with regard to: (i) the path of oil production and prices, (ii) interest rates and the rate of return on the oil savings fund, (iii) non-oil GDP growth, and (iv) a target for the debt-to-non-oil GDP ratio at the end of the period. Based on these

³ The evaluation assumes that the government has an important role to play in the management of oil resources, including the following issues: (i) arrangements regarding oil exploration, production and taxation; (ii) the provision of public goods, including basic social services; (iii) intergenerational redistribution of oil resources, including the management of an “oil savings fund” with the proper safeguards; and (iv) the servicing of public debt. Gabon has recently taken significant steps to improve efficiency and transparency in budget management, including the establishment of an integrated budget information system, and the institution of a framework to fight corruption. Sala-i-Martin and Subramanian (2003) have proposed a different approach in the case of Nigeria. They advise that, in view of the past misuse of oil resources, oil revenue should be distributed to citizens (adult women) directly, the government being excluded from the appropriation of oil resources.

⁴ The framework supposes that the saved oil revenue is used as intended, which in practice is a difficult endeavor. In this regard, the paper assumes that the resources of the Fund for Future Generations are invested abroad, which would help avoid not only political spending pressures, but also the appreciation of the real exchange. However, the question remains whether these resources could not be invested locally for the development of the non-oil economy, if budget management and control systems strengthen and the return on investment improves. For a discussion on the domestic use of these resources, see Söderling (2002) and Barnett and Ossowski (2002).

assumptions, the simulations derive a “sustainable path” for the non-oil primary fiscal deficits, the overall primary fiscal surpluses, and equitable oil-based income transfers across generations. The paper shows that the non-oil primary deficit would have to decline gradually from 16 percent of non-oil GDP in 2002 to about zero percent by year 2031 if the authorities aim at reducing the debt-to-non-oil GDP ratio from 132 percent at end-2002 to 20 percent by year 2033, a 30-year period.⁵ Total net wealth, after declining from 136 percent of non-oil GDP in 2002 to some 69 percent in 2025 (reflecting declining oil wealth), would increase gradually thereafter, reaching almost 72 percent by year 2033. After year 2033, the fiscal effort required to stabilize the debt ratio at 20 percent would entail a lower primary surplus (0.2 percent of non-oil GDP), and the country could run non-oil primary deficits that could be covered by transfers from the Fund for Future Generations.

II. ANALYSIS OF FISCAL AND DEBT SUSTAINABILITY

A. Background

Fluctuating oil revenues and pro-cyclical fiscal policy increased government borrowing, resulting in a high debt burden. Since Gabon is a member of the CFA monetary zone, government fiscal deficits had no lasting impact on inflation, interest rates and the exchange rate, because of the fixed exchange rate of the CFA franc to the French franc and the cointegration of prices in CFA countries and prices in France (Odedokun, 1997 and Nuven, 1994). However, the initial appreciation of the real exchange that followed the discovery of oil four decades ago raised the economy’s cost structure, which was detrimental to the development of non-oil exports. At the same time, oil rents inflated the size of an inefficient public sector in the economy; and an increased oil dependency gave rise to large variations in fiscal balances and high levels of government borrowing necessary to maintain expenditure initiated during boom years.⁶ The external debt burden, which represented only about 23 percent

⁵ According to Reinhart, Rogoff, and Savastano (2003), “safe” debt-to-GNP ratio thresholds for highly debt-intolerant countries could be as low as 15 percent. The targeted debt-to-non-oil GDP ratio of 20 percent is realistic for a middle-income country aiming at accessing capital markets for economic diversification (see page 22 for a detailed discussion).

⁶ For a comprehensive analysis of fiscal policy during 1970-2001, see International Monetary Fund (2002). The study shows that, during this period, Gabon experienced heavily fluctuating oil prices, gradually increasing and then falling oil production, large variations in real GDP growth, ambitious investment programs, and episodes of strong fiscal adjustment (in part under Fund-supported programs) with strong wage restraint, stepped-up tax collection, and deep cuts in investment spending. The fiscal impulse analysis shows that fiscal policy has been essentially pro-cyclical, reflecting developments in oil revenue, with a limited stabilization role. The positive fiscal impulse has been particularly large during the three-to-four-year periods immediately following the first (1973-74) and second (1979-81) favorable oil shocks, as well as during the 1998 spending excess and breakdown of budget management.

of government revenue in the years 1980-86, rose to 56 percent during 1987-95. Gabon had to resort to six debt reschedulings from Paris Club creditors between 1987 and 2000. Because these reschedulings were nonconcessional, the external debt service burden has remained high, reducing the resources available for the development of basic economic and social infrastructure, which are necessary for long-term development (Gerson, 1998, Loko and others, 2003).

A typical phenomenon in Gabon has been that during oil boom years large expenditure programs were initiated, but during subsequent periods of lower oil prices and lower government revenue, these programs were maintained even though they should have been cut back or postponed. The fiscal deficits recorded in the early 1970s, most of the 1980s, and the early 1990s were financed by recourse to external and domestic borrowing. The debt-to-GDP ratio increased from about 30 percent in the early 1970s to about 100 percent during 1998-99. Reflecting mainly stepped-up net repayments, the debt ratio has since then been on a declining trend and stood at about 76 percent of GDP at end-2002. While external debt has represented the bulk of public debt, domestic debt became important during the 1990s, averaging 20 percent of GDP in the second half of that decade. However, with the improvement in the government's fiscal position, domestic debt was reduced to about 14 percent of GDP at end-2002. Foreign borrowing was arranged essentially at unfavorable commercial conditions, including high interest rates and short maturities.⁷ As a result, external debt service has become a heavy burden for Gabon's development, representing over 10 percent of GDP and over 40 percent of government revenue during the period 1999-2002. Despite the large primary fiscal surpluses (averaging over 11 percent of GDP over this period), external payment arrears reached 8 percent of GDP at end-2002, requiring further debt rescheduling. Domestic borrowing included bank financing and the accumulation of payments arrears.^{8, 9}

⁷ In 1982, the implicit interest rate averaged 14 percent (22 percent for floating rates and 8 percent for fixed rates). In 1979, the average maturity of Gabon's debt was about three years (Barro Chambrier, 1990). Until the early 1980s, bank loans and export credits represented the bulk of Gabon's external debt. Since then, the debt composition has however changed in favor of bilateral loans (mainly Paris Club creditors), with longer maturities.

⁸ Seigniorage in the Economic Community of Central African States (CEMAC) is limited by the requirement that central bank financing (statutory advance) during period t should not exceed 20 percent of revenues collected in period $t-1$. However, since no limit is set on the government borrowing from commercial banks, there is a risk of crowding out the private sector. Such a risk is alleviated by setting targets on total net bank credit to government under the Bank of Central African States' (BEAC's) monetary programming exercise, and in the context of Fund-supported programs.

⁹ The accumulation of domestic payments arrears had a negative impact on private investment and the local banking system. Following a comprehensive audit in 1999, the government has
(continued...)

B. Traditional Framework for Debt and Fiscal Sustainability

The analysis of fiscal sustainability determines whether the government can pursue indefinitely a given set of fiscal policies without future policy reversals (Zee, 1998; and Horne, 1991). In practice, fiscal policy has been deemed sustainable if it stabilizes the debt-to-GDP ratio.¹⁰ The current analysis uses indicators of fiscal sustainability developed by Blanchard and others (1990) in the context of member countries of the Organization of Economic Cooperation and Development (OECD) and builds on the debt dynamics developed by Buiter (1997):

$$\Delta D_t = I_t - B_t \quad (1)$$

$$I_t = rD_{t-1},$$

where ΔD_t is the change in government debt ($D_t - D_{t-1}$), I_t the interest payments, B_t the primary balance, and r the nominal interest rate (assumed constant). The budgetary primary balance is the difference between government revenue and noninterest spending. Equation (1) indicates that the overall fiscal deficit (interest payments plus the budgetary primary balance, on the right-hand side) is financed by an increase in the stock of public debt (the left-hand side).

Equation (1) indicates that government fiscal deficits are financed by the contracting of new debt; the stock of debt is reduced when primary surpluses exceed interest payments. By dividing both sides of the equation by GDP ($Y_t = (1+g)Y_{t-1}$), where g is the nominal GDP growth rate (assumed constant), and after rearranging the variables, equation (1) leads to the following dynamic equation (lower cases are ratios to GDP):

$$\Delta d_t = (r-g)d_{t-1}/(1+g) - b_t, \quad (2)$$

where d and b are the debt and primary balance in terms of GDP.

Solving forward this first-difference equation leads to the *intertemporal budget constraint* that the stock of debt has to be equal to or less than the present discounted value of future primary fiscal balances (*also known as the solvency condition*):

$$d_t \leq -\sum_{j=1}^{\infty} \gamma^j b_{t+j} \quad \gamma = (1+r)/(1+g) \text{ and } \gamma - 1 = (r-g)/(1+g). \quad (3a)$$

$$\lim_{j \rightarrow \infty} b_{t+j} = 0. \quad (3b)$$

stepped up their clearance, notably through commercial agreements with domestic creditors (so-called securitization).

¹⁰ The issue of the desirable level of the debt-to-GDP ratio is addressed in Section II.D. “Achieving a Normative Debt-to-GDP Ratio”.

Failure to meet this constraint will result either in an abrupt change in fiscal policy or a debt repudiation, high inflation, and real exchange rate depreciation, therefore suggesting that the current fiscal policies are not sustainable.

One indicator of fiscal sustainability is provided by the comparison of the actual primary balance with a “steady-state primary balance” (b^*) that would stabilize the ratio of debt to GDP at d_{t-1} , or $\Delta d_t=0$:

$$b^* = d_{t-1} (r-g)/(1+g) = d_{t-1} (\gamma - 1) \quad (4)$$

$$b^* - b_t = d_{t-1}(\gamma - 1) - b_t. \quad (5)$$

Equation (4) shows that, when growth is higher than the interest rate (implausible over the long run), the stock of debt could be stabilized while incurring primary fiscal deficits. Otherwise, primary fiscal surpluses would be needed to stabilize the debt-to-GDP ratio at the current level (d_{t-1}). Equation (5) gives the magnitude of the fiscal adjustment that would be required to stabilize the debt-to-GDP ratio. If this is not achieved, the country's debt-to-GDP ratio would continue to increase above the current level at a rate equal to $b^* - b_t = \Delta d_t$; accordingly, the underlying fiscal policy would not be deemed sustainable.

A positive primary balance gap indicates the fiscal effort needed to stabilize the debt stock. A negative value indicates a *budgetary margin*. It should be noted that stabilizing the debt-to-GDP ratio at the existing level does not imply that the current level is desirable (see Section D below).

C. Assessing Gabon's Fiscal Performance from 1991 to 2002

The above framework is applied to Gabon for the 1991-2002 period. Simulation results suggest that Gabon has made progress towards fiscal sustainability since 1994 (Table 1 and Figure 1). Primary balance gaps, which were positive from 1991 to 1993, became negative during most of the period since 1994 when the country embarked on a comprehensive adjustment program following the devaluation of the CFA franc. However, the reemergence of positive gaps in 1998 and to a lesser extent in 2001 is indicative of the fragility of Gabon's fiscal adjustment. To dampen cyclical effects and estimate the fiscal adjustment required over the medium term, medium-term gaps (b^*-b_3) were constructed using three-year forward averages for the primary balance (b_3), based on the primary balances for the current year and the following two years. This indicator broadly confirms the finding reached using annual primary gaps.

Table 1. Gabon: Analysis of Fiscal and Debt Sustainability, 1991–2002

(In percent of GDP, unless otherwise indicated)

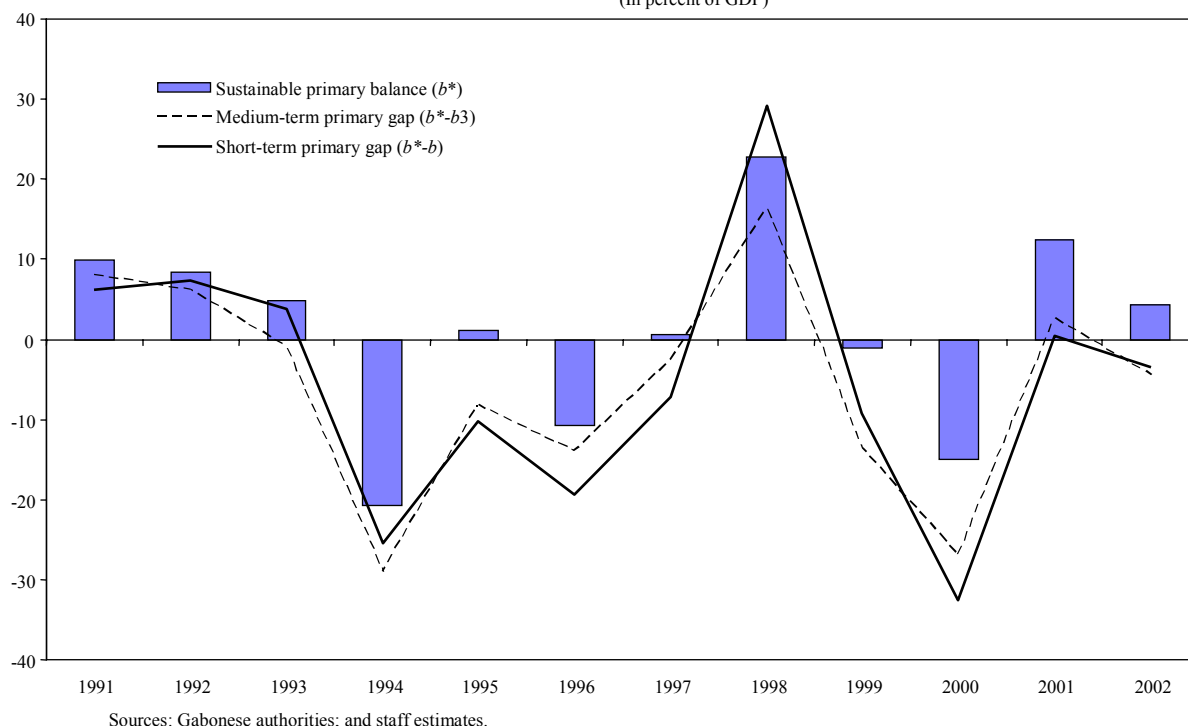
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Debt-to-GDP ratio at the end of $t-1$ (d_{t-1})	60	67	67	80	124	112	89	86	102	101	73	76
Primary balance (b)	4	1	1	5	11	9	8	-6	8	18	12	8
Primary balance, three-year average ahead (b_3)	2	2	6	8	9	3	3	6	13	12	10	9
Interest rate (r) in percent 1/	9	9	11	13	7	7	7	8	7	7	12	6
Nominal GDP growth (g), in percent	-6	-3	3	52	6	18	7	-15	9	26	-5	0
Estimated primary balance gaps 2/												
b^*	10	8	5	-21	1	-11	1	23	-1	-15	12	4
b^*-b	6	7	4	-25	-10	-19	-7	29	-9	-33	0	-4
b^*-b_3	8	6	-1	-29	-8	-14	-3	16	-14	-27	3	-5

Sources: Gabonese authorities; and staff estimates and projections.

1/ Interest payments due in t divided by stock of debt at the end of $t-1$.

2/ b^* is the sustainable primary balance (allowing the stabilization of the debt ratio at d_{t-1}); (b^*-b) and (b^*-b_3) the short- and medium-term primary gaps.

Figure 1. Gabon: Estimated Primary Balance Gaps, 1991–2002
(In percent of GDP)



D. Achieving a Normative Debt-to-GDP Ratio

The analysis of fiscal sustainability based on the stabilization of the existing debt-to-GDP ratio is limited by the fact that it does not necessarily imply that the debt-to-GDP ratio would be stabilized at an optimal or desirable level.¹¹ A lower debt-to-GDP ratio may be justified by the need to improve the government's credibility relative to the private sector (including successful access to capital markets), or to reduce the debt-service burden, so as to provide room for maneuvering for fiscal policy in its macroeconomic stabilization role. In particular, the prospects for oil revenue exhaustion in the case of Gabon would call for a reduction in the debt-to-GDP ratio to a level consistent with the expectations for non-oil revenue.

To reduce the debt-to-GDP ratio to a desirable level in year n (d_n), significant incremental primary surpluses will have to be generated each year until year n . Only when the desirable debt-to-GDP ratio has been reached, can the analysis developed above be applied. Expanding equation (2) to get $d_n = \gamma^n d_o - b (1 + \gamma + \gamma^2 + \dots + \gamma^{n-1})$, where d_o is the initial debt-to-GDP ratio,

¹¹ Croce and Juan-Ramón (2003) have recently proposed a fiscal sustainability indicator to assess whether a given fiscal policy can help achieve a targeted debt-to-GDP ratio. However, the use of the indicator is limited by the fact that it does not provide a time frame for achieving such a target. Moreover, they do not address issues specific to oil-producing countries.

one obtains the primary surplus (\underline{b}) required every year to reduce the debt-to-GDP ratio from d_o to d_n after n years:

$$\underline{b} = (\gamma^n d_o - d_n)(\gamma - 1)/(\gamma^n - 1) \quad (6a)$$

$$\underline{b} = \underbrace{d_n (\gamma - 1)}_{(1)} + \underbrace{(d_o - d_n) (\gamma - 1)[\gamma^n/(\gamma^n - 1)]}_{(2)}, \quad (6b)$$

where the first term in (6b) is the primary balance required to stabilize the debt-to-GDP ratio at the desirable level d_n and the second term in (6b) is the incremental fiscal effort required to reduce the debt-to-GDP ratio from d_o to d_n in n years.¹² When $r=g$ (or $\gamma=1$), GDP growth eliminates the debt dynamics due to the interest rates so that $\underline{b} = (d_o - d_n)/n$ and $b^* = 0$.

The table below shows (i) the primary surpluses required to reduce the debt-to-GDP ratio from 70 percent to various desired levels in three years; and (ii) the primary balance needed to stabilize the debt-to-GDP ratio once the desirable level has been reached. For example, with an interest rate of 6 percent and a GDP growth rate of 5 percent, a primary surplus of some 17 percent of GDP would be required every year to reduce the debt-to-GDP ratio from 70 percent to 20 percent over a three-year period. Maintaining this level thereafter would require a primary surplus of some 0.2 percent of GDP every year.

Table 2. Primary Balance Needed to Achieve and Maintain
A Normative Debt-to-GDP Ratio (d_n)

(In percent of GDP, to be achieved in three years, from an initial level of 70 percent of GDP)

	70	60	50	40	30	20
Interest rate=6 percent; nominal GDP growth=8 percent						
Annual primary balance needed to achieve d_n (\underline{b})	-1.3	2.1	5.5	8.9	12.3	15.7
Annual primary balance needed to maintain d_n (b_n^*)	-1.3	-1.1	-0.9	-0.7	-0.6	-0.4
Interest rate=6 percent; nominal GDP growth=5 percent						
Annual primary balance needed to achieve d_n (\underline{b})	0.7	4.0	7.3	10.5	13.9	17.2
Annual primary balance needed to maintain d_n (b_n^*)	0.7	0.6	0.5	0.4	0.3	0.2

Source: Staff estimates and projections.

¹² The second term of (6b) is close to $(d_o - d_n)/n$, i.e., the debt reduction divided by the number of years required to achieve it.

III. FISCAL SUSTAINABILITY IN THE FACE OF EXHAUSTIBLE RESOURCES

A. Introduction

The traditional sustainability analysis has an additional limitation when the government revenue base is not permanent. For countries like Gabon, where the government budget is dominated by oil revenue, there is a need to have a forward-looking approach by considering the expected stream of oil revenue over time. In this regard, it is essential not to consider the income derived from oil as the accrual of revenue, but rather as a reduction in wealth associated with an exhaustible resource.¹³ This is particularly important for Gabon for which oil production is projected to be reduced by almost one-half over the next five years.¹⁴ The intertemporal government budget constraint given by equation (3) and the sustainable primary balance of equation (4) may be misleading in such a case, since the underlying levels of “sustainable” fiscal primary balance is underestimated (Alier and Kaufman, 1999). In fact, such a framework assumes that revenue, including oil revenue, would be collected indefinitely. Given the finite horizon for the exploitation of oil resources, this would require effective revenue diversification or enormous expenditure cuts, which would clearly be an unrealistic undertaking.¹⁵

Fiscal policy should aim at the replacement of oil resources by financial assets (including the public debt) and ensure intergenerational equity in the distribution of oil wealth. There are two ways to safeguard oil wealth, either by not exploiting the resource or by investing the value of oil production and consuming only all or part of the associated investment income. The decision would depend on future oil prices and the interest rates on the investment of oil resources.¹⁶ A

¹³ According to Barnett and Ossowski (2002), oil revenue should not be viewed as income, but rather as financing item, namely a portfolio transfer that converts oil wealth into financial assets.

¹⁴ Oil production has declined from the 1997 peak of 18½ million tons to 12.6 million tons in 2002. The authorities project that, barring major discoveries, oil production would decline to about 7 million tons by year 2008. However, the recent exploitation of marginal oil fields has slowed down somewhat the fall in production. If the current oil recuperation policy continues, oil production could be slightly above current projections.

¹⁵ For an analysis of the experience of policies in a number of oil-producing countries, see Liuksila, Garcia, and Basssett (1994). The authors noted the headway made in Mexico, Egypt, and Indonesia in the diversification of sources of government revenue. Their evaluation, however, shows the experience in the cases of Nigeria and Venezuela to be poor.

¹⁶ For a framework for the optimal exploitation of irreplaceable resources, see Hotelling (1931). Caution should be exercised in valuing oil resources, since the volatility of oil prices or exchange rate depreciations could lead the government into an unsustainable consumption path based on a poor valuation. Accordingly, the value of oil wealth should be reexamined continuously (see Tersman, 1991 in the case of Norway).

forward-looking approach is needed to ensure that the government is not forced to revise its policies at the expense of future generations, when the oil wealth comes to exhaustion.¹⁷ Fiscal policy should aim at intergenerational equity, by setting aside part of oil revenue in earlier years to be shared with future generations when oil resources are much lower or exhausted. Spreading the spending of foreign exchange earnings from oil over time would also lead to a smoother path for the real exchange rate, since the depreciation eventually required when oil reserves are exhausted would start early on as financial reserves in foreign exchange are built.¹⁸ The problem at hand is, therefore, to find a sustainable path for the non-oil fiscal balance where deficits in later years can be financed by part of the oil revenue set aside in early years.¹⁹

It can be argued that investment in infrastructure, health, and education in the context of a growth and poverty reduction strategy help generate higher growth in the non-oil sector and adequate non-oil revenue for future generations.²⁰ A delicate balance will therefore have to be struck between the current investment needs and the constitution of savings for future generations. This balance will depend on a number of variables, including the time preference of the current generation,²¹ the information on the stock of oil reserves, and the period remaining until depletion, the return on financial investments versus the cost of borrowing, and

¹⁷ For a forward-looking balance sheet approach, see Tersman (1991), Liuksila, Garcia, and Bassett (1994), and Baunsgaard (2003). These studies do not specifically deal with the indebtedness issue.

¹⁸ The assets of the Fund for Future Generations are assumed to be invested abroad, with the proper management safeguards. This would help avoid an appreciation of the exchange rate that could hamper the development of a non-oil economy which was dramatically affected by the “Dutch disease.” In fact, such a policy would help protect these resources from political spending pressures, while insulating the domestic economy from volatility of oil revenues (see Davis and others, 2001). Fasano and Wang (2002) show how, by articulating fiscal policy in a medium-term framework and by adopting formal oil savings/stabilization funds for more than 20 years, Kuwait and Oman were able to smooth expenditure changes to oil revenue changes.

¹⁹ The current analysis does not deal with precautionary policies aimed at smoothing oil revenue (excess oil revenue saved to be used when oil revenue is below the permanent income level), including the use of market-based hedging instruments. However, as shown below, setting up a rule of a constant oil-based revenue transfer per capita implicitly addresses the issue of isolating the budget from oil revenue volatility.

²⁰ Although Gabon is ranked as a middle-income country, its social indicators are similar to those in low-income countries (over 60 percent of the population live below the poverty line).

²¹ Savings by the current generation in favor of future generations depend very much on the time preference of the current generation, a function of interest rates and population growth.

the return on investment that depends on the country's absorptive capacity and the ability of the current generation to use effectively oil resources.

B. A Framework for Fiscal Sustainability and Intergenerational Equity

Fiscal sustainability should be considered in the context of a comprehensive approach that aims at a progressive reconstitution of the government's net wealth following the exhaustion of oil reserves. As in Barnett and Ossowski (2002), this section shows that optimal fiscal policy critically hinges on a careful targeting of the non-oil budgetary primary balance and a conversion of oil revenue into financial assets, so as to ensure a replacement of the oil wealth by financial assets. However, unlike in Barnett and Ossowski (2002) and Baunsgaard (2003), this paper does not assume the maintenance of the current net wealth. In view of the uncertainty associated with the estimation of the net wealth, the paper proposes a gradual fiscal adjustment of the non-oil primary balance that allows a progressive replacement of oil resources by financial assets, without imposing any specific path for non-oil revenue or government expenditure.²² In fact, the permanent income hypothesis underlying the unchanged wealth model assumes a rate of the time preference that allows for consumption smoothing over time, in the sense that the ratio of government expenditure to non-oil GDP would be constant, with non-oil revenue growing at the same rate as non-oil GDP. Experience shows that government spending in Gabon has been subject to major waste and distortions, which are epitomized by low non-oil sector growth and the poor social indicators. A case could therefore be made that, with improved expenditure management and the greater focus on poverty reduction, in the short to medium term the government could set spending (essentially centered on economic infrastructure and human capital development) at a level higher than that required by the permanent income hypothesis (spending would, however, decline in relation to existing spending levels, reflecting improved efficiency). The associated higher non-oil GDP growth would help reconstitute government wealth over the long run. The paper also differs in the sense that it introduces a target for the debt-to-non-oil GDP ratio.

²² Fiscal sustainability for oil-producing countries has traditionally been analyzed as the capacity to preserve the current total stock of government net wealth, through the instantaneous transformation of oil revenue into financial assets (see Barnett and Ossowski, 2002 and Baunsgaard, 2003). In a sense, this presumes that the current stock of net wealth is at an optimal level (in spite of the uncertainty associated with its estimation); maintaining it entails limiting government consumption (therefore the non-oil primary balance) to the return on government wealth, with a view to preserving future consumption possibilities (as under the permanent income framework). However, as suggested in pages 26-28, such a policy could be unduly contractionary in the medium term, and could counter the government's objectives of economic diversification and poverty reduction. Under the current progressive framework, fiscal sustainability is seen as the government's capacity to avoid a sustained reduction in total net wealth over the long run.

The framework below derives a path for oil and non-oil wealth and the associated non-oil primary balances, while attempting to illustrate the choices faced by the government in the management of declining oil resources and of its heavy non-oil debt:

$$W_{t+1} = A_{t+1} + FFG_{t+1} + Vo_{t+1} \quad (7a)$$

$$A_{t+1} = A_t(1+r) + F_{t+1} + Yo_{t+1} \quad (7b)$$

$$FFG_{t+1} = FFG_t(1+\rho) + To_{t+1} - Yo_{t+1}, \quad (7c)$$

$$Vo_{t+1} = Vo_t(1+r) - To_t(1+r) \quad (7d)$$

where A is the public debt ($A < 0$), F the non-oil primary balance, To the oil revenue, Yo the transfer of oil-based revenue (direct budgetary allocations of oil revenue or/and transfer from the oil savings fund, or Fund for Future Generations, FFG), ρ the return on FFG resources, and Vo the discounted future oil revenues, a measure of the oil wealth.²³

Oil wealth and oil revenue. To estimate oil wealth, it is assumed that annual oil production (O_t) changes at a constant rate ($-1 < e < 0$, i.e., a decline), the tax rate τ on oil resources is constant, and a parameter λ determines the annual rate of change in world oil prices (P_t).²⁴ Under these conditions, oil revenue and oil wealth in current year t and beyond are, respectively

$$\begin{aligned} To_{t+j} &= \tau P_t O_t (1+\lambda)^j (1+e)^j \\ &= To_t (1+\lambda)^j (1+e)^j \end{aligned} \quad (8a)$$

$$\begin{aligned} Vo_t &= \tau P_t O_t \left(\sum_{j=0}^{\infty} [(1+\lambda)(1+e)/(1+r)]^j \right) \\ &= To_t (1+r) / [1+r - (1+e)(1+\lambda)] \end{aligned} \quad (8b)$$

$$Vo_{t+j} = Vo_t (1+\lambda)^j (1+e)^j,$$

²³ The oil wealth is the sum of discounted future oil revenues

$$Vo_t = \sum_{j=0}^{\infty} To_{t+j} / [1+r]^j.$$

²⁴ Such a representation is obviously a simplification of developments in oil prices that could be better modeled by a stochastic process. However, it allows one to estimate outcomes under possible developments in the terms of trade.

where $To_t = \tau P_t O_t$ is the oil revenue in period t .²⁵ From relations (8a) and (8b), oil revenue in period $t+j$ equals to:

$$To_{t+j} = Vo_t \Phi (1+\lambda)^j (1+e)^j; \quad \Phi = [1+r - (1+e)(1+\lambda)]/(1+r). \quad (8c)$$

Transfers to the budget of oil-based income. These income transfers include direct budgetary oil revenue and transfers from the FFG. It is assumed that the oil wealth, Vo_t , is distributed equitably across generations through equal income transfers per capita (y^*):²⁶

$$Vo_t = y^* N_t \sum_{j=0}^{\infty} [(1+\eta)/(1+r)]^j = y^* N_t (1+r)/(r-\eta) \quad (9a)$$

$$y^* = Vo_t (r - \eta)/N_t (1+r) \quad (9b)$$

$$Yo_t^* = N_t y^* = Vo_t (r - \eta)/(1+r) \quad (9c)$$

$$Yo_{t+j}^* = N_{t+j} y^* = Vo_t [(r - \eta)/(1+r)] (1 + \eta)^j. \quad (9d)$$

Equation (9d) indicates that (i) the higher the oil wealth the larger the oil-based transfer; (ii) the higher the difference between the interest rate and the population growth, the higher is the oil-based transfer; and (iii) the oil-based income transfer will increase at a rate equal to η , the population growth rate. In terms of non-oil GDP, the part of oil redistributed is equal to

$$yo_{t+j}^* = vo_t [(r - \eta)/(1+r)] [(1 + \eta)/(1+g)]^j \quad (9e)$$

When non-oil GDP grows at the same rate as the population ($\eta=g$), relation (9e) equals

$$yo_{t+j}^* = yo_t^* = vo_t (r - g)/(1+r), \quad (9f)$$

and the oil-based income transfers will be constant in terms of non-oil GDP.

Fund for Future Generations. The FFG is funded by the net amount of oil revenue and transfers to the budget, in addition to earnings on the fund's resources. Using equations (7c), (8c) and (9d), the path for *FFG* is as follows:

$$FFG_{t+j} = FFG_{t+j-1}(1+\rho) + Vo_t \Phi [(1+\lambda)(1+e)]^j - Vo_t [(r - \eta)/(1+r)] (1 + \eta)^j. \quad (10a)$$

²⁵ For a finite horizon (T) for the exploitation of oil resources, the oil wealth amounts to $Vo_t = To_t [(1+\lambda)(1+e)/(1+r)]^{T-t+1} - 1 / [(1+\lambda)(1+e)/(1+r) - 1]$.

²⁶ The current analysis is general in the sense that it considers the maintenance of total net wealth (including public debt). Baunsgaard (2003) is for example concerned with the preservation of oil wealth, which constrains consumption to the return on oil resources.

After a few rearrangements, it can be shown that, as a ratio of non-oil GDP, the position of the Fund for Future Generations evolves according to the following path:²⁷

$$ffg_{t+j} = v_{ot} \left\{ \frac{\Phi}{\Pi-1} \left[\frac{(1+\rho)^j}{(1+g)^j} - \frac{\Psi^j}{(1+g)^j} \right] + \frac{\Omega}{\Theta-1} \left[\frac{(1+\eta)^j}{(1+g)^j} - \frac{(1+\rho)^j}{(1+g)^j} \right] \right\}, \quad (10b)$$

with $\Omega = (r - \eta)/(1+r)$; $\Theta = (1+\rho)/(1+\eta)$; $\Psi = (1+\lambda)(1+e)$; $\Pi = (1+\rho)/\Psi$; $\Phi = 1 - \Psi/(1+r)$.

The first term of the right side of (10b) describes developments in production while the second term refers to intergenerational distribution. When $r = \rho$, expression (10b) reduces to

$$ffg_{t+j} = v_{ot} \left\{ \frac{\Psi}{1+r} \left[\frac{(1+r)^j}{(1+g)^j} - \frac{\Psi^j}{(1+g)^j} \right] + \frac{1+\eta}{1+r} \left[\frac{(1+\eta)^j}{(1+g)^j} - \frac{(1+r)^j}{(1+g)^j} \right] \right\}. \quad (10c)$$

When $r = \eta$, the second term of the right side of (10b) equals zero, since there is no oil-based income redistribution. All oil resources are channeled to and remain in the Fund for Future Generations. Accordingly, ffg is determined essentially by developments in oil production and prices (Ψ) as well as the return on the resources of FFG (ρ). In that case, (10b) reduces to the following expression:

$$ffg_{t+j} = v_{ot} \left\{ \frac{\Phi}{\Pi-1} \frac{(1+\rho)^j}{(1+g)^j} - \frac{\Psi^j}{(1+g)^j} \right\}. \quad (10d)$$

Considering that oil production is on a declining trend ($-1 < e < 0$) and given plausible values for λ and g , over the long run the second term of equation (10c) will tend to zero. Provided that the return on FFG resources (ρ) is higher than non-oil GDP growth (g), the investment impact could override the negative effect of production and, over the long run, the position of the FFG could tend to or even exceed v_{ot} , the ratio of oil wealth relative to non-oil GDP in the base year. This suggests that a proper accumulation of financial assets in the Fund for Future Generations could help reproduce the oil wealth, which would correspond to the perfect transformation of oil wealth into financial capital.

Non-oil debt. For the dynamics of the debt and the net financial position excluding oil-based wealth, we turn to the earlier fiscal sustainability analysis (equations 6a-b), replacing the primary balance \underline{b} by the non-oil primary balance F_t plus the transfers of the oil-based income to the budget (Y_{ot}^*). A target for the debt-to-non-oil GDP ratio (a_{t+n}) to be reached in year $t+n$ is also assumed, leading to a path for the debt in equation (11b):

²⁷ Considering that the FFG position is zero at the origin.

$$\underline{b} = f_t + y_{o_t}^* = a_{t+n} (\gamma - 1) + (a_t - a_{t+n}) (\gamma - 1) [\gamma^n / (\gamma^n - 1)] \quad (11a)$$

$$a_{t+j} = a_t \gamma^j - \underline{b} [(\gamma^j - 1) / (\gamma - 1)], (j=1, \dots, n), \quad (11b)$$

with f_t and $y_{o_t}^*$ representing F_t and $Y_{o_t}^*$ expressed in terms of the non-oil GDP.

The first term in (11a) is the overall primary balance (including oil-based transfers, or direct oil revenue and transfers from the FFG) required to stabilize the debt-to-non-oil GDP ratio at the desirable level a_{t+n} , while the second term is the incremental fiscal effort to get to the desired level in n years.

Non-oil primary balance. The non-oil primary balance (f_t , likely a deficit in early years) is determined residually once the political choices about sustainable and intergenerationally equitable oil transfers ($y_{o_t}^*$) and the desirable debt-to-non-oil GDP ratio have been made. The non-oil primary balance is considered as an essential indicator of long-term fiscal policy sustainability and a key determinant of the total net wealth.²⁸ Fiscal sustainability should be analyzed by assessing whether the underlying fiscal policy in the non-oil sector is strong enough to sustain a viable fiscal position in the long run, especially after the depletion of oil reserves.

Equation (11a) indicates that $f_t = \underline{b} - y_{o_t}^*$, namely that (i) the higher the targeted debt reduction the higher should be the non-oil primary balance; and (ii) the higher the oil wealth (thus the per capita constant oil-based income transfer), the lower the non-oil primary balance. In the case non-oil GDP and population grow at the same rate ($\eta=g$), f_t and $y_{o_t}^*$ will be constant ($f = \underline{b} - y_{o_t}^*$). Without the objective to reduce the debt-to-non-oil GDP ratio ($\underline{b} = 0$), the country could generate non-oil primary deficits equal to the oil-based income transfer ($f_t = - y_{o_t}^*$). In this particular case, assessing fiscal sustainability would consist of ensuring that the actual non-oil primary deficit is less than or equal to the oil-based income transfer $y_{o_t}^*$.²⁹ In the case where there is no reduction in the debt-to-non-oil GDP ratio ($\underline{b} = 0$) and non-oil GDP and population grow at a same rate ($g = \eta$), the country could generate a constant non-oil primary deficit ratio equal to the oil-based income transfer ratio ($f = - y_{o_t}^*$).

C. Application to Gabon

Fiscal prospects with no policy change. Gabon's current non-oil financial position is negative and consists mainly of the domestic and external debt, representing about 132 percent of non-oil GDP at end-2002 (76½ percent of GDP).³⁰ During 2003-33, oil production is assumed to

²⁸ Chalk (1998) uses the term "core deficit."

²⁹ See for example Baunsgaard (2003) in the context of a financial framework which determines the non-oil deficit preserving the oil wealth but does not deal with debt reduction. *In such a framework, the oil-based income transfer equals the return on total wealth.*

³⁰ Net foreign assets of the central bank are not included in the government's net position, given their past volatility and their current low level (negative during 1998, 1999, and 2001, and only
(continued...)

decline on average by 6 percent annually ($e = -0.06$), and existing oil reserves are assumed to be virtually depleted by 2032.³¹ Non-oil GDP nominal growth (g) is projected at 5 percent, based on deep structural reforms aimed at non-oil economic diversification.³² In the same period, the assumption is that oil prices remain unchanged in nominal terms (or $\lambda=0$) at the average world price for 2002 of US\$25.2 per barrel, but still above the average price recorded during 1979–2002 (US\$22.3 per barrel), and medium-term projections in the September 2003 WEO (US\$21–25 per barrel).³³ Assuming a long-term market nominal interest rate (r) of 6 percent, the oil wealth Vo_t (or discounted oil revenue) is estimated at 268 percent of non-oil GDP (156 percent of GDP) at end-2002, and is projected to decline continuously in the future and to disappear practically after year 2032 following the virtual exhaustion of oil reserves. The total net wealth position at end-2002 is estimated at about 136 percent of non-oil GDP (Table 3).

The baseline projections in Table 3 indicate that, even though fiscal policy has been strengthened in recent years so as to significantly reduce the non-oil primary deficit, the latter still represents almost 17 percent of non-oil GDP in 2002. If current policies were to continue—that is, maintaining the deficit in terms of non-oil GDP—the net wealth position of the government would become increasingly negative from year 2010 onward, reaching 469 percent of non-oil GDP by year 2033, corresponding to the debt ratio. A strong adjustment in the non-oil primary balance would be needed to avoid such a deterioration in the government's net wealth position, indicating that current fiscal policy is unsustainable.

1.3 percent of GDP in 2002). Similarly, privatization proceeds were not included, with past experience indicating that they have barely covered restructuring costs.

³¹ In the absence of new oil discoveries, oil production would fall to below 2 million tons in year 2033. A constant reduction in oil production of 6 percent implies a current stock of exploitable reserves of less than 2 billion barrels (or 274 million tons, based on the generally accepted conversion ratio of 7.3 barrels per ton).

³² Assuming an inflation rate of 1½ percent (consistent with the inflation in the euro area), the real GDP growth per capita would be about 1 percent.

³³ It is assumed that the best estimate of future prices is the current price ($E_t P_{t+j} = P_t$). According to Engel and Valdés (2000), most prices changes are transitory. This implies, *ceteris paribus*, a decline in the real oil prices over the long run. With an annual decline of 1 percent (or $\lambda=-1$), nominal oil prices would drop to US\$20 a barrel by 2025 and fall thereafter into the range of \$16–20 a barrel for long-term oil prices in the August 2003 WEO (IMF, 2003a). Such unfavorable developments in oil prices would not alter fundamentally the results of this paper.

Fund for Future Generations under no policy change. The government could save part of its oil revenue so as to compensate for the future depletion of oil reserves. This could be achieved through Gabon's Fund for Future Generations (FFG), legally created in 1998.³⁴ Its statutes state that 10 percent of the budgeted oil revenue is to be transferred to the FFG until a minimum capital of CFAF 500 billion (about 25 percent of the 2002 non-oil GDP) is attained. Such an arrangement would be an improvement (Table 3, second panel). However, the simulations at an interest rate of 6 percent show that the amounts to be set aside under the FFG statutes would not allow a replacement of oil revenue in later years. With the FFG attaining only 30½ percent of non-oil GDP by 2033, the stock of debt would continue to increase, and the net wealth position would reach -469 percent of non-oil GDP by year 2033, as under the baseline scenario. To avoid such a deterioration in net wealth, considerably larger fiscal adjustment would be needed.

The results are sensitive to the assumptions on various parameters, notably on the return on the FFG resources.³⁵ For example, with a nominal return of 10 percent, the *FFG* position and the total net wealth would be about 44 percentage points of non-oil GDP higher than for a return of 6 percent by year 2033. Therefore, it is important to maximize the return on FFG resources, since it would not make much sense to keep poorly remunerated funds when the country continues to face challenging development needs and high interest rates on its debt. However, even with a high remuneration of the current fund, Table 3 shows that, with the serious deterioration in total net wealth, fiscal policy would continue to be unsustainable.

³⁴ For a comprehensive discussion on the establishment and the use of savings funds for nonrenewable resources, see Davis and others (2001) and Liuksila, Garcia, and Bassett (1994). These authors find that the constitution of savings funds is not a panacea since it has not been successful in disconnecting expenditure decisions from oil revenue developments. To be useful, the FFG will have to be coupled with the implementation of a credible fiscal policy, notably based on clear targets for the non-oil primary balance. In other words, FFG resources should be saved effectively and should not interfere with the conduct of fiscal policy. Liuksila, Garcia, and Bassett (1994) show how oil contingency mechanism funds established by Venezuela had limited success, partially owing to pressing expenditure needs and to the diversion of resources. Davis and others (2001) provide an exhaustive discussion on the necessary conditions for successful savings funds. There is an urgent need for the CEMAC to put in place the proper management safeguards for oil funds established by its member countries.

³⁵ A slower decline in oil production or higher oil prices would improve Gabon's financial prospects; however, they would not fundamentally change the thrust of the analysis.

Table 3. Gabon: Analysis of Fiscal and Debt Sustainability, 2002–33
(In percent of non-oil GDP, unless otherwise indicated)

	2002	2005	2010	2015	2020	2025	2030	2033
Non-oil GDP in billions of CFA francs	2,005.9	2,322.1	2,963.6	3,782.4	4,827.5	6,161.2	7,863.4	9,102.9
Oil production, in millions of tons	12.6	10.4	7.7	5.6	4.1	3.0	2.2	1.8
Debt, with no policy change	-131.8	-112.7	-123.5	-169.1	-236.7	-319.8	-416.2	-477.6
Non-oil primary balance	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9
Oil revenue	30.4	21.8	12.5	7.2	4.1	1.5	0.8	0.5
Overall primary balance	13.5	4.9	-4.4	-9.7	-12.8	-15.4	-16.1	-16.4
Market nominal interest rate (percent)	6.0							
Non-oil GDP nominal growth (percent)	5.0							
Number of years before oil reserve depletion	30.0	27.0	22.0	17.0	12.0	7.0	2.0	0.0
Oil price changes (percent)	0.0							
Oil production growth (percent)	-6.0							
Oil wealth (discounted oil revenue)	268.2	192.4	110.6	63.6	36.6	21.0	12.1	8.7
Total asset (without policy change)	136.4	79.7	-12.8	-105.5	-200.1	-298.8	-404.1	-468.9
With the constitution of the FFG 1/								
Non-oil primary balance	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9
Primary balance, excluding the FFG	13.5	2.7	-5.6	-10.4	-13.2	-15.6	-16.2	-16.4
Oil revenue	30.4	21.8	12.5	7.2	4.1	1.5	0.8	0.5
Annual allocation to the budget	30.4	19.6	11.3	6.5	3.7	1.3	0.7	0.5
Annual allocation to the FFG	0.0	2.2	1.3	0.7	0.4	0.1	0.1	0.1
FFG position	0.0	7.4	15.8	21.3	25.0	27.6	29.5	30.5
Debt	-131.8	-120.1	-139.3	-190.4	-261.6	-347.4	-445.7	-508.1
Oil wealth (discounted oil revenue)	268.2	192.4	110.6	63.6	36.6	21.0	12.1	8.7
Total assets	136.4	79.7	-12.8	-105.5	-200.1	-298.8	-404.1	-468.9
Sensitivity to the FFG return								
FFG return (percent)	2.0							
Oil wealth (discounted oil revenue)	268.2	192.4	110.6	63.6	36.6	21.0	12.1	8.7
FFG position	0.0	7.1	13.6	16.0	16.3	15.4	13.8	12.8
Debt	-131.8	-120.1	-139.3	-190.4	-261.6	-347.4	-445.7	-508.1
Total assets	136.4	79.4	-15.1	-110.7	-208.8	-311.0	-419.8	-486.6
FFG return (percent)	8.0							
Oil wealth (discounted oil revenue)	268.2	192.4	110.6	63.6	36.6	21.0	12.1	8.7
FFG position	0.0	7.6	17.1	24.6	31.1	37.3	43.5	47.5
Debt	-131.8	-120.1	-139.3	-190.4	-261.6	-347.4	-445.7	-508.1
Total assets	136.4	79.9	-11.5	-102.2	-194.0	-289.1	-390.1	-451.9
FFG return (percent)	10.0							
Oil wealth (discounted oil revenue)	268.2	192.4	110.6	63.6	36.6	21.0	12.1	8.7
FFG position	0.0	7.7	18.5	28.4	38.8	50.5	64.3	74.1
Debt	-131.8	-120.1	-139.3	-190.4	-261.6	-347.4	-445.7	-508.1
Total assets	136.4	80.0	-10.1	-98.3	-186.3	-275.9	-369.3	-425.3

Source: Staff estimates and projections

1/ Each year, 10 percent of oil revenue is allocated to the FFG and invested at a rate of 6 percent.

Possible scenario for a sustainable fiscal path. The following forward-looking scenario, based on the discussion above on fiscal sustainability and intergenerational equity, incorporates an equitable distribution of oil wealth across generations (namely, keeping the oil-based income transfers constant per capita across generations), as developed in equations (7-11).³⁶ Simulations of a sustainable path for the non-oil primary balance, the net transfers from the FFG, and the overall primary balance (and, hence, the change in the financial wealth) were conducted under the following assumptions: (i) a nominal growth rate of non-oil GDP of 5 percent; (ii) a population growth rate of 2.4 percent, equal to the growth rate of the oil-based income transfers; (iii) a nominal interest rate on public debt of 6 percent; (iv) a nominal return on FFG resources equal to nominal interest rate on public debt; and (v) a target for the debt-to-non-oil GDP ratio of 20 percent to be reached by year 2033.

Although the 20 percent target for the debt-to-non-oil GDP ratio is somewhat arbitrary, it is a reasonable indicator of Gabon's long-term fiscal consolidation.³⁷ Sustainable debt levels are usually estimated by discounting future primary balances, as in equation (3a), based on the extrapolation of primary balances recorded in the past (IMF, 2003b). However, as discussed above, this method is not appropriate for countries dependent on exhaustible resources. In view of the projected decline in government revenue, the issue of debt intolerance stressed by Reinhart, Rogoff, and Savastano (2003) needs to be considered, including the possibility that the government could lose credibility and access to financing if the level of debt is perceived as too high by potential lenders. Past primary balances (when the entire oil revenue was transferred to the budget) are not a good measure of Gabon's capacity to borrow in the post-oil era, given the projected decline of oil revenue. Accordingly, a measure for the "sustainable" primary balance b^* was constructed, based on the long-term oil revenue projected over the period 2000–33. The long-term oil revenue, which should have been transferred to the budget, represents

³⁶ Oil-based income transfers are constant in per capita terms, that is, they grow over time at the same rate as population growth. They could be constant relative to non-oil GDP if population were to grow at the same rate as non-oil GDP.

³⁷ Ceilings for the debt-to-GDP ratio vary across countries (30 percent in New Zealand, 40 percent in Canada and Ecuador, 60 percent under the Maastricht treaty, and 70 percent within the CEMAC). Patillo, Poirson, and Ricci (2002) find that the average impact of external debt on per capita growth is negative for countries with a debt-to-GDP ratio above 35-40 percent. The impact could be as high for countries with low debt-to-GDP ratios but with a heavy debt-service burden, as Gabon. Clements and others (2003) find that debt stocks with net present values over 20-25 percent of GDP depress economic growth in low-income countries. This paper's analysis suggests that the CEMAC convergence criteria related to debt and the primary balance should be based on the debt-to-non-oil GDP ratio and the non-oil primary balance, respectively.

only 42 percent of the oil revenue during the period 2000–02. On this basis, Gabon’s “sustainable” debt level d^* was estimated based on the average primary balance b^* (average non-oil primary balance, f , plus the assumed long-term oil revenue) during 2000–02, the average implicit interest rate on the existing debt, r , and the average growth for the non-oil GDP, g .³⁸ The maximum debt limit that the country could sustain amounts to some 21 percent of non-oil GDP, which is close to the proposed target.³⁹

According to equation (11a), the debt reduction objective would entail primary surpluses equivalent to 4.4 percent of non-oil GDP during the period 2003–33 (Table 4). The oil-based income transfer is calculated from equations (9d–e) above at about 8⅔ percent of non-oil GDP in 2003 (some US\$200 per capita, about 30 percent of projected oil revenue in 2003). Given that non-oil GDP is assumed to grow faster than the population, the non-oil GDP ratio of oil-based transfers will decline gradually over time to some 4 percent by year 2033. As a result, the sustainable fiscal path implies that the non-oil primary deficit would have to decline gradually from about 4 percent of non-oil GDP in 2003 to around zero around year 2031. After 2033, the fiscal effort required to sustain a much lower non-oil GDP debt ratio (20 percent at end-2033) would be reduced (a primary surplus of 0.2 percent of non-oil GDP), and the country could run non-oil deficits financed by the oil-based income transfers.

During the first five years of this scenario, transfers to the FFG would represent over half of oil revenue; from 2008 onward, the bulk of the decreasing oil revenue would be transferred to the budget to finance non-oil primary deficits. Initially, the projected non-oil primary deficits would be financed by oil revenue allocated directly to the budget and, from 2017 onward, by transfers from the FFG. As shown in Figure 2 and Table 4, such a strategy would allow a reduction in the debt-to-non-oil GDP ratio while helping in reconstituting the initial net wealth position.

The debt would be reduced from 132 percent of non-oil GDP at end-2002 to below 70 percent (one of the five CEMAC’s convergence criteria) by the year 2021, well before the projected

³⁸ The limit for the debt-to-GDP ratio d^* is estimated according to the following formula: $d^* = b^*(1+g)/(r-g)$. The assumed oil transfer to the budget (about 42 percent of current oil revenue in 2000–02) represents 15.4 percent of non-oil GDP; with an average non-oil primary deficit of 14.5 percent of non-oil GDP during 2000–02, the “sustainable primary balance b^* ” amounts to 0.9 percent of non-oil GDP; r and g averaged about 8.5 percent and 4.0 percent, respectively. This low “sustainable” debt ratio is consistent with the finding in IMF (2003b) that countries with low and variable revenue will generally sustain lower public debt levels.

³⁹ This threshold is in the range of intermediate debt-to-GDP ratios (19 percent to 49.7 percent of GDP) considered by Manasse, Roubini and Schimmelpfennig (2003). The authors suggest that even countries with such relatively low ratios face default risks, especially those who have potentially serious liquidity problems, face political uncertainty, and have a history of pegged exchange rates. Gabon shares a number of these characteristics.

depletion of oil reserves.⁴⁰ The FFG position would be at about US\$9 billion by 2025 and reach almost US\$11 billion in 2033 (or 83 percent of non-oil GDP).⁴¹ Total net wealth would increase to some US\$ 6 billion by 2025 and to over US\$ 9 billion by year 2033.

Table 4. Gabon: A Path for the Sustainable Replacement of Oil Resources, 2002-33 1/

	2002 Est.	2005	2010	2015	2020	2025	2030	2033
		Proj.						
Policy variables								
		(In percent of non-oil GDP)						
Oil revenue	30.4	21.8	12.5	7.2	4.1	2.4	1.4	1.0
Primary balance (\underline{b} for $a_{t+n}=20\%$)	13.5	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Oil transfers (yo^*_t from 2003)	30.4	8.4	7.5	6.6	5.8	5.1	4.5	4.2
Direct budgetary allocations	30.4	8.4	7.5	6.6	0.0	0.0	0.0	0.0
Transfers from the FFG	0.0	0.0	0.0	0.0	5.8	5.1	4.5	4.2
Non-oil primary balance (f_t)	-16.9	-4.1	-3.1	-2.2	-1.4	-0.7	-0.1	0.2
Outcomes								
Total debt (a_t)	-131.8	-122.3	-106.0	-88.9	-70.9	-52.1	-32.3	-20.0
FFG position (ffg_t)	0.0	47.8	90.9	106.5	107.3	100.5	89.9	82.9
Oil wealth (vo_t)	268.2	192.4	110.6	63.6	36.6	21.0	12.1	8.7
Total net wealth (w_t)	136.4	117.9	95.6	81.3	73.0	69.4	69.7	71.6
		(In millions of U.S. dollars)						
Total debt	-3,801	-4,085	-4,517	-4,833	-4,921	-4,612	-3,653	-2,618
FFG position	0	1,596	3,876	5,795	7,450	8,900	10,171	10,849
Oil wealth	7,736	6,425	4,716	3,461	2,540	1,864	1,368	1,136
Total net wealth	3,935	3,937	4,075	4,423	5,069	6,152	7,886	9,367

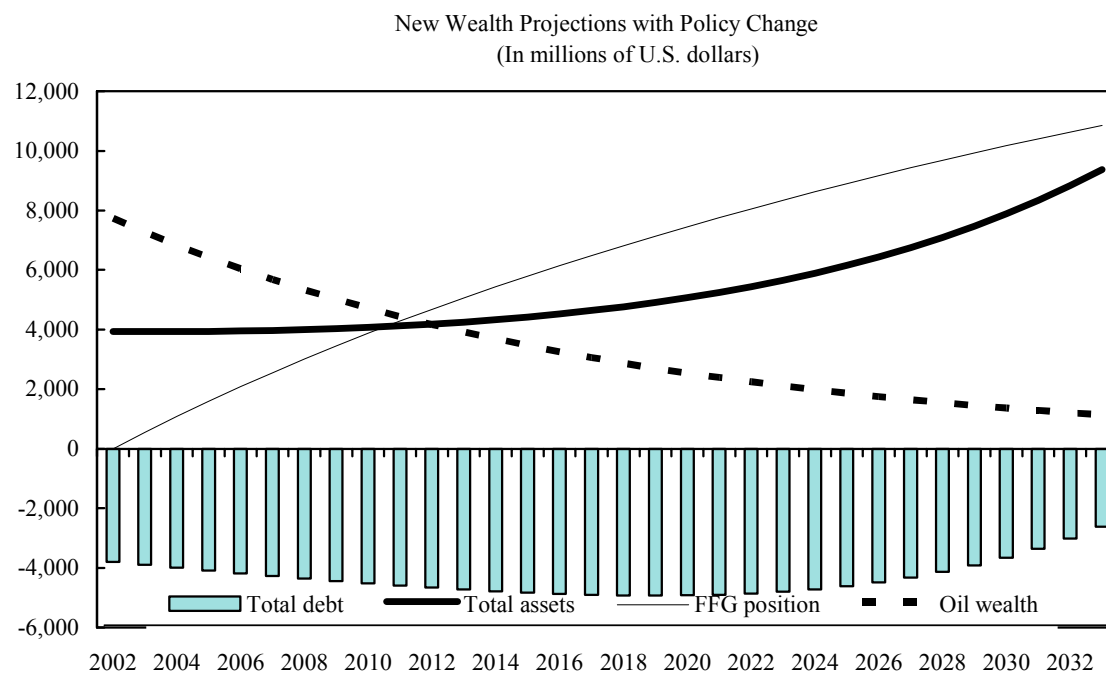
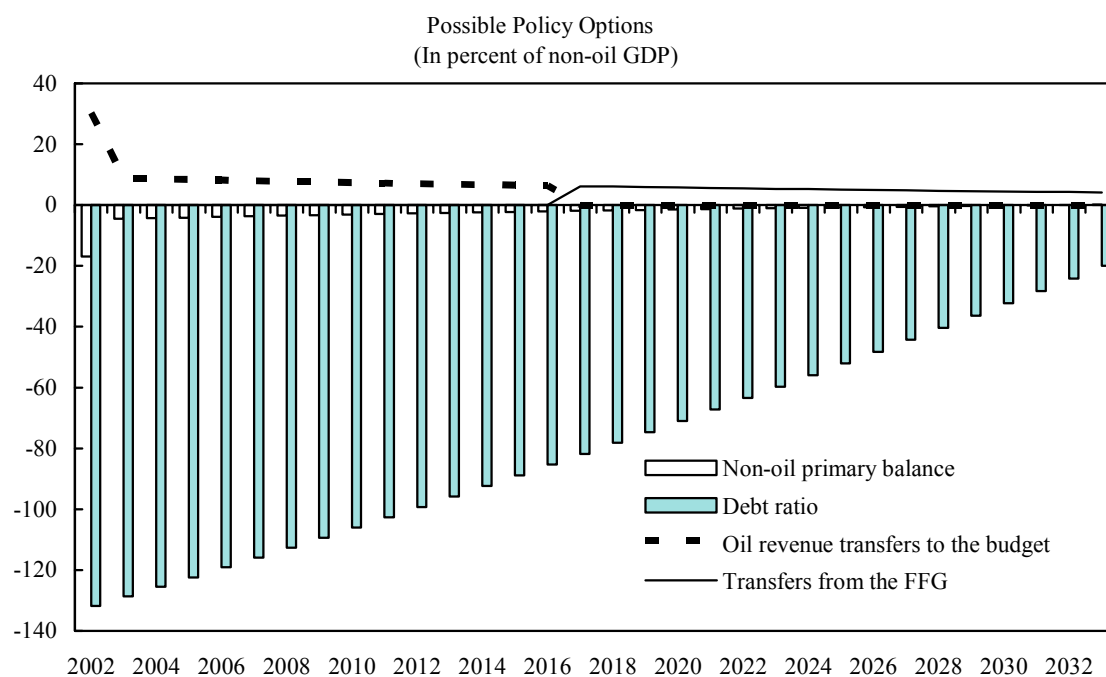
Source: Staff estimates and projections.

1/ Assuming $\lambda=0$; $e=-6\%$; $r=6\%$; $\rho=6\%$; $g=5\%$; $a_{t+n}=20\%$; and $\eta=2.4\%$.

⁴⁰ Given the short maturities that characterize Gabon's debt, a primary surplus of 4.4 percent of non-oil GDP might not be sufficient to service the debt obligations in the medium term. Debt relief from external creditors could help spread debt repayment over a longer period. In the absence of such assistance, a more ambitious objective for debt reduction and primary balance would be required in the early years. Similarly, if the FFG return were to fall well below the interest paid on public debt, a faster debt repayment (maintaining total net wealth unchanged) should be considered.

⁴¹ A higher return on FFG resources would produce better results. For example, with a nominal return of 8 percent, the FFG position would reach 159 percent of non-oil GDP by year 2033, which would lead to a faster reproduction of the initial oil wealth (268 percent). The net wealth would reach 148 percent of non-oil GDP (compared with the current level of 136 percent).

Figure 2. Gabon: Possible Policy Options and Fiscal Sustainability, 2002–33



Source: Staff estimates and projections.

Sensitivity analysis. In view of the inherently uncertain nature of the model, in particular associated with the volatility of oil prices, stochastic simulations would better help policymakers judge the associated risks. Accordingly, the path for the non-oil primary balance proposed under the current framework should be seen as a minimum policy objective.⁴² Nevertheless, alternative scenarios based on less favorable developments in a number of key variables suggest that the findings under the baseline scenario would not be fundamentally altered. For instance, lower oil prices and production would necessitate a higher non-oil primary balance, while the position of the FFG and net wealth would be lower than projected. However, although the results are sensitive to the various assumptions (oil wealth is particularly sensitive to developments in oil production and prices), the thrust of the analysis is not altered significantly; with an annual decline of 1 percent in nominal oil prices, oil-based transfers would be reduced by about ½ of 1 percent of non-oil GDP, while the positions of the FFG (which would require an equivalent adjustment in the non-oil primary balance) and net wealth would be lower by 7–8 percentage points of non-oil GDP. Appendix I shows that less favorable conditions with regard to non-oil GDP growth and FFG return would not change fundamentally the thrust of the analysis. Appendix II also indicates that, under a scenario with a less ambitious debt-reduction target, the results would not fundamentally differ from those under the baseline scenario.

Preservation of total wealth. The preservation of the government's total wealth as a definition of fiscal sustainability could be unduly contractionary in the short to medium term. Maintaining the current total of government total wealth would imply an instantaneous replacement of declining oil wealth (as a share of non-oil GDP) with an increase in net financial assets (as a share of non-oil GDP), which might be unrealistic in practice. Using equations 7a-7d, and assuming the ratio of total net wealth to non-oil GDP w_t unchanged ($\Delta w_t = 0$), the implicit non-oil primary balance (as a ratio to GDP) is given by

$$f_{t+1} = -(a_t + v_{ot})(r-g)/(1+g) - ffg_t(\rho-g)/(1+g) + t_{ot}(1+r)/(1+g) - t_{ot+1}, \quad (12)$$

where t_o is the ratio of oil revenue to non-oil GDP. As in Barnett and Ossowski (2002) and Baunsgaard (2003), equation (12) states that the non-oil primary balance should equal the return

⁴² Barnett and Ossowski (2002) argue that, under risk aversion, the volatility of oil prices calls for higher precautionary savings. Tersman (1991) cautions that given the uncertainty on developments in oil prices and interest rates, government consumption should be constantly re-examined and suggests precautionary savings and increased wealth diversification. Barnhill and Kopits (2003) propose the use of the *value-at-risk* approach (used to assess financial institution risks) to analyze the risks associated to government financial operations as a way of assessing fiscal sustainability under uncertainty in emerging market economies, in particular those endowed with nonrenewable resources. They use a stochastic framework to simulate the risk-adjusted net worth for Ecuador. The framework is however limited by the fact that the risk is estimated from past time-series, which might not be replicated in the future.

(adjusted for non-oil GDP growth) on the oil wealth (v_{ot}) and net financial assets (including interests paid on the debt a_t and earned on the Fund for Future Generations ffg_t).

Simulations (Table 5a) show that, with the proposed path for the FFG, maintaining the total net wealth unchanged would require the constitution of non-oil primary budgetary surpluses in the medium term (declining from 2.2 percent of non-oil GDP in 2003 to 0.1 percent in 2011), followed by non-oil primary deficits in later years (increasing from 0.02 percent of non-oil GDP in 2012 to 1.2 percent by 2033). These deficits would be financed by the income on the substantial financial assets accumulated in earlier years. Under this framework, the debt could be paid off by around 2021. Such a policy could, however, be unduly contractionary in the face of the strong demand for the development of basic economic and social infrastructure.⁴³

The high fiscal adjustment required under this scenario reflects essentially the need to keep the ratio of net wealth to non-oil GDP unchanged in the face of a growing non-oil economy. If the objective were to preserve absolute net wealth, the adjustment effort would be less significant. Net wealth as a ratio of non-oil GDP would, however, deteriorate. The preservation of absolute net wealth at about US\$3.9 billion would entail non-oil primary deficits ranging between US\$130 million in 2003 to US\$220 million in 2033 (Table 5b). Relative to the non-oil GDP, the non-oil primary deficit would decline over time from 4.3 percent in 2003 to 1.7 percent in 2033. As a ratio of non-oil GDP, total net wealth would deteriorate from 130 percent in 2003 to only 30 percent by 2033. Such a policy would clearly be unsustainable, as it would not allow future generations equitable consumption possibilities (in terms of non-oil GDP).

Table 5a. Gabon: Preservation of the Ratio of Net Wealth to Non-Oil GDP, 2002-33

	2002 Est.	2005	2010	2015	2020	2025	2030	2033
		Proj.						
		(In percent of non-oil GDP)						
Oil wealth	268.2	192.4	110.6	63.6	36.6	21.0	12.1	8.7
Non-oil financial assets	-131.8	-56.0	25.8	72.8	99.8	115.4	124.3	127.7
Of which: debt	-131.8	-103.8	-65.2	-33.7	-7.5	0.0	0.0	0.0
Total net wealth	136.4	136.4	136.4	136.4	136.4	136.4	136.4	136.4
Memorandum items:								
Non-oil primary balance	-16.9	1.5	0.3	-0.4	-0.8	-1.0	-1.1	-1.2
Change in oil wealth	-12.73	-22.5	-12.9	-7.4	-4.3	-2.5	-1.4	-1.0
Change in financial wealth	1.0	22.5	12.9	7.4	4.3	2.5	1.4	1.0

⁴³ In particular, the 5 percent objective for non-oil GDP growth could be out of reach (assuming the unchanged productivity of capital).

Table 5b. Gabon: Preservation of Absolute Net Wealth, 2002-33

	2002 Est.	2005	2010	2015	2020 Proj.	2025	2030	2033
(In millions of U.S. dollars)								
Oil wealth	7,736	6,425	4,716	3,461	2,540	1,864	1,368	1,136
Non-oil financial assets	-3,801	-2,490	-780	475	1,395	2,071	2,567	2,799
<i>Of which: debt</i>	-3,801	-4,086	-4,656	-5,321	-6,055	-6,829	-7,604	-8,050
Total net wealth	3,935	3,935	3,935	3,935	3,935	3,935	3,935	3,935
Memorandum item:								
Non-oil primary balance 1/	-487	-143	-168	-186	-199	-209	-216	-220
(In percent of non-oil GDP)								
Oil wealth	268.2	192.4	110.6	63.6	36.6	21.0	12.1	8.7
Non-oil financial assets	-131.8	-74.6	-18.3	8.7	20.1	23.4	22.7	21.4
<i>Of which: debt</i>	-131.8	-122.4	-109.2	-97.8	-87.2	-77.1	-67.2	-61.5
Total net wealth	136.4	117.9	92.3	72.4	56.7	44.4	34.8	30.1
Memorandum item:								
Non-oil primary balance	-16.9	-4.3	-3.9	-3.4	-2.9	-2.4	-1.9	-1.7

Source: Staff estimates and projections.

1/ The non-oil primary balance that maintains the absolute total wealth corresponds to
 $F_{t+1} = -rA_t - \rho FFG_t - rV_{ot} + (1+r)T_{ot} - T_{ot+1}$.

IV. CONCLUSIONS AND POLICY IMPLICATIONS

Although traditional indicators suggest that since 1994 Gabon has made progress toward fiscal sustainability with a shift from past pro-cyclical policies, the fiscal situation remains fragile, particularly in the face of the expected decline in oil production. Forward-looking policies are needed to avoid drastic policy reversals when the oil resources come to depletion. The proposed framework would consist of a number of policy actions: (i) defining a debt reduction objective; (ii) targeting a non-oil primary deficit—which reflects the correct fiscal stance as it isolates expenditure decisions from developments in oil revenue, thereby ensuring long-term fiscal sustainability—compatible with the equitable intergenerational oil-based income transfer; and (iii) setting aside some oil revenue so as to enable future generations to benefit from the adequate provision of public goods, after the oil resources have been exhausted.

Simulations show how fiscal policy based on the non-oil primary balance and a constant oil-based income per capita across generations could help reduce the debt-to-non-oil GDP ratio to sustainable levels and preserve Gabon's net wealth over the long run. The immediate policy implications are that the authorities should pursue their efforts to consolidate public finances by improving non-oil revenue through a broadening of the tax base, by strengthening expenditure management and control, reducing non-priority spending (including reducing the wage bill to levels compatible to lower oil revenue), and by reorienting public spending in favor of basic infrastructure and social services, in line with the poverty reduction strategy. The ongoing effort to improve transparency and governance should result in an efficient management of public resources, so that more basic services can be rendered at reduced cost. Structural reforms should also be deepened to foster non-oil sector development and economic diversification.

The paper also finds that the level of oil revenue savings needed to ensure fiscal sustainability and intergenerational equity would be much higher than envisaged under the 1998 statutes of the FFG. The constitution of an appropriate savings fund could help insulate government spending from volatile oil revenue and allow a relatively smooth path for real exchange depreciation which is required to help replace declining oil resources by non-oil tradable production over time.

It is essential to ensure that FFG resources are managed in a transparent and efficient manner. In view of the limited domestic absorptive capacity and high spending pressures, FFG resources would be invested abroad with clear management objectives, with all FFG accounts being audited and published on a regular basis. Given the short maturity of Gabon's debt, the debt repayment period might not correspond to the contractual amortization schedule, which could require some debt relief so as to lengthen the repayment period. Also, in view of the unfavorable social indicators, with the improvement in expenditure effectiveness, the authorities would have to strike a delicate balance between meeting the existing basic development needs and setting aside savings for future generations.

The fact that the framework does not take into account uncertainty associated with the projection of some key variables constitutes a shortcoming, even though alternative scenarios based on less favorable developments in these variables suggest that the findings under the baseline scenario would not be fundamentally altered. Moreover, the results of the paper depend heavily on the government's commitment to good governance, including the sound and transparent management of the resources of the Fund for Future Generations.

REFERENCES

- Alier, Max and Martin Kaufman, 1999, "Nonrenewable Resources: A Case for Persistent Fiscal Surpluses," IMF Working Paper 99/44 (Washington: International Monetary Fund).
- Barnhill, Theodore M., and George Kopits, 2003, "Assessing Fiscal Sustainability Under Uncertainty," IMF Working Paper 03/79 (Washington: International Monetary Fund).
- Barnett, Steven and Rolando Ossowski, 2002, "Operational Aspects of Fiscal Policy in Oil-Producing Countries," IMF Working Paper 02/177 (Washington: International Monetary Fund).
- Barro Chambrier, A.H., 1990, "L'Economie du Gabon: Analyse des politiques d'ajustement et d'adaptation," *Economica*.
- Baunsgaard, Thomas, 2003, "Fiscal Policy in Nigeria: Any Role for Rules?" IMF Working Paper 03/155 (Washington: International Monetary Fund).
- Blanchard, Olivier, Jean-Claude Chouraqui, Robert P. Hagemann, and Nicola Sartor, 1990, "The Sustainability of Fiscal Policy: New Answers to an Old Question," *OECD Economic Studies*, Vol. 15 (Autumn), pp. 7–36.
- Buiter, Willem H., 1997, "Aspects of Fiscal Performance in Some Transition Economies Under Fund-Supported Programs," IMF Working Paper 97/31 (Washington: International Monetary Fund).
- Chalk, Nigel, 1998, "Fiscal Sustainability with Non-Renewable Resources," IMF Working Paper 98/26 (Washington: International Monetary Fund).
- Clements, Benedict, Rina Bhattacharya, and Toan Quoc Nguyen, 2003, "External Debt, Public Investment, and Growth in Low-Income Countries," IMF Working Paper 03/249 (Washington: International Monetary Fund).
- Croce, Enzo and V. Hugo Juan-Ramón, 2003, "Assessing Fiscal Sustainability: A Cross-Country Comparison," IMF Working Paper 03/145 (Washington: International Monetary Fund).
- Davis, Jeffrey M., Rolando Ossowski, James Daniel, and Steven Barnett, 2001, *Stabilization and Savings Funds for Nonrenewable Resources—Experience and Fiscal Policy Implications*, IMF Occasional Paper No. 205 (Washington: International Monetary Fund).
- Engel, Edouardo, and Rodrigo Valdés, 2000, "Optimal Fiscal Strategy for Oil Exporting Countries," IMF Working Paper 00/118 (Washington: International Monetary Fund).

- Fasano, Ugo and Qing Wang, 2002, "Testing the Relationship Between Government Spending and Revenue: Evidence from GCC Countries," IMF Working Paper 02/201 (Washington: International Monetary Fund).
- Gerson, Philip, 1998, "The Impact of Fiscal Policy Variables on Output Growth," IMF Working Paper 98/1 (Washington: International Monetary Fund).
- Horne, Jocelyn, 1991, "Indicators of Fiscal Sustainability," IMF Working Paper 91/5 (Washington: International Monetary Fund).
- Hotelling, Harold, 1931, "The Economics of Exhaustible Resources," *Journal of Political Economy*, Vol. 39 (April), pp. 137–75.
- International Monetary Fund, 2002, "Gabon: Selected Issues and Statistical Appendix," IMF Country Report No. 02/94 (Washington: International Monetary Fund).
- International Monetary Fund, 2003a, "Longer-Term Prospects for Oil Prices," *World Economic Outlook*, Appendix 1.1 (Washington: International Monetary Fund).
- International Monetary Fund, 2003b, "Public Debt in Emerging Markets: Is It too High?," *World Economic Outlook*, Chapter III (Washington: International Monetary Fund).
- Liuksila, Claire, Alejandro Garcia, and Sheila Bassett 1994, "Fiscal Policy Sustainability in Oil-Producing Countries," IMF Working Paper 94/137 (Washington: International Monetary Fund).
- Loko, Boileau, Montfort Mlachila, Raj Nallari, and Kadima Kalonji, 2003, "The Impact of External Indebtedness on Poverty in Low-Income Countries," IMF Working Paper 03/61 (Washington: International Monetary Fund).
- Manasse, Paolo, Nouriel Roubini, and Axel Schimmelpfennig, 2003, "Predicting Sovereign Debt Crises," IMF Working Paper 03/221 (Washington: International Monetary Fund).
- Nuven, Diep, 1994, "Linkages in Price Level and Inflation Rate Between CFA Franc Zone Countries and France," IMF Working Paper 94/93 (Washington: International Monetary Fund).
- Odedokun, M. O., 1997, "Dynamics of Inflation In Sub-Saharan Africa: The Role of Foreign Inflation, Official and Parallel Market Exchange Rates, and Monetary Growth," *Applied Financial Economics*, Vol. 7 (August), pp. 395-402.
- Patillo, Catherine, Hélène Poirson, and Luca Ricci, 2002, "External Debt and Growth," IMF Working Paper 02/69 (Washington: International Monetary Fund).

Reinhart, Carmen M., Kenneth S. Rogoff, and Miguel A. Savastano, 2003, “Debt Intolerance,” NBER Working Paper 9908 (Cambridge, Massachusetts: National Bureau of Economic Research).

Sala-i-Martin, Xavier, and Arvind Subramanian, 2003, “Addressing the Natural Resource Curse: An Illustration from Nigeria,” IMF Working Paper 03/139 (Washington: International Monetary Fund).

Söderling, L., 2002, “Escaping the Curse of Oil? The Case of Gabon,” IMF Working Paper 02/93 (Washington: International Monetary Fund).

Tersman, Gunnar, 1991, “Oil, National Wealth and Current and Future Consumption Possibilities,” IMF Working Paper 91/60 (Washington: International Monetary Fund).

Zee, Howell H., 1998, “The Sustainability and Optimality of Government Debt,” *Staff Papers*, International Monetary Fund, Vol. 35 (December), pp. 658–85.

Appendix I: Alternative Path Under Lower Growth and FFG Return

This appendix presents in Table A and Figure A the results of a scenario under less favorable conditions: (i) a lower nominal growth rate of non-oil GDP (4 percent); and (ii) a nominal return on FFG resources of 5 percent (the current yield of a 30-year U.S. treasury bond), lower than the interest on public debt (both rates are equal under the baseline scenario). The target for the debt-to-non-oil GDP ratio remains unchanged at 20 percent (entailing however a higher reduction in the nominal debt, given the lower non-oil GDP growth) and the assumptions with regard to population growth (2.4 percent) and the nominal interest rate on public debt (6 percent) are the same as under the baseline scenario.

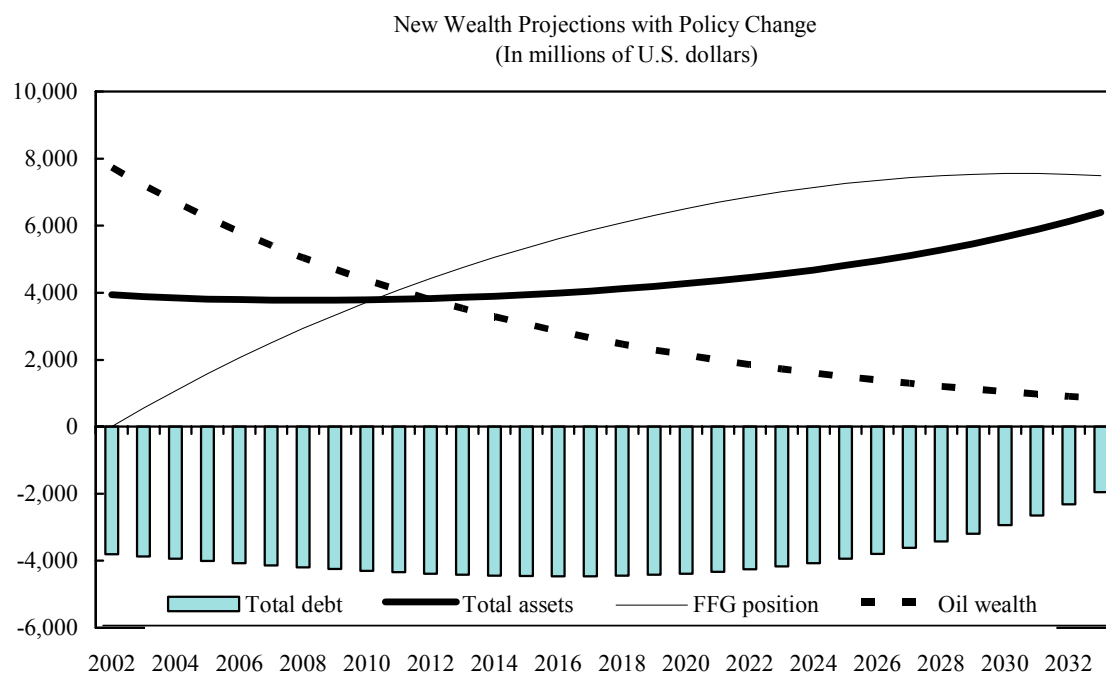
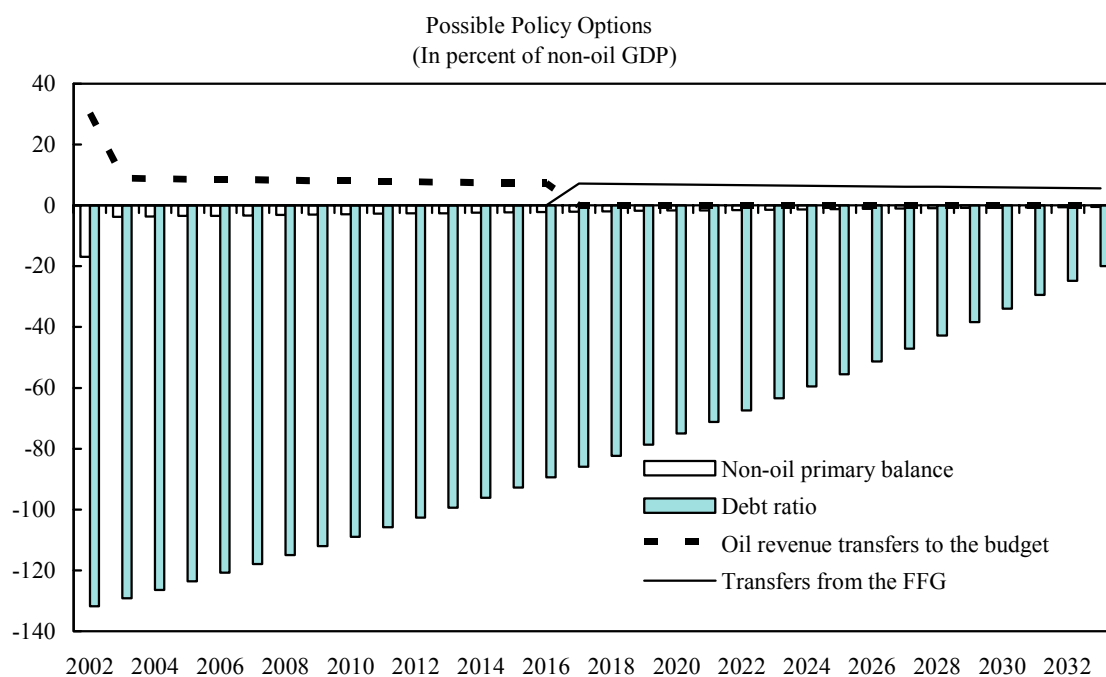
The results under this scenario are not fundamentally different from those under the baseline scenario. Given the unchanged target for the debt-to-non-oil GDP, the lower non-oil GDP growth would require a higher primary balance (by 0.8 percentage point of non-oil GDP). However, the oil-based income transfer would be higher and the difference would widen over time from 0.3 percent of non-oil GDP in 2005 to 1.4 percent by 2033. As a result, the non-oil primary deficit would be lower in early years, but would worsen in later years. In view of the lower FFG return, the FFG position and total net wealth in U.S. dollars terms would be lower in later years, but differences would be less significant in terms of non-oil GDP.

Table A. Gabon: Alternative Path Under Lower Growth and FFG Return, 2002-33 1/

	2002	2005	2010	2015	2020	2025	2030	2033
	Est.				Proj.			
Policy variables								
	(In percent of non-oil GDP)							
Oil revenue	30.4	22.4	13.5	8.2	4.9	3.0	1.8	1.3
Primary balance (\underline{b} for $a_{t+n}=20\%$)	13.5	5.2	5.2	5.2	5.2	5.2	5.2	5.2
Oil transfers (yo^*_t from 2003)	30.4	8.7	8.0	7.4	6.9	6.4	5.9	5.6
Direct budgetary allocations	30.4	8.7	8.0	7.4	0.0	0.0	0.0	0.0
Transfers from the FFG	0.0	0.0	0.0	0.0	6.9	6.4	5.9	5.6
Non-oil primary balance (f_t)	-16.9	-3.5	-2.8	-2.2	-1.7	-1.2	-0.7	-0.4
Outcomes								
Total debt (a_t)	-131.8	-123.6	-108.9	-92.7	-75.0	-55.4	-33.9	-20.0
FFG position (\hat{ffg}_t)	0.0	48.7	94.1	111.1	111.4	102.0	87.3	77.0
Oil wealth (vo_t)	268.2	192.4	110.6	63.6	36.6	21.0	12.1	8.7
Total net wealth (w_t)	136.4	117.5	95.9	82.0	73.0	67.7	65.5	65.7
	(In millions of U.S. dollars)							
Total debt	-3,801	-4,010	-4,299	-4,454	-4,381	-3,940	-2,934	-1,946
FFG position	0	1,580	3,716	5,336	6,509	7,255	7,552	7,489
Oil wealth	7,736	6,244	4,368	3,056	2,138	1,496	1,046	845
Total net wealth	3,935	3,813	3,785	3,938	4,266	4,810	5,665	6,388

1/ Assuming $\lambda=0$; $e=-6\%$; $r=6\%$; $\rho=5\%$; $g=4\%$; $a_{t+n}=20\%$; $\eta=2.4\%$.

Figure A. Gabon: Alternative Outcomes Under Lower Growth and FFG Return, 2002–33



Source: Staff estimates and projections.

Appendix II: Alternative Path Under Lower Debt Reduction

This appendix presents in Table B and Figure B the results of a scenario under less ambitious target for debt reduction. The debt-to-non-oil GDP ratio is assumed to decline from 132 percent of non-oil GDP to 30 percent by year 2033, instead of 20 percent contemplated under the baseline scenario. The other assumptions are unchanged.

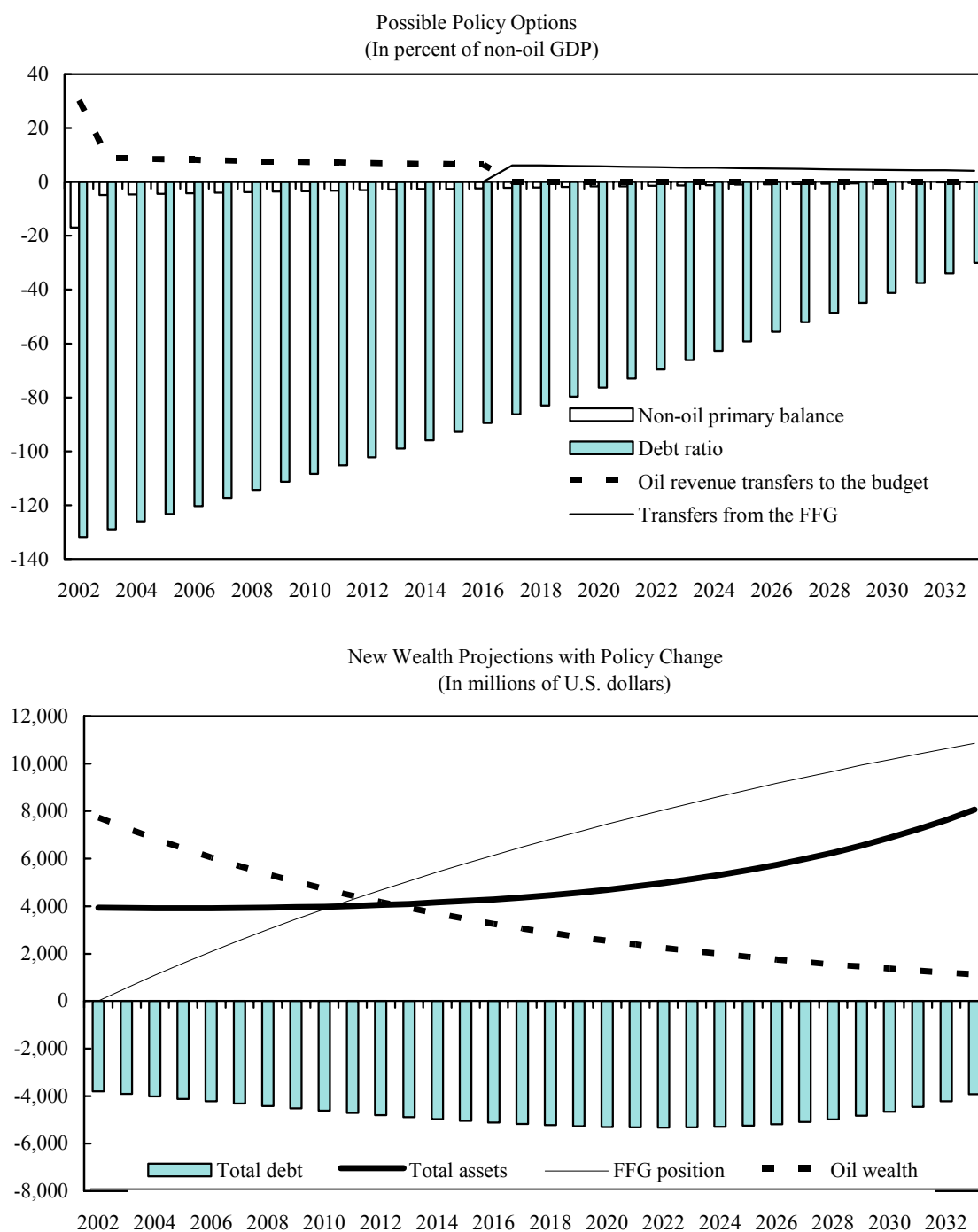
The results under this scenario are not fundamentally different from those under the baseline scenario. Given the lower target for the debt-to-non-oil GDP, the primary balance is lower by 0.3 percentage point of non-oil GDP. In view of the unchanged oil-based income transfer, the needed primary balance is lower, which is reflected in a lower non-oil primary balance (in deficit throughout the period). Although the debt ratio declines by 100 percentage points by 2033, the nominal debt level would remain broadly unchanged relative to 2002, reflecting the strong growth of non-oil GDP. Since the FFG position would be unchanged relative to the baseline scenario, total net wealth would be lower by 10 percentage points of non-oil GDP.

Table B. Gabon: Alternative Path Under Less Ambitious Debt Reduction Target, 2002-33 1/

	2002	2005	2010	2015	2020	2025	2030	2033
	Est.	Proj.						
Policy variables								
		(In percent of non-oil GDP)						
Oil revenue	30.4	21.8	12.5	7.2	4.1	2.4	1.4	1.0
Primary balance (\bar{b} for $a_{t+n}=30\%$)	13.5	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Oil transfers (yo^*_t from 2003)	30.4	8.4	7.5	6.6	5.8	5.1	4.5	4.2
Direct budgetary allocations	30.4	8.4	7.5	6.6	0.0	0.0	0.0	0.0
Transfers from the FFG	0.0	0.0	0.0	0.0	5.8	5.1	4.5	4.2
Non-oil primary balance (f_t)	-16.9	-4.4	-3.4	-2.5	-1.7	-1.0	-0.4	-0.1
Outcomes								
Total debt (a_t)	-131.8	-123.2	-108.3	-92.7	-76.3	-59.2	-41.2	-30.0
FFG position (ffg_t)	0.0	47.8	90.9	106.5	107.3	100.5	89.9	82.9
Oil wealth (vo_t)	268.2	192.4	110.6	63.6	36.6	21.0	12.1	8.7
Total net wealth (w_t)	136.4	117.1	93.3	77.5	67.6	62.3	60.8	61.6
		(In millions of U.S. dollars)						
Total debt	-3,801	-4,113	-4,615	-5,042	-5,299	-5,244	-4,659	-3,927
FFG position	0	1,596	3,876	5,795	7,450	8,900	10,171	10,849
Oil wealth	7,736	6,425	4,716	3,461	2,540	1,864	1,368	1,136
Total net wealth	3,935	3,909	3,976	4,215	4,691	5,520	6,880	8,058

1/ Assuming $\lambda=0$; $e=0$; $r=6\%$; $\rho=6\%$; $g=5\%$; $a_{t+n}=30\%$; and $\eta=2.4\%$.

Figure B. Gabon: Alternative Path Under Less Ambitious Debt Reduction Target, 2002–33



Source: Staff estimates and projections.