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Country Economic Memorandum

Getting Competitive, Staying Competitive:
The Challenge of Managing Kazakhstan's Oil Boom*

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Fiscal Policy and the Oil Windfall Management

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KAZAKHSTAN : FISCAL POLICY AND THE OIL WINDFALL MANAGEMENT

ABSTRACT

Kazakhstan is on the steeply increasing production profile curve as new fields such as Tengiz and Kashegan are still only in the initial phase of extraction with capacities increasing with the inflow of foreign direct investments from major international oil consortia. The experience of other resource rich countries has not been universally good and the potentials that these booms promised have not been realized. Balanced growth and successful development of the non-oil sector, therefore, will only ensue with a very careful macroeconomic and fiscal policy. This paper develops and applies a framework for designing an optimal fiscal strategy for an oil-rich economy, consistent with macroeconomic stability and with sustainable economic growth in the non-oil sector.

I. OIL RESERVES, EXTRACTION, AND REVENUES IN KAZAKHSTAN

Kazakhstan has crude oil reserves estimated at 30 billion barrels, corresponding to 2.5 percent of total proven world reserves. The economy is on the steeply increasing production profile curve as new fields such as Tengiz and Kashegan are still only in the initial phase of extraction with capacities increasing with the inflow of foreign direct investments from major international oil consortia. As most of increase of production would be exported, extraction rates are also strongly driven by the transport routes availability[1]. In spite of initial phase of extraction, even now the dependence on energy resources is very high, as the share of these resources in government revenues and exports is similar to that characteristic for other leading energy-based economies.

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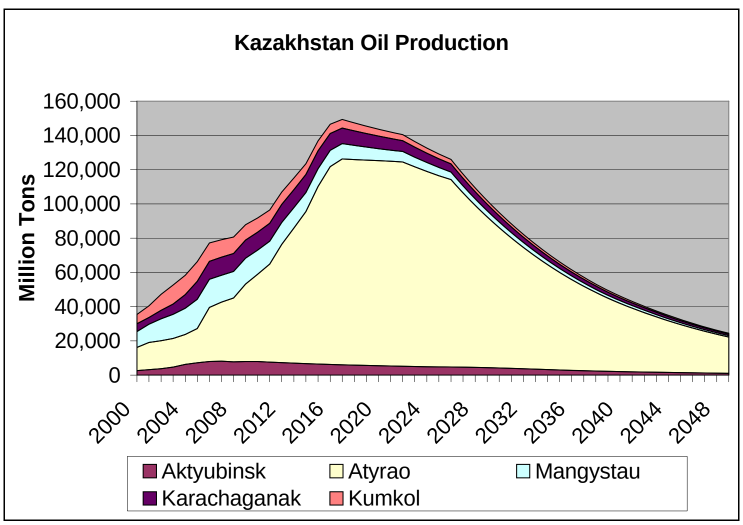
[1] Prior to 1997, exporters of Caspian region oil had only one major pipeline option available to them, the 240,000-bbl/d Atyrau-Samara pipeline from Kazakhstan to Russia. Smaller amounts of oil were exported by barge and by rail through Russia, as well as by a second, smaller pipeline from Kazakhstan to Russia. In the decade since the collapse of the Soviet Union, several new oil export pipelines, such as the Baku-Novorossiisk, the Tengiz-Novorossiisk, and the Baku-Supsa pipelines, have been constructed, and the Atyrau-Samara pipeline recently was upgraded to increase its capacity to 300,000 bbl/d. Nevertheless, the Caspian region's relative isolation from world markets, as well as the relative lack of export options, continues to hinder exports outside of the former Soviet republics. Of the 920,000 bbl/d exported from the region in 2001, only about 400,000 was exported to consumers outside of the former Soviet Union. The planned Baku-Ceyhan Main Export Pipeline to transport oil from Azerbaijan to Turkey and then to European consumers might change this situation considerably with the planned 1-million-bbl/d capacity. construction on the Turkish section of the pipeline began in June 2002. The entire pipeline is expected to be finished in late 2004, with the first tanker leaving Ceyhan in January 2005 (Energy Information Administration www.eia.com)

Table 1. Indicators of resource dependence

	Azerbaijan	Kazakhstan	Mexico	Iran	Norway
	2000	2000	1999	1999	1999
Oil and gas as percent of total exports	85.2	46.8	7.3	69.4	0.3
Oil and gas as percent of total government revenues	36.2	27.5	29.8	45.9	0.2
FDI in oil and gas as percent of total FDI	80.5	69.7	na	na	na

Source: EBRD (2001)

With production and exports expected to grow over the next decade, the need for increased accumulation of alternative forms of capital is pressing. In Kazakhstan known resources are substantial, with a projected peak at 150 million tons in 2017, an extended plateau with decline accelerating only after 2027, so that half of peak production is reached in 2033. Based on the existing proven reserves estimates, the natural resources are depleted in 2049.[2]

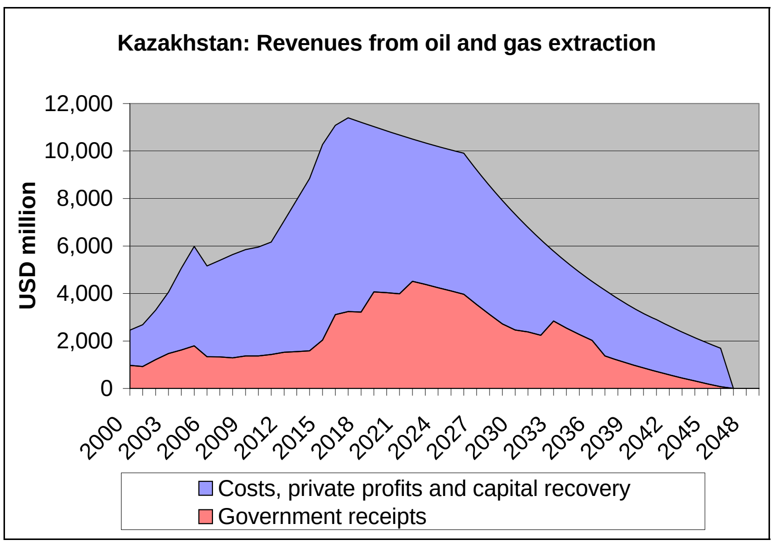


Source: World Bank

[2] These technical assessments are drawn from the participating oil companies' own estimates.

Oil and Gas Fiscal revenues are projected based on the estimated production volumes and prices[3], and taking into account the profit sharing agreements between the government and the foreign companies. In Kazakhstan government revenues consist of profit taxes, royalties, signature bonuses and share in oil production. Government revenues peak (again a few years after the peak in total oil sales) in 2022 at USD 4.5 billion or 26 percent of 2001 non-oil GDP. Projections of future government oil receipts allow, as it will be shown in theoretical part of this paper, evaluate the size of total oil wealth which is simply the discounted value of future oil receipts.

The net present value of the future oil wealth in Kazakhstan stands at USD 45 billion or 260% of non-oil GDP. Because of the sheer size of oil wealth as well as its time pattern - oil windfall is projected to last about five decades in Kazakhstan - **defining a fiscal strategy requires making a choice about inter-temporal allocation of the oil-related fiscal revenues.** To extend the time horizon and to properly address this issue, a national oil fund was created. The objective of this fund is to provide fiscal stabilization and promote conversion of oil assets into financial assets.



Source: World Bank

II. THE ROLE OF FISCAL POLICY

Because the revenues from the oil windfall will be largely concentrated in the public sector, there is an enormous role of the fiscal policy for the design of the medium term development strategy that aims at poverty reduction and non-oil sector development.

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[3] These projections are based on the assumption that the oil price will decline from US$28.3 per bbl in 2000 to US$22 per bbl. in 2003 and remain at US$18 per bbl after 2006 (prices are expressed in constant 2002 dollars).

