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Fiscal Policy Sustainability in Oil-Producing Countries

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Abstract

Assessing the sustainability of a given fiscal policy is especially important for countries that depend on income from exhaustible resources. Political and growth pressures may push governments to raise expenditure when revenue from exhaustible resources rises, but cutting outlays when price swings reduce income is often difficult. Traditional fiscal accounting may give a misleading view of policy sustainability. This paper argues that for countries in which a significant proportion of government revenue is derived from the exploitation of an exhaustible natural resource, fiscal policy sustainability can best be assessed within a permanent income framework that takes into account total government wealth, including the imputed wealth from reserves of natural resources. Using this framework, the paper takes a sample of six countries where government revenue from petroleum extraction is significant and draws conclusions about the sustainability of their fiscal policies during 1980-92.

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### Summary

The need for meaningful, yet easily calculable, indicators of fiscal sustainability has long been recognized. Conventionally defined measures of the government deficit and public debt may misstate both government solvency and the sustainability of a given fiscal policy because they focus on only a portion of government assets and liabilities and have a narrow time perspective--generally a single budget year. A number of economists have called for a forward-looking balance sheet approach to analyzing fiscal sustainability that would focus on maintaining a desired level of government net worth over the long term. In this view, net worth would encompass the whole range of government assets and liabilities, including, for example, the expected stream of income from the exploitation of exhaustible natural resources.

This paper proposes that such an approach is particularly useful for assessing the sustainability of fiscal policies in countries in which a significant share of government revenue is derived from petroleum exploitation. Political and growth pressures often push governments in these countries into a cycle of "stop-go" fiscal policies, dictated by the swings in international petroleum prices. Taking a long view is especially important to help these countries avoid this policy pitfall.

The paper argues that for countries in which a significant proportion of government revenue is derived from the exploitation of an exhaustible natural resource, fiscal policy sustainability can best be assessed within a permanent income framework that takes into account total government wealth, including the imputed wealth from reserves of natural resources. Using this framework, the paper takes a sample of six countries in which government revenue from petroleum extraction is significant and draws conclusions about the sustainability of their fiscal policies during 1980-92.

## I. Introduction

In evaluating the appropriateness of the fiscal stance government policymakers must ask how long current policies can be continued without raising taxes, cutting expenditure, or resorting to monetization of the deficit or even debt repudiation. Answering the policy sustainability question is especially important for countries that depend upon the income from exhaustible resources because such income is often subject to large variations and will, eventually, disappear. Political and growth pressures often push governments to raise expenditure when revenue from exhaustible resources increases, but these governments find it difficult to cut outlays when price swings reduce income. Taking a long view is especially helpful for these countries if stop-go fiscal policies are to be avoided.

Recent work on fiscal sustainability has centered on highly indebted countries, while the sustainability issue has been ignored in countries in which the public sector is a net creditor. However, the issue of the long-term sustainability of fiscal policy is still relevant for the latter countries, particularly if a significant share of government revenue is derived from exploiting exhaustible natural resources.

This paper attempts to provide the tools for analyzing this issue. A simple generalization of existing models to consider net creditors is a first step, but is not enough to address the issue of fiscal sustainability in these countries. Exhaustible natural resources should be seen as part of the net wealth of the country. Therefore, the traditional accounting of revenues generated from their exploitation can be misleading. Such revenues should not be included in the flow of normally recurring revenues, but treated instead as a portfolio transaction.

Accordingly, this paper argues that for countries in which a significant proportion of government revenue is derived from the exploitation of an exhaustible natural resource, fiscal policy sustainability can best be assessed within a permanent income framework that takes into account total government wealth, including the imputed wealth from reserves of exhaustible resources. Using this framework, the paper takes a sample of six countries in which government revenue from petroleum extraction is significant and draws conclusions about the sustainability of their fiscal policies during 1980-92.

## II. Issue of Fiscal Sustainability

### 1. Intertemporal budget constraint

The need for meaningful, yet easily calculable, indicators of fiscal sustainability has long been recognized and has been analyzed by reference to the intertemporal budget constraint. Horne (1991), Zee (1988), and Spaventa (1986) have provided full derivations of the intertemporal budget identity, while others, such as Blanchard (1990), have used it as a starting point to develop a range of indicators of sustainability. Briefly, following the approach discussed in Blanchard (1990), the government's budget constraint is given by:

$$\hat{ST} = E - T + rST = PB + rST, \quad (1)$$

where  $ST$  is the stock of government debt in real terms,  $E$  is government expenditure excluding interest,  $T$  is government revenue,  $r$  is the real interest rate, the circumflex denotes the first difference with respect to time, and  $PB$  is the primary balance, defined as the overall balance excluding net interest payments, with all variables measured in real terms. Thus, the change in government debt is equal to the overall fiscal deficit (surplus) incurred during a given time period. This presentation assumes that government deficits are financed entirely by borrowing, rather than through some combination of borrowing and money creation. However, the analysis could be extended to take into account the monetization of budget deficits as well (Horne, 1991). Equation (1) can be rewritten in terms of ratios to GDP, denoted by lower case letters, as:

$$\hat{st} = e - t + (r - g) st = pb + (r - g) st, \quad (2)$$

where  $g$  is the real rate of growth of GDP.