What Should Be the Appropriate Fiscal Policy to Address the Following Challenges:

(i) The hump-shaped profile of the oil windfall and the need to reallocate oil-related fiscal revenue across generations

The oil boom in Kazakhstan is likely to last for about five decades. During this period, the economy will experience double-digit economic growth rates and a massive windfall with a concomitant fiscal gain. This fiscal gain may help to alleviate the widespread poverty, to contribute to growth and increase general standards of living. The gain, however, is a result of the depletion of country's oil and gas reserves. Long-term sustainability, therefore, requires that a part (or all) of the resource rents have to be re-invested to compensate for the natural resource depletion. In view of the hump-shaped profile of the oil windfall, designing a sustainable fiscal strategy would require **making a choice about the allocation of the oil revenue across generations.**

(ii) **This fiscal strategy needs to account for the negative impact of rapid oil spending on exchange rate and the non-oil sector growth and to insulate public expenditure from the uncertainty and volatility of the oil prices**

Although there maybe a case for more rapid oil spending to the benefit of the current (worst off) generation, **there may be a limited institutional and economic capacity to absorb rapid increases in government expenditures.** For example, a rapid spending of the oil windfall is likely to induce pressures towards real exchange rate appreciation, which may result in deteriorating economic competitiveness and may inhibit the non-oil sector development. Furthermore, there is a well documented evidence that a rapid oil windfall spending often results in waste of oil wealth through investing in unproductive activities and corruption.

There is therefore a trade-off between how fast the current generations can benefit from the oil windfall through increased public spending, and on the other hand, the negative implications of the rapid public spending on the non-oil growth and macroeconomic stability. This trade-off can be captured implicitly by introducing adjustment costs in the optimal fiscal strategy, so that there is only a gradual convergence to the long-run optimal level of expenditures. The risks of "Dutch Disease" or excessive volatility can be minimized by sterilizing a large majority of oil revenues through Oil Fund savings abroad and translating volatile revenues into a smooth pattern of expenditures. The resulting strategy implies, that during the initial years, when the oil production volume is still low, there is a case for spending of a somewhat higher fraction of the oil windfall revenues, or alternatively, to borrow, to finance some increase in public expenditure. During the peak years of oil production, however, long-run sustainability requires that a significant share of the oil windfall be saved, leading to increasing government savings.

(ii) **Political Economy Issues of Implementation of the Sustainable Fiscal Policy**

Prudent fiscal policy requires the accumulation of large savings in the form of financial assets abroad. Such an accumulation is necessary to avoid large and destabilizing oil related outflows leading to excessively rapid growth in government expenditures and lack of competitiveness of non-oil sector. The latter scenario would seriously hurt the non-oil growth prospects and propagate the poverty long into the future. The government and political parties need to be well aware of this trade-off: High public expenditures today will most likely lead to low standards of living tomorrow and day after tomorrow. This is the lesson that many small oil exporting countries has painfully learnt in the last decades. Indeed these countries performed consistently worse than no resource abundant countries.

This brings the question of how to generate political support for high savings out of current oil revenues. It is necessary to recognize that fiscal revenues from the oil windfall are exhaustible and volatile, and to highlight the long-term risks related with high oil spending, which can build consensus around prudent and sustainable fiscal policies. It is therefore important to realize that **fiscal policy stance cannot be properly assessed based on traditional fiscal indicators, because the oil windfall reduces transparency of these indicators and may lead to a formulation of unsustainable fiscal policies**

The most important implication is to use economically meaningful budgetary and macroeconomic indicators, which will enhance transparency and therefore create support for prudent and sustainable fiscal policy. We strongly argue that government proceeds from oil extraction that are appropriated by the government and the Oil Fund should not be included in the budget bill as revenues. Instead, they should be strictly treated as deficit financing items. This is the best practice procedure adopted by most of the advanced transition economies with regards to the proceeds of privatization. And it makes sense. Proceeds form oil extraction or privatization are not truly revenues – they come from the reduction of the national wealth.

In other terms the headline budget deficit figure that reflects the basic decision of policy makers should be defined as expenditures minus non-oil revenues. In the technical discussion this measure is defined as a non-oil deficit as it excludes proceeds from oil extraction and interest earned on Oil Fund assets. It is important to introduce conversion to this concept of budgetary position as early as possible, to prevent pressures on rapid public expenditures increases in line with oil extraction revenues.

Classification of oil proceeds as deficit financing rather than budgetary revenues has the strong positive impact on the budgetary process. When oil extraction will be at its peak the government would have to save the large majority of the oil proceeds, which will be shown as a very substantial overall fiscal surplus, which would be very difficult to present to the Parliament and to the wider public. The true measure of fiscal position, however, is the deficit that excludes oil proceeds, or the non-oil deficit, which is actually quite expansionary, XX percent of non-oil GDP. Is it sensible to argue that the fiscal policy that depletes the national wealth at such rate is overly restrictive?

The macroeconomic framework, prepared jointly by the Ministry of Economy, Ministry of Finance, and the National Bank should formulate sensible medium to long term time paths for correctly defined fiscal deficits. In formulating them, the authorities have to take into account the need to leave some resources to children, to avoid excessive appreciation of the currency that may destroy non-oil sectors and to avoid being too optimistic about the institutional capacities to increase public spending without efficiency losses. Possible future liabilities that would make the strategy of high deficits and rapid asset distraction even more risky need also be remembered. Such liabilities include environment costs of the oil boom and planned transition to the capital pension system. Analysis must be based on the conservative oil price projections to avoid the risk of future policy reversals. Results of such analysis need to be subject to the parliamentary approval in the multi-year budget plans. Finally these multi-years budget plans need to be incorporated in the annual budget bills.

The multiyear budget plans should be reviewed on the rolling basis in order to revaluate their correctness in terms of efficiency of budgetary spending and its impact on the real exchange rate and the competitiveness of the non-oil sector. Changes in the medium term oil price projections might also suggest corrections to the medium term fiscal plans. Such approach would also avoid rapid short-term policy reversals in the face of oil market movements. Such reviews focused on the correct policy target (deficit excluding oil revenues) would be the crucial condition for maintaining fiscal discipline and therefore supporting non-oil growth in Kazakhstan in years to come.

III. OPTIMAL INTER-TEMPORAL ALLOCATION OF THE OIL WINDFALL: A THEORETICAL FRAMEWORK

During next decades, Kazakhstan will experience a massive windfall with a concomitant fiscal gain. This fiscal gain, however, is a result of the depletion of country's oil and gas reserves. Long-term sustainability, therefore, requires that a part (or all) of the resource rents have to be re-invested productively, to compensate this reduction in natural resource capital by the accumulation of other forms of assets, such as physical capital or human capital. Since oil rents are to a large extent concentrated in the public sector, the question of how should the oil and gas revenue be spent and distributed across present and future generations becomes a cornerstone to successful economic development. Furthermore a surge in natural resource revenue may stimulate an inefficient domestic spending and waist of petroleum resources. Too rapid domestic spending may give raise to excessive real appreciation and structural shift towards non-tradable sectors. Finally, if the budgetary process is not transparent and the institutional setting gives raise to severe governance and corruption problems, the budget would not be an adequate fiscal policy instrument.

This section provides a theoretical framework and illustrative calculations for the optimal allocation of the oil and gas fiscal revenues over time, based on an objective function, and subject to an inter-temporal budget constraint. The methodology of derivation is close in spirit to the framework presented by Engel and Valdes (2000). The authors argue that while intergeneration transfers usually do not take place, policy makers have to make explicit decisions about the intergenerational distribution of revenues related to the extraction of exhaustible resources. The natural starting point for such a consideration is the permanent income hypothesis. Under this hypothesis economic agents should spend only the permanent component of their current income. As the immediate implication of the permanent income framework for resource-rich country Liuksila et al. (1994) recommends that a prudent government should keep the value of total wealth constant over time. This can be achieved through a full conversion of the oil-wealth into net financial assets, so that future interest payments compensate future generation for depleted oil resources. Current government consumption out of oil is therefore equal to the implicit interest earned on oil-wealth of the country.

Permanent income hypothesis is generally too restrictive as it rules out intergenerational transfers of the oil related wealth (Engel and Valdes (2000)). The correct approach, therefore, is to spread the oil revenues "not by giving every generation the same amount of public good…but by choosing among all possible policies that are Pareto improving, the one that increase SWF (social welfare function) the most." The model presented below fulfills these requirements.[4] Furthermore, the model shows that the requirement of preserving the oil wealth constant in per capita terms (permanent income hypothesis) can be strictly optimal when the non-oil GDP per capita is expected to be flat in the long run. If the non-oil GDP per capita is expected to increase over time, saving oil resources for future generations that will be richer anyway need not to be justified on intergenerational equity grounds. On the contrary if the decline in per capita non-oil GDP is expected to decline over time (for example due to rapid growth of population) the optimal fiscal strategy requires an increasing rather than constant real per capita net wealth over time. Although the recommendation of constant net wealth is only a special case in the optimization problem, it is the most robust to assumptions, offers a simple rule of thumb, and therefore might be attractive for actual policy-making.

The government's objective function is to maximize welfare of its citizens living within the time horizon through smoothing the disposable income per capita. For the purpose of this analysis, the disposable income is defined as the after-tax non-oil GDP per capita plus oil-financed government expenditure per capita. Transfers to population increase directly the disposable income, whereas public consumption is assumed to be equivalent to private consumption. The focus on disposable income allows avoiding the explicit modeling of private sector saving/consumption decision. This simplification is desired as almost all the revenues from the oil extraction accrue to the government, and the problem of allocation of these revenues dwarfs possible consumption smoothing undertaken by the individuals. In addition, private opportunities for shifting consumption in time are constrained by the undeveloped financial institutions and the lack of collateral.

It is assumed that oil-related expenditure is equivalent to public consumption or transfers to population. Treating public investments as consumption reflects well-

[4] On the contrary extension to the permanent income hypothesis suggested by Davoodi (2002) in which oil wealth is kept constant as a share of GDP implies that oil expenditures are benefiting more (in dollar terms) generations of higher income, what clearly is not optimal.

documented skepticism about the efficiency of public investment programs. The risk of failed investments is particularly high when a rapid surge in the available financing due to oil extraction is not met by an adequate institutional capacity to select and implement only the most profitable projects. The resulting public expenditure ceiling, therefore, should not be binding for some particular investment projects that yield a very high rate of return, because as those can be treated as substitutes for investment in financial assets. Such projects, however, need to be evaluated on a case-by-case basis. Only in the case of particularly profitable and reliable projects it is possible to assume the rate of return is higher that the one earned on financial assets.

Formally, **the optimal rule for public expenditure is derived from maximizing the government's objective function, combined with the inter-temporal budget constraint.**

Inter-temporal government utility function has the form:[5]

$$\mathrm{U} = \sum_{t=1}^{T} \beta^{t} \ln I_{t} = \sum_{t=1}^{n} \beta^{t} \ln\left(\frac{GDP_{t}^{Non-oil}(1-\tau_{t}) + E_{t}^{Oil}}{N_{t}}\right)$$

where β is the time preference factor and I_t is the proxy for the disposable income per capita defined as a sum of after-tax non-oil GDP ($GDP_t^{Non-oil}$) per capita and oil-financed government expenditure E_t^{Oil} per capita. N_t is the size of the population, τ_t is the effective tax rate on non-oil GDP. This utility function is maximized subject to the inter-temporal budget constraint.

The inter-temporal government budget constraint implies that the net present value of all future revenues must be equal to the net present value of all future expenditures and change in the net present value of debt. This inter-temporal budget constraint is derived in the following three steps: (i) we specify the government budget constraint in each period, (ii) we specify the relation between the oil-related fiscal revenues and the rate of oil reserves depletion, and (iii) we derive the inter-temporal budget constraint by iterative substitution across the time horizon.[6] Fiscal sustainability implies that the inter-temporal budget constraint has to be satisfied over the entire future, i.e. over the infinite number of years. In some scenarios it is also allowed that the shortsighted government is planning to satisfy the constraint over explicitly defined finite period of time. In such case it is imposed that deficit is equal to zero in every period after

[5] Compare footnote 2. We do not show workers remittances and non-oil budgetary transfers for the sake of transparency of the presentation.
[6] Similar derivation is given by Davoodi (2002).

the end of time horizon.[7] Such approach yields results that are virtually identical to infinite budget constraint, if time horizon is very long.

The government budget constraint in each period simply states that the budget deficit has to be covered by a decline in net government assets.

$$\left[E_t^{Oil} + E_t^{Non-oil} + i \cdot D_{t-1}\right] - \left[R_t^{Oil} + R_t^{Non-oil} + i \cdot FA_{t-1}^{Oil}\right] = \left[D_t - D_{t-1}\right] - \left[FA_t^{Oil} - FA_{t-1}^{Oil}\right]$$

where $E_t^{Non-oil}$ is non-oil-financed and non-interest government expenditure, R_t^{Oil} stands for revenues from oil extraction that are appropriated by the budget and Oil Fund, $R_t^{Non-oil}$ are budgetary non-oil revenues. i is the real interest rate, D_t is public debt, and FA_t^{Oil} represents financial assets accumulated out of oil-revenues. The distinction between debt and oil-based financial assets is somehow artificial. However it is further assumed that debt to GDP is hold constant as a share of non-oil GDP, while the path of oil-based assets is optimized, therefore this distinction is useful.

The relation between the oil-related fiscal revenues and the rate of oil reserves depletion is given by the change of the (current) value of future oil revenues from extraction to be appropriated by the budget and Oil Fund V_t^{Oil} from period t-1 to period t:

$$V_t^{Oil} = (1+i) \cdot V_{t-1}^{Oil} - R_t^{Oil}$$

It is also possible to define total oil-related wealth W_t^{Oil} as the sum of value of remaining oil revenues to be appropriated by the budget and Oil Fund and accumulated oil related assets.

$$W_t^{Oil} = V_{t-1}^{Oil} + FA_t^{Oil}$$

Which allows rewriting the budget constraint in every period as:

$$\left[E_t^{Oil} + E_t^{Non-oil} + i \cdot D_{t-1}\right] - \left[R_t^{Non-oil}\right] = \left[D_t - D_{t-1}\right] - \left[W_t^{Oil} - W_{t-1}^{Oil}\right] + i \cdot W_{t-1}$$

This identity shows that the non-oil deficits (that is overall budget deficits without revenues related to oil - extraction or interest earned on oil-related assets) are financed by

[7] Only if time horizon is shorter than time necessary for the full depletion of oil resources we allow the government to spend net present value of remaining oil resources. In the following periods government is still assumed to have zero non-oil deficit, however it runs overall budget surplus equal to current oil revenues.

interest earned on total oil wealth (permanent income out of the oil wealth) and changes in oil wealth and public debt.

The inter-temporal budget constraint is then derived by iterative substitution for financial assets in identity from paragraph 8 across the entire time horizon. However, it is necessary to make a few simplifying assumptions about non-oil revenues, expenditures and debt. Specifically, it is assumed that non-oil expenditures (including public debt service) in each period are equal to non-oil revenues and are a constant share of non-oil GDP. This assumption would imply that the government can only shift its oil related fiscal revenues across generations to increase the income of the generations that are worse off.[8] Furthermore, public debt is assumed to remain constant as a share of the non-oil GDP.[9] With these assumptions it is possible to show that[10]:

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[8] Too much redistribution across time, including the non-oil tax revenues seem to give results that are of less practical importance.

[9] It is possible to include some debt dynamics in the analysis, in particular to analyze the situation when the government decides to redeem all or part of public debt using the oil revenues or use oil revenues for debt service. However, since we take the net asset view, it is actually irrelevant whether one is borrowing to finance its expenditures, or depleting its oil wealth. It should be also noted that public debt constitutes only a small fraction of value of oil assets.

[10] With simplifying assumption stated in paragraph 10, the identity form paragraph 8 can be expressed as:

$$\frac{E_t^{Oil} - R_t^{Oil} - g_t D_{t-1} + FA_t^{Oil}}{(1+i)} = FA_{t-1}^{Oil}$$

Forwarding this identity forward by one period we get (again assuming debt at a constant share of non-oil GDP) we get:

$$\frac{E_{t+1}^{Oil} - R_{t+1}^{Oil} - g_{t+1}(1+g_t)D_{t-1} + FA_{t+1}^{Oil}}{(1+i)} = FA_t^{Oil}$$

We use this result to eliminate FA_t^{Oil} from the first identity:

$$\frac{E_t^{Oil} - R_t^{Oil} - g_t D_{t-1}}{(1+i)} + \frac{E_{t+1}^{Oil} - R_{t+1}^{Oil} - g_{t+1}(1+g_t)D_{t-1} + FA_{t+1}^{Oil}}{(1+i)^2} = FA_{t-1}^{Oil}$$

By forwarding the original identity by two periods we can similarly eliminate FA_{t+1}^{Oil} in the last equation. By repeating the substitution successively we can eliminate FA_{t+2}^{Oil}, FA_{t+3}^{Oil} and so on. This sequence of steps leads us to constraint:

$$\sum_{t=1}^{T}\frac{R_t^{Oil} - E_t^{Oil}}{(1+i)^t} - D_{t-1}\sum_{t=1}^{T}\frac{g_t(1+g_{t-1})^{t-1}}{(1+i)^t} = FA_{t-1}^{Oil} + \frac{FA_T^{Oil}}{(1+i)^T}$$

Since we assume that initial stock of oil related assets is equal to zero and from terminal (or tranversality) condition we know the same is true about last element of the last equation, the right hand side of the constraint disappears, what leads us to the constraint as shown in the paragraph 10 (for simplicity of exhibition it is further assumed that growth rate is constant throughout time).

$$\sum_{t=1}^{T}\frac{E_t^{\ Oil}}{(1+i)^t}=\sum_{t=1}^{T}\frac{R_t^{\ Oil}}{(1+i)^t}+\frac{(1+i)g}{(1+g)(i-g)}D_0=W_{t-1}+NPV(\Delta D)$$

This equation states that the net present vale of oil-financed expenditure must be equal to the sum of net present value of all oil-revenues and present value of future increases in nominal debt. This is the inter-temporal budget constraint that government faces in its optimization decision about allocation of the oil revenues.

Optimization of the utility function of the government subject to the inter-temporal budget constraint yields the following optimal path of disposable income:

$$I_{t+1}=\frac{(1+i)}{(1+\beta)}\ I_t$$

By substituting the I_t in the equation, we obtain the following recursive rule for expenditure financed out of the oil wealth as a share of the non-oil GDP:

$$\frac{E_{t+1}^{\ Oil}}{GDP_{t+1}^{\ Non-oil}}=\frac{(1+i)(1+n)}{(1+\beta)(1+g_{t+1})}\left[1+\frac{E_t^{\ Oil}}{GDP_t^{\ Non-oil}}-\tau_t\right]+\tau_{t+1}-1$$

where g_t is rate of growth of non-oil GDP and n_t is rate of growth of population. The path of oil-financed expenditures consistent with this rule and with budget constraint is derived numerically. It should be noted that with permanent non-oil per capita growth the optimal rule that implies constant disposable income per capita can be supported only for the finite number of years. In this case we follow the algorithm suggested by Engel and Valdes (2000). Oil wealth is used to raise the income of the poorest generation until it equals the second poorest. If it does not exhaust oil wealth, the income of two poorest generations is raised until it equals that of third poorest. We repeat this algorithm until oil wealth is fully exhausted. Afterwards disposable income is raising at the rate of growth of non-oil GDP per capita.

Based described methodology, the optimal total expenditure, the optimal consolidated budget deficit and the optimal non-oil budget deficit as ratios to non-oil GDP are derived. Results are highly sensitive to two main sets of parameters:

(i) parameters that characterize government preferences: time horizon and time preference factor ; and
(ii) parameters beyond direct control of the government: population growth, international interest rates, growth rates of non-oil GDP, and oil price changes.

Intuitively, the first set of parameters, time horizon together with time preference factor represents the impatience of the government and its willingness to expatriate all rents from oil extraction (and to smaller degree also non-oil revenues) for nearer

periods of time. If interest rate were equal to the time preference factor, government would ensure that disposable income per capita is constant throughout targeted time horizon. However, if interest rate were lower, the government would tend to shift consumption forward. Similarly, if the rate of growth of the non-oil GDP is the same as the rate of growth of population, the non-oil part of disposable income is constant throughout time, which implies that it is optimal for the government to distribute the oil revenues equally in each period. When the rate of growth of the non-oil GDP is faster, however, it would be optimal to also shift the oil revenues forward.

Adjustment costs. Optimal public spending path derived above does not take into account the difficulties in rapid adjustments in **expenditures** and the limited capacity of economy to absorb such adjustments. In the extension to basic model above these adjustment costs are accounted for in line with methodology **suggested** by Engel and Valdes (2000). More specifically the modified utility function is:

$$U = \sum_{t=1}^{T} \beta^t \left[\ln I_t - k \cdot (\ln I_t^{OPT} - \ln I_{t-1})^2\right]$$

where I_t^{OPT} is optimal disposable income per capital as derived in the basic model. Engel and Valdes (2000) prove that the maximization of this utility function subject to the original intertemporal budget constraint can be approximated by the simple rule:

$$\ln I_t - \ln I_{t-1} = \alpha \cdot (\ln I_t^{OPT} - \ln I_{t-1})$$

where α is the speed of adjustment towards optimal path of income and it is derived as a function of parameters of utility function:

$$\alpha = \frac{1 - k(1-\beta) + \sqrt{1 + 2k(1+\beta) + k^2(1-\beta)^2}}{1 + k(1-\beta) + \sqrt{1 + 2k(1+\beta) + k^2(1-\beta)^2}}$$

Intuitively, the government that in the absence of adjustment costs would immediately increase spending to the optimal level, would introduce increases more gradually and converge to optimal path only after several years of adjustment in the presence of these costs. Parameters that underlie presented results imply the speed of adjustment α equal to 25 percent, which means that a quarter of the gap between actual and optimal path of disposable income is covered in each year. As path of after-tax non-oil GDP is exogenous this rule allows for the derivation for modified path of government oil-financed expenditures. In practical exercises we sometimes introduce simple limit to annual growth of government as a share of non-oil GDP.

All presented scenarios are sustainable as they satisfy ex-ante the inter-temporal budget constraint. It should be noted, however, that too optimistic assumptions would lead to the choice of path that ultimately can prove to be unsustainable when less favorable outcomes would undermine fiscal stance of the government.

However, the political risk is a major limitation in the application of this approach. While large deficits in next few years are consistent with optimal (and sustainable) fiscal path of relatively impatient government, the optimality of this path requires very substantial surpluses in longer-term perspective. This, however, may not be feasible, as the ability of the current government to commit future government to actually run such large surpluses is very low. In particular the fiscal path that is optimal (and sustainable) ex ante may prove to be unsustainable ex post, when future governments would be systematically avoiding fiscal adjustment. Scenarios reported below present optimal path that would be chosen by relatively conservative government with infinite time horizon and time preference discount equal to the interest rate. Scenarios differ with respect to the assumed non-oil growth rates. Results of sensitivity analysis in respect to oil prices and interest rates are also reported.

IV. THE OPTIMAL FISCAL STRATEGY IN KAZAKHSTAN

We first consider two basic scenarios that correspond to constant and increasing non-oil GDP per capita to illustrate the character of choices that government needs to make. The first basic scenario is the most conservative as it assumes that the non-oil GDP per capita is constant over time and the government is assumed to care for current and all future generations. Results reproduce the Permanent Income Hypothesis. The second basic scenario shows the optimal fiscal strategy when non-oil GDP per capita is increasing over time. Tables 1 and 4 as well as Figures 1 and 2 summarize the following fiscal sustainability implications for these illustrative scenarios: (i) the path of the disposable income per capita reported at constant US dollar prices; (ii) associated public spending, the non-oil fiscal deficit and overall budget deficits as a share of the non-oil GDP; (iii) the time path of financial asset accumulation in the Oil Fund as a share of the non-oil GDP. Note that those scenarios should only be seen as an illustration of how the optimal inter-temporal allocation of oil revenues should be made and what are the issues that need to be considered when designing a fiscal framework for public expenditure. Scenarios that are exactly in line with our macro projections presented in Section A of Chapter 4 are more complex in character and account for varying growth rates and expenditure adjustment costs. Results of these scenarios are presented in detail further below.

The first scenario, or the case of flat non-oil GDP per capita implies optimal path of spending that is identical to the permanent income hypothesis, assuming an infinite time horizon. To construct this scenario, we assume that the real non-oil GDP growth and population growth are equal zero over the infinite time horizon. Furthermore, we assume that the real annual interest rate is equal to the rate of time preference (4 percent), and the underlying oil price, including transport and other costs is equal to US$18 per bbl after 2006. Finally, we assume that the effective tax rate on the non-oil economy is constant as a share of the non-oil GDP and equal to 23 percent of the non-oil GDP. The results shown in Table 1 and Figure 1 suggest, that given the projected extraction rates and the amount of fiscal revenues accruing to the government, the optimal non-oil deficit that can sustain a constant disposable income per capita over the entire time horizon is 10.3 percent of the non-oil GDP per annum. This allows for keeping disposable income constant infinitely at its highest viable level just above US$1050 per capita.

The total expenditure that the government can sustain over the time horizon is therefore equal to 33.3 percent of the non-oil GDP. Under this scenario, the government can consume only the annuity fraction of its net wealth, thus keeping the net wealth constant at about 260 percent of the non-oil GDP forever. This implies that until 2015 the government may run the overall moderate deficit that in order to allow the current generations to consume the permanent income fraction out of the future oil wealth, financing this excess consumption by borrowing. Afterwards, as the large production volumes would materialize, the government needs to save a larger fraction of its oil proceeds thus returning to a balanced budget in 2006 and then running a large surplus, which will peak at around 18 percent of the non-oil GDP in 2025. As soon as the oil reserves are depleted, in 2050, the government needs to run a balanced overall budget.

Permanent income hypothesis is not optimal if the non-oil GDP per capita is increasing. To illustrate this point we present a second and more optimistic basic scenario, in which the real non-oil GDP is growing faster than the population. This scenario is presented in Table 4 and Figure 2 We keep all the assumptions the same as in our base case, except for the non-oil GDP growth rate at 0.5 percent per annum forever. Under these assumptions it is optimal to spend faster the oil wealth in order to increase the welfare of the current generations, as future generations will be benefited by the non-oil growth. This allows keeping the disposable income just above US$1150 per capita until 2045, when the accumulated effects of non-oil GDP growth compensates the depletion of oil revenues, and thereafter the disposable income per capita can increase forever. This is as much income smoothing that the government can achieve unless it is allowed to perform intergenerational transfers of the non-oil income.

The share of public expenditure in total non-oil GDP in scenario of increasing per capita non-oil GDP increases up to above 40 percent during the initial period and is declining gradually to 23 percent in 2045. Expenditures will stay at this level permanently. As a result, the sustainable non-oil deficit will be now much higher in the initial period, reaching 19 percent of GDP in 2003, which implies that the overall deficit to the non-oil GDP will reach 11 percent. Later on, when the rapid oil production takes place and the non-oil growth benefits the population, the non-oil deficit will decline gradually to zero in 2046. This path implies surplus on the overall budget, reaching 10 percent in 2025 converging to 0 percent in 2045. By this time oil-related financial assets will also be fully depleted.

Finally, we recognize that a dramatic increase of public expenditure for a brief period of time may lower their efficiency and have important political and economic risks. To take these adjustment costs into account, we introduce explicitly barriers to annual growth of government expenditures.[11] As a result, public expenditures increase only gradually instead of "jumping" to their optimal level. Therefore due to adjustment costs, the non-oil deficit and public expenditure are much lower during 2003-2010 and slightly higher in

[11] We usually assume a quadratic loss function for changes in public expenditure levels. For more details on the derivation procedure, see Engel and Valdes (2000). Results presented here are based on the limit to annual increases in public expenditures as a share of non-oil GDP of 1 percent before 2008. Given high initial rates of growth of non-oil GDP this restriction still allows for substantial increases in expenditures in absolute terms.

the rest of the time horizon as compared to results under the absence of adjustment costs. These results for basic oil prices and are shown in tables 7 and 9 and figures 3 and 4 below.

In analyzing these results it must be understood that optimistic assumptions about future growth and oil prices lead to the choice of more expansionary path of expenditures that ultimately might prove to be unsustainable when underlying predictions are not realized. In such a situation, the sharp adjustment in the fiscal policy would be necessary in the future in order to regain sustainability. It is therefore argued that government should tend to adopt conservative assumptions in order to avoid risks of major policy reversals. To illustrate this point we attach results of our simulations under two alternative oil price assumptions.

V. AN OUTLINE OF AREAS FOR FUTURE WORK

ANNEX 1

No Adjustment Costs

Table 1. Constant Non-oil GDP per Capita (see also Figure 1)

	2002-2007	2008-2018	2019-2024	2025-2050
Disposable income per capita, USD	1051	1051	1051	1051
Public spending, share of non-oil GDP	33.3%	33.3%	33.3%	33.3%
Non-oil budget balance, share of non-oil GDP	-10.3%	-10.3%	-10.3%	-10.3%
Overall budget balance, share of non-oil GDP	-2.0%	0.3%	15.1%	7.0%
Average Oil Fund assets, share of non-oil GDP	-4%	-19%	44%	228%

Assumptions: Annual population growth rate: 0%, non-oil GDP growth rate: 0%, time preference rate: 4%, interest rate: 4%, effective tax rate on non-oil GDP: 23%. International oil price is US$18 per bbl after 2006.

Table 2. Constant Non-oil GDP per Capita (Low oil prices)

	2002-2007	2008-2018	2019-2024	2025-2050
Disposable income per capita, USD	993	993	993	993
Public spending, share of non-oil GDP	28.4%	28.4%	28.4%	28.4%
Non-oil budget balance, share of non-oil GDP	-5.4%	-5.4%	-5.4%	-5.4%
Overall budget balance, share of non-oil GDP	2.1%	0.0%	5.0%	4.0%
Average Oil Fund assets, share of non-oil GDP	12%	11%	32%	127%

Assumptions: International oil prices lower by 20% (US$14.4 per barrel), all other assumptions as in the base scenario.

1 Table 3. Constant Non-oil GDP per Capita

(High oil prices)

	2002-2007	2008-2018	2019-2024	After 2025
Disposable income per capita, USD	1135	1135	1135	1135
Public spending, share of non-oil GDP	40.5%	40.5%	40.5%	40.5%
Non-oil budget balance, share of non-oil GDP	-17.5%	-17.5%	-17.5%	-17.5%
Overall budget balance, share of non-oil GDP	-8.5%	-0.5%	25.6%	13.0%
Average Oil Fund assets, share of non-oil GDP	-29%	-77%	28%	369%

Assumptions: International oil prices higher by 20% (US$21.6 per barrel), all other assumptions as in the base scenario.

No Adjustment Costs

Table 4. Permanently Increasing Non-oil GDP per Capita (see also Figure 2)

	2002-2007	**2008-2018**	**2019-2024**	**2025-2050**
Disposable income per capita, USD	1159	1159	1159	1162
Public spending, share of non-oil GDP	40.8%	36.8%	32.9%	26.1%
Non-oil budget balance, share of non-oil GDP	-17.8%	-13.8%	-9.9%	-3.1%
Overall budget balance, share of non-oil GDP	-10.5%	-7.3%	7.4%	3.5%
Average Oil Fund assets, share of non-oil GDP	-34%	-113%	-109%	-11%

Assumptions: Annual non-oil GDP growth rate: 0.5%, all other assumptions as in base scenario.

Table 5. Permanently Increasing Non-oil GDP per Capita (Low oil prices)

	2002-2007	**2008-2018**	**2019-2024**	**2025-2050**
Disposable income per capita, USD	1083	1083	1083	1123
Public spending, share of non-oil GDP	34.4%	30.7%	27.0%	23.3%
Non-oil budget balance, share of non-oil GDP	-11.4%	-7.7%	-4.0%	-0.3%
Overall budget balance, share of non-oil GDP	-4.8%	-5.3%	1.2%	3.2%
Average Oil Fund assets, share of non-oil GDP	-12%	-62%	-77%	-7%

Assumptions: Annual non-oil GDP growth rate: 0.5%, international oil prices lower by 20% (US$14.4 per barrel),all other assumptions as in base scenario.

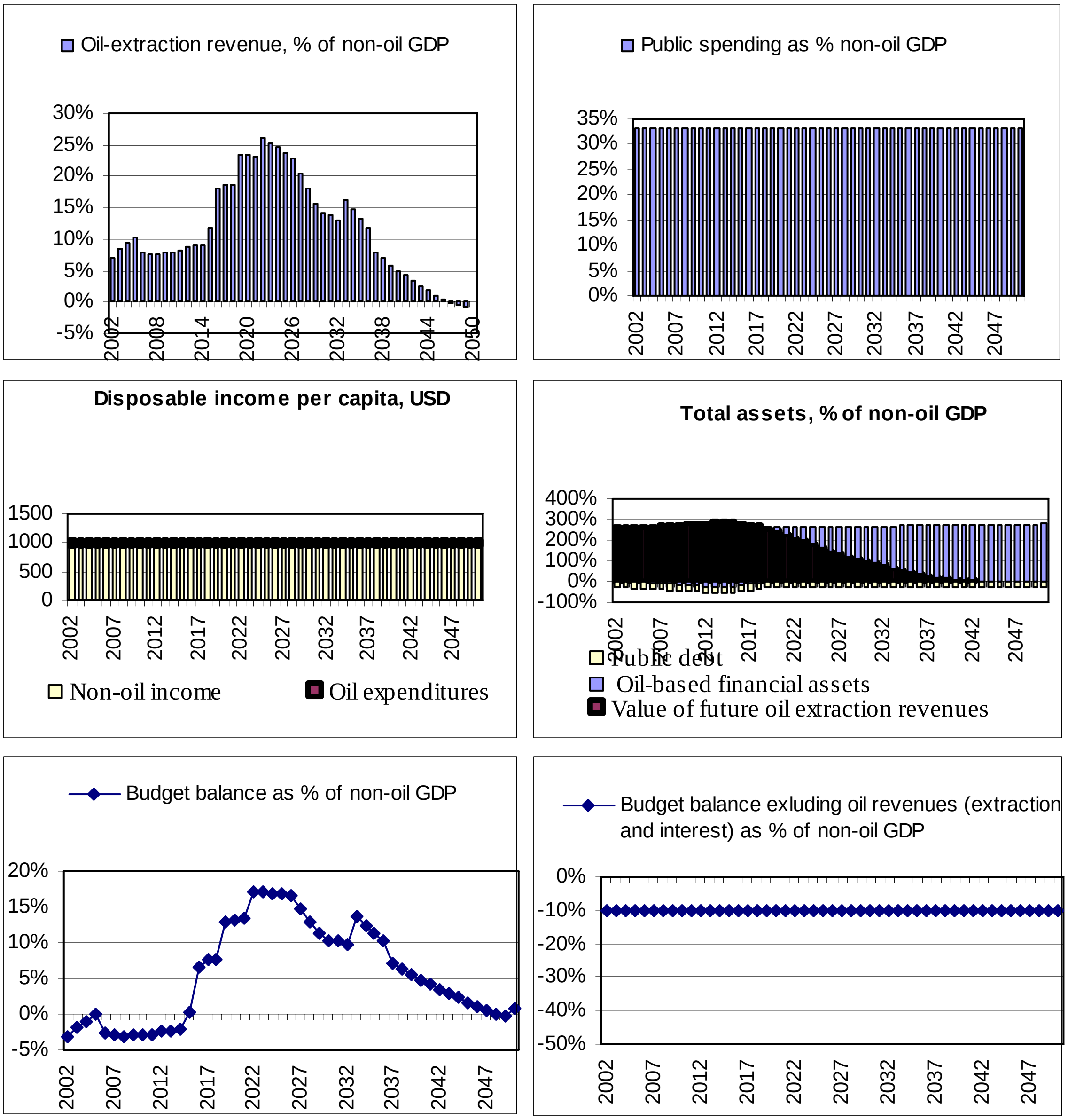
Table 6. Permanently Increasing Non-oil GDP per Capita (High oil prices)

	2002-2007	**2008-2018**	**2019-2024**	**2025-2050**
Disposable income per capita, USD	1255	1255	1255	1255
Public spending, share of non-oil GDP	48.9%	44.6%	40.4%	32.8%
Non-oil budget balance, share of non-oil GDP	-25.9%	-21.6%	-17.4%	-9.8%
Overall budget balance, share of non-oil GDP	-18.1%	-9.7%	14.6%	5.1%
Average Oil Fund assets, share of non-oil GDP	-62%	-183%	-154%	28%

Assumptions: Annual non-oil GDP growth rate: 0.5%, international oil prices higher by 20% (US$21.6 per barrel),all other assumptions as in base scenario.

No Adjustment Costs

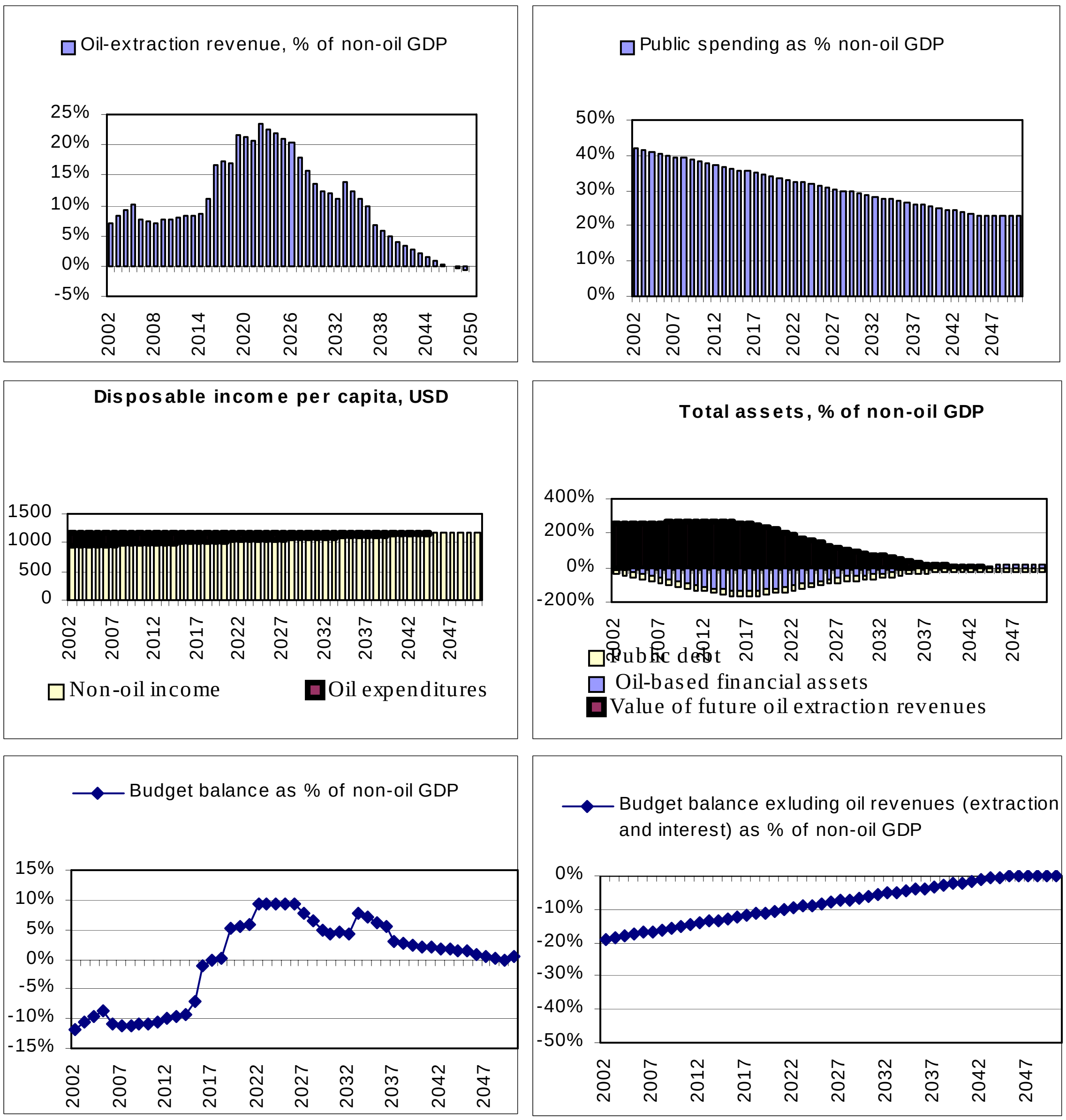
Figure 1. Constant Non-oil GDP per Capita



Assumptions: Annual population growth rate: 0%, non-oil GDP growth rate: 0%, time preference rate: 4%, interest rate: 4%, effective tax rate on non-oil GDP: 23%. International oil price is US$18 per bbl after 2006.

No Adjustment Costs

Figure 2. Permanently Increasing Non-Oil GDP per Capita



Assumptions: Annual non-oil GDP growth rate: 0.5%, all other assumptions as in base scenario.

Adjustment Costs

Table 7. Constant Non-oil GDP per Capita (see also Figure 3)

	2002-2007	2008-2018	2019-2024	2025-2050
Disposable income per capita, USD	989	1063	1071	1071
Public spending, share of non-oil GDP	28.0%	34.3%	35.1%	35.1%
Non-oil budget balance, share of non-oil GDP	-5.0%	-11.3%	-12.1%	-12.1%
Overall budget balance, share of non-oil GDP	4.0%	1.0%	15.1%	7.0%
Average Oil Fund assets, share of non-oil GDP	19%	24%	88%	271%

Assumptions: Annual population growth rate: 0%, non-oil GDP growth rate: 0%, time preference rate: 4%, interest rate: 4%, effective tax rate on non-oil GDP: 23%. International oil price is US$18 per bbl after 2006. The change in public expenditures must not exceed 1 percent of non-oil GDP.

Table 8. Constant Non-oil GDP per Capita
(Low oil prices)

	2002-2007	2008-2018	2019-2024	2025-2050
Disposable income per capita, USD	984	996	996	996
Public spending, share of non-oil GDP	27.6%	28.6%	28.6%	28.6%
Non-oil budget balance, share of non-oil GDP	-4.6%	-5.6%	-5.6%	-5.6%
Overall budget balance, share of non-oil GDP	3.1%	0.0%	5.0%	4.0%
Average Oil Fund assets, share of non-oil GDP	18%	17%	38%	133%

Assumptions: International oil prices lower by 20% (US$14.4 per barrel), all other assumptions as in table 7.

2 Table 9. Constant Non-oil GDP per Capita

(High oil prices)

	2002-2007	2008-2018	2019-2024	2025-2050
Disposable income per capita, USD	989	1089	1188	1232
Public spending, share of non-oil GDP	28.0%	36.5%	45.0%	48.8%
Non-oil budget balance, share of non-oil GDP	-5.0%	-13.5%	-22.0%	-25.8%
Overall budget balance, share of non-oil GDP	5.4%	8.9%	28.9%	13.0%
Average Oil Fund assets, share of non-oil GDP	21%	69%	229%	577%

Assumptions: International oil prices higher by 20% (US$21.6 per barrel), all other assumptions as in table 7.

Adjustment Costs

Table 10. Permanently Increasing Non-oil GDP per Capita (see also Figure 4)

	2002-2007	2008-2018	2019-2024	2025-2050
Disposable income per capita, USD	1007	1156	1251	1251
Public spending, share of non-oil GDP	28.0%	36.5%	40.0%	32.4%
Non-oil budget balance, share of non-oil GDP	-5.0%	-13.5%	-17.0%	-9.4%
Overall budget balance, share of non-oil GDP	3.8%	-2.3%	5.3%	0.0%
Average Oil Fund assets, share of non-oil GDP	18%	11%	15%	56%

Assumptions: Annual non-oil GDP growth rate: 0.5%, all other assumptions as in table 7.

Table 11. Permanently Increasing Non-oil GDP per Capita (Low oil prices)

	2002-2007	2008-2018	2019-2024	2025-2050
Disposable income per capita, USD	1007	1111	1121	1138
Public spending, share of non-oil GDP	28.0%	32.9%	30.0%	24.3%
Non-oil budget balance, share of non-oil GDP	-5.0%	-9.9%	-7.0%	-1.3%
Overall budget balance, share of non-oil GDP	2.5%	-5.8%	-0.5%	2.3%
Average Oil Fund assets, share of non-oil GDP	16%	-20%	-48%	-3%

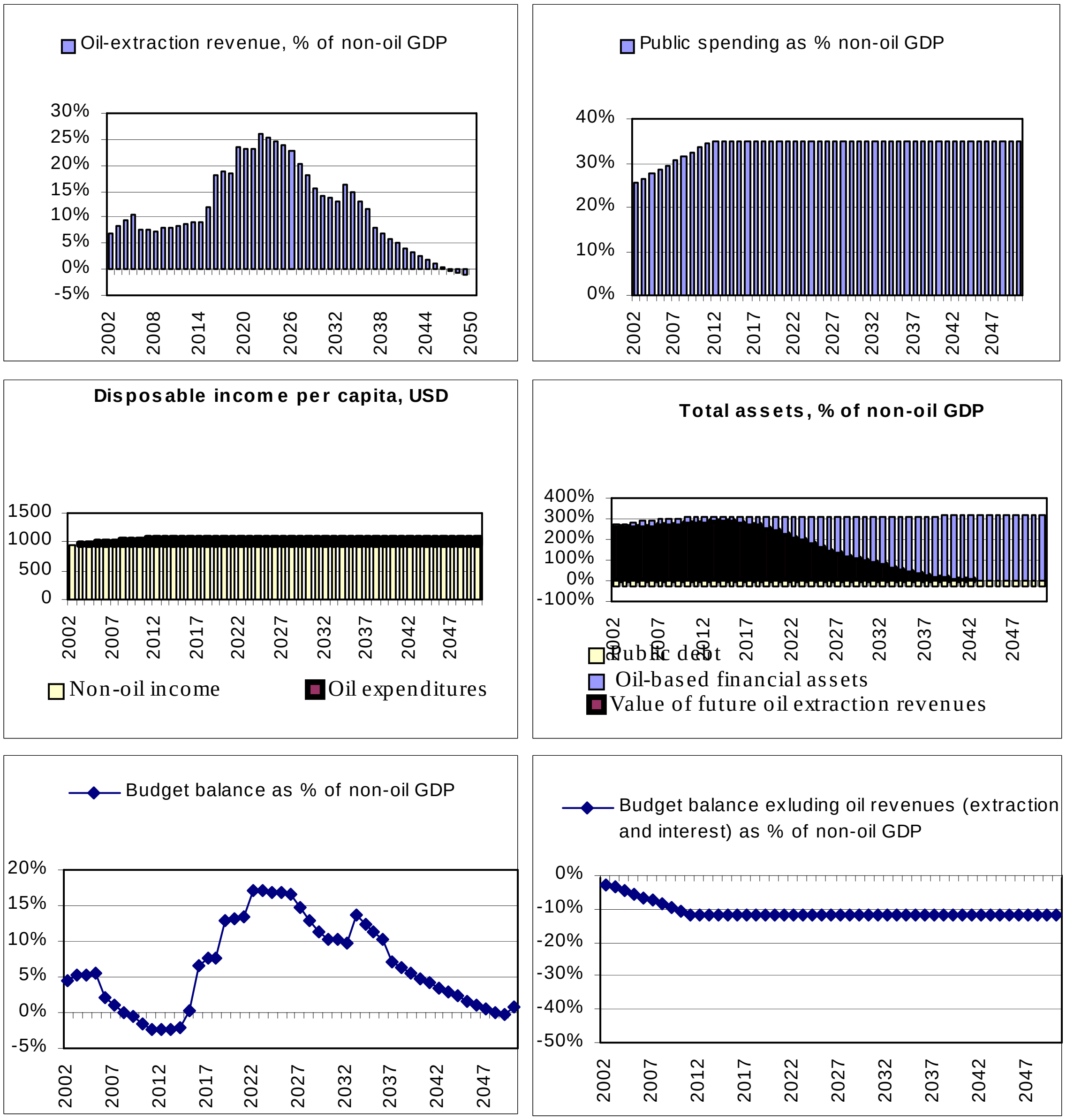
Assumptions: Annual non-oil GDP growth rate: 0.5%, international oil prices lower by 20% (US$14.4 per barrel),all other assumptions as in table 7.

Table 12. Permanently Increasing Non-oil GDP per Capita (High oil prices)

	2002-2007	2008-2018	2019-2024	2025-2050
Disposable income per capita, USD	1007	1156	1316	1474
Public spending, share of non-oil GDP	28.0%	36.5%	45.0%	48.3%
Non-oil budget balance, share of non-oil GDP	-5.0%	-13.5%	-22.0%	-25.3%
Overall budget balance, share of non-oil GDP	5.2%	7.3%	23.3%	2.0%
Average Oil Fund assets, share of non-oil GDP	20%	60%	187%	336%

Assumptions: Annual non-oil GDP growth rate: 0.5%, international oil prices higher by 20% (US$21.6 per barrel),all other assumptions as in table 7.

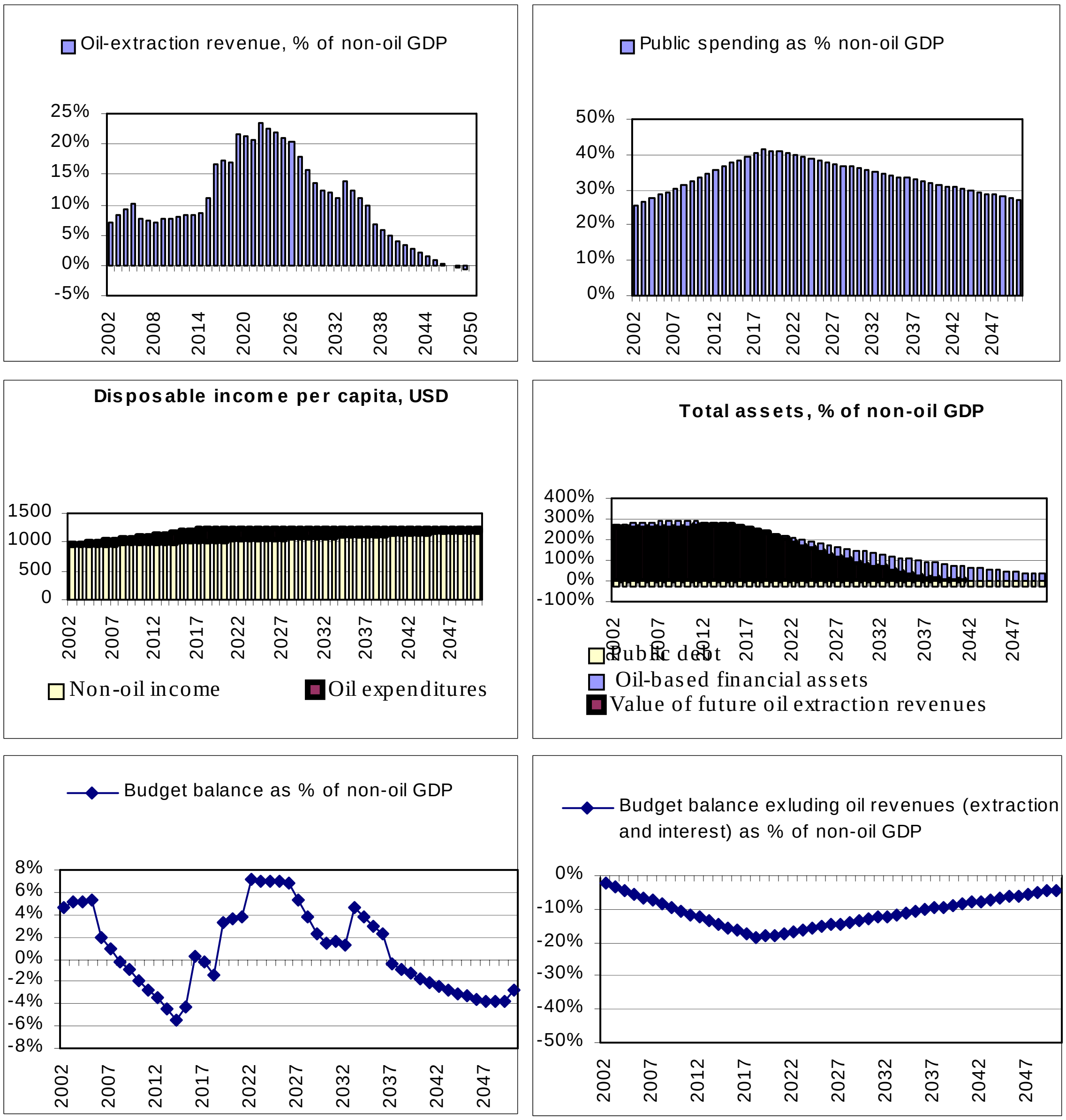
Figure 3. Constant Non-oil GDP per Capita



Assumptions: Annual population growth rate: 0%, non-oil GDP growth rate: 0%, time preference rate: 4%, interest rate: 4%, effective tax rate on non-oil GDP: 23%. International oil price is US$18 per bbl after 2006.

Adjustment Costs

Figure 4. Permanently Increasing Non-Oil GDP per Capita



Assumptions: Annual non-oil GDP growth rate: 0.5%, all other assumptions as in Figure 3.