Over an infinite time horizon, the intertemporal budget constraint is derived by summing the succession of single-period budget constraints. Assuming some notional constant values for  $r$  and  $g$ , equation (2) implies that for fiscal policy to be sustainable, the present value of primary

surpluses ( $pb$ ), discounted by the difference between the real interest rate and the real growth rate ( $r - g$ ), must be equal to the initial level of debt ( $st$ ), (which essentially means that the initial debt will be repaid): 1/

$$st = \int_0^{\infty} pb \exp - (r - g) dt. \quad (3)$$

While useful as one indicator of sustainability if employed in conjunction with other indicators, this approach has been criticized on a number of grounds. One problem is that the sustainability condition can be met at very high levels of public debt. But this begs the question of the appropriate distribution of public expenditure between debt service and other claims on public resources, as well as its implications for the distribution of financial resource flows between the private and public sectors. Moreover, as Horne (1991) has observed, the absolute size of the public debt ratio may have a critical influence on the private sector's perception of the government's ability to meet future debt liabilities and thus also on the future level of interest rates required to service the debt. Moreover, because the analysis is a simple accounting framework, it has no behavioral content. Thus, shocks to the economy as well as endogenous changes in economic variables that induce movements in interest rates and real output are not taken into account.

## 2. Permanent income approach

Buiter (1983), Boskin (1987), and Kotlikoff (1989), among others, have been concerned that conventionally defined deficit and debt measures seriously misstate both government solvency and the sustainability of a given fiscal policy because they focus on only a portion of government assets and liabilities and have a narrow time perspective--generally a single budget year. These authors see the need to move to a forward-looking balance sheet approach that would focus on maintaining government net worth over the long term. In this view, in a world with perfect foresight and perfect markets, both private sector agents and the government would make decisions on whether to consume or to invest in real or financial assets taking into account *permanent desired income from a comprehensive measure of wealth*. Of course, in the real world the illiquidity of certain assets, capital market imperfections, and a host of other problems might constrain both private agents and governments to deviate from the optimal path. Nevertheless, the forward-looking balance sheet approach can still provide useful information with which to assess the sustainability of current policies.

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1/ For a full derivation of equation (3), see: Horne (1991) or Zee (1988).

For the government accounts, this approach would include on the asset side of the balance sheet both the current stock of government assets and the present value of anticipated future revenue from both tax and nontax sources. For example, this approach could include foreign and domestic financial assets, and the present value of government-owned mineral rights and shares in public enterprises, as well as the expected stream of future tax revenue. On the liability side, the current outstanding stock of debt and other current obligations would be included as well as the present value of future government obligations, such as pensions and subsidies. As Guidotti and Kumar (1991) point out, this approach underscores the fundamental equivalence between the stock and flow dimensions of fiscal policy. Future streams of revenue and expenditure are as important in determining policy sustainability as are current transactions. The full implications of current policies cannot be appreciated without taking into account the future stream of government revenues and obligations arising from current taxation and spending decisions.

Thus, in this approach, the government's balance sheet identity could be represented as:

$$FA + T + MR + EP + M + K = E + S + ST + HM + NW, \quad (4)$$

where assets, expressed in present value terms, include but are not limited to financial assets ( $FA$ ), tax and nontax revenue ( $T$ ), land and mineral rights ( $MR$ ), equity in public enterprises ( $EP$ ), the imputed net value of the government's cash monopoly ( $M$ ), and the value of government physical and social capital ( $K$ ). The present value of liabilities could include recurrent government liabilities, excluding entitlement programs ( $E$ ), the present value of social insurance, and other entitlement programs ( $S$ ), interest bearing debt ( $ST$ ), and the stock of high-powered money ( $HM$ ). Government net worth is denoted by  $NW$ , which is equal to the sum of government assets ( $A$ ) less the sum of government liabilities ( $L$ ):

$$NW = A - L, \quad (5)$$

In this approach, the government's balance ( $GB$ ) in any given period would be equal to the change in government net worth:

$$GB_t = NW_t - NW_{t-1}. \quad (6)$$

All things being equal, a welfare-maximizing fiscal policy would leave the present value of government net worth unchanged for a given desired long-run level of net worth. For example, a decision to reduce entitlement payments should improve government net worth over the long run by lowering



the stream of future government liabilities. This result could leave room to lower taxes, or reduce the stock of government debt, and thus further other policy goals.

As long as government net worth is positive, the government is regarded as solvent and can meet its future obligations. However, when the government is barely solvent, net worth is close to zero, and the perception of near insolvency could be reflected in the need to pay higher interest rates or a risk premium on government debt, thus pushing the government into actual insolvency. In this case, policy action would be required well before insolvency had been reached.

From an operational point of view, the net-worth approach's main limitation is one of computation. Many variables that could enter the net worth identity simply cannot be measured accurately or indeed measured at all. Yet, for countries in which a significant portion of government revenue is derived from the exploitation of exhaustible mineral resources, the net worth framework may provide a useful approach to the issue of fiscal sustainability. Changes in government net worth caused by upward or downward revisions in the value of mineral rights can profoundly affect public policy and decisions by private agents. These effects may be more or less pronounced depending upon how myopic private and public agents prove to be in assessing future asset and liability streams.

Take for example a country in which oil has just been discovered. Assuming that the oil is owned by the government, the present value of government mineral rights rises. Following permanent income principles, the government could choose to raise spending on, for example, infrastructure, or lower taxes in line with the permanent income equivalent of this change in wealth. Exploiting the discovery will take time, and thus the income from the discovery will be realized only with a lag. In the meantime, the decision to lower taxes/increase spending will have to be financed by government borrowing. Once the discovery begins to produce income, this debt can be retired, leaving the government's net worth unchanged compared with its initial level.

The situation becomes more difficult to work out from the policy perspective when net worth is affected by capital gains or losses caused by changes in the value of mineral rights owing to price fluctuations. This change in net worth introduces a high degree of uncertainty into policymaking as governments cannot be sure how long the increase (decrease) in natural resource prices will last. In an ultra-rational world, during periods of rising prices governments would save the excess over "normal" earnings from mineral exploitation, that is, the capital gain, in the expectation that at some point in the future a capital loss will be sustained as prices move back to or even below their normal level. In practice, however, this is seldom the case. Political pressures often lock governments into a higher level of expenditure well after the effects of the price shock have faded.

This temporary euphoria may be shared by private agents as well. Vaez-Zadeh (1989) found that oil price changes in Venezuela were associated with strong private wealth effects that raised private consumption and capital outflows, even though oil revenues accrued almost entirely to the government and the price effect itself was short-lived. This effect disappeared relatively quickly, but the intensity of the combined public and private wealth effects was such that government policies to dampen inflation and contain the balance of payments deficit should have been much stronger, initially, to take into account this wealth effect.

### 3. Government wealth and optimal resource exploitation

For countries that depend heavily on revenue from exhaustible resources, acceptance of the broad-based net worth approach to assessing the sustainability of fiscal policies also involves assessing the optimal rate of resource extraction. The classic article by Hotelling (1931) on the optimal rate of extraction of exhaustible resources and a later refinement by Hartwick (1977) take as a starting point the need to ensure intergenerational equity. That is, different generations should be treated identically from the standpoint of economic welfare, implying that the current generation should leave behind sufficient resources to permit future generations to enjoy the same level of consumption as the current generation. In the absence of population growth and technical change, and assuming that the stock of physical capital does not depreciate, Hotelling and Hartwick have argued that the optimum rate of resource extraction--that rate at which intergenerational equity is achieved--would be one at which the accumulation of reproducible capital exactly offsets the decline in the stock of exhaustible resources. That is, society would exchange wealth in the ground--exhaustible resources--for physical capital that could be used to replace the spent wealth derived from natural resources. Exploitation of exhaustible resources would be worthwhile as long as the net return on such resources was at least equivalent to the return on reproducible capital, which can be approximated by the interest rate.

This approach carries with it certain unrealistic assumptions, that is static population and the absence of depreciation and technological change, and does not explicitly account for investment in financial assets as a store of wealth. Nevertheless, it would still be possible to maintain per capita consumption constant even in the face of population growth as long as consumption does not grow faster than output (Solow (1986)).

In discussing the role of oil in the Norwegian economy, Tersman (1991) carries the argument further and notes that intergenerational equity could be achieved if society only consumed the return from oil wealth, thus preserving the level of wealth itself. But, he notes, this would not necessarily prevent a deterioration in the level of oil wealth relative to non-oil GDP. Consumption based on a shrinking oil sector would be unsustainable over the long run. Therefore, for intergenerational equity to be preserved, Tersman asserts that consumption, as well as the growth of national wealth itself, should be determined by increases in non-oil output. Pulling the threads of this argument together, in a growing economy the

permanent income owing to oil wealth would be determined by the difference between the real interest rate (the return on oil wealth) and the real growth rate of non-oil GDP (the determinant of consumption). For given values of the interest rate and non-oil GDP and a given level of oil reserves, variations in consumption would depend on the price of oil.

Applied to fiscal policy, this reasoning suggests that a sustainable policy for a country heavily dependent upon revenue from oil resources would be one in which, over the long run, the non-oil fiscal deficit would be less than or equal to the permanent income derived from oil. Putting this back in the net worth context, the stream of payments arising from government commitments, less the stream of revenue from non-oil taxes and from government real and financial assets, would have to be less than or equal to the long-run return on oil exploitation.

### III. Framework for Analysis

The literature reviewed in the previous section gives useful insights on how to approach the problem of fiscal sustainability. In particular, it makes quite obvious that traditional indicators used to analyze the fiscal stance (for example the overall balance) give a limited perspective of the fiscal situation, especially long-run sustainability. However, while alternative indicators address important theoretical issues, trying to apply them can prove challenging. First, the data requirements to compute government net worth and other alternative indicators are much greater. Not only are comprehensive fiscal data needed, but estimating the behavior of the private sector is also required to take into account endogenous changes in the macroeconomic environment. The intensive data requirements limit the applicability of the indicators even in countries that have a good data base. Second, the intertemporal approach used in the construction of alternative indicators rests on crucial assumptions regarding the future evolution of key macroeconomic variables. The time at which a country becomes (or is no longer) solvent is very sensitive to these assumptions. For purposes of policy implementation, it is of limited value to conclude that an economy will be solvent in 50 years (or any other long-term horizon) if economic variables evolve as predicted. A useful set of sustainability indicators must take into account the fact that economic variables are subject to change in the short term, or should at least explicitly define their relevance to the short term.

The horizon of sustainability has another dimension from the policy point of view. Even if it is possible to define a target level for an indicator of long-term sustainability, policy makers are normally concerned with short-term decisions. Practical sustainability indicators should signal whether their short-term policy stance is in the right or in the wrong direction. Policymakers normally obtain this information by setting targets on partial indicators of sustainability, such as the short-term evolution of the ratio of public debt to GDP.

Because of these difficulties, rather than a behavioral model, this paper develops a consistent accounting framework within which projections of the balance sheet of the public sector can be made. The framework is kept as simple as possible so as to be an effective tool for operational analysis. The conclusions derived from this procedure should be considered indicative in nature, given that they depend on extremely simplistic assumptions. Despite its obvious limitations, the framework does give useful insights regarding the fiscal stance and has advantages for operational work. In fact, as we shall see, a simple accounting framework can prove to be a powerful tool for the analysis of fiscal sustainability.

The framework we develop combines a generalization of the existing fiscal sustainability models to include net creditor countries with an alternative accounting for exhaustible resource revenue. The framework treats this revenue as a portfolio transaction. This broader approach allows the analysis of cases not covered under the traditional framework. As we have seen, the traditional approach generally considers that changes in the financial position are a result of the "operation" of the public sector, that is, the normal recurrent flows of revenues and expenditures. In the alternative framework, changes in the financial position can also result from portfolio decisions, that is, changes in the composition of stocks of assets or liabilities.

In the following pages we develop an analytical framework to simulate different time paths of financial and wealth positions for the public sector of oil-exporting countries, given an initial fiscal stance. <sup>1/</sup> It is assumed that the government decides on the level of taxation and nontax revenues, and also on the level of primary (non-interest) expenditure. The primary balance would thus be an indicator of discretionary fiscal policy. The fiscal stance is measured by the overall balance, obtained by adding the net interest bill to the primary balance. Given the initial financial position of the public sector and conditions in financial markets (the level of interest rates), the net interest bill and the fiscal stance can be determined.

1. Oil as a revenue source: Net financial position indicator of sustainability

A particular fiscal stance will imply changes in the financial position of the public sector, which will be reflected in its balance sheet. This

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<sup>1/</sup> The framework presented here is a simplified version of the one used for analyzing the data. The purpose of this is to highlight certain properties of the model which could be obscured in the detailed presentation required for dealing with concrete data. The complete description can be found in Appendix I.

can be written as a simple difference equation, similar to that obtained from the intertemporal budget constraint framework: 1/

$$ST_t = ST_{t-1} [(1+i)/(1+g)] + PB_t, \quad (7)$$

where  $ST$  = Net financial position of the public sector,  $g$  = Growth rate of GDP,  $PB$  = Primary balance,  $i$  = Interest rate.

By definition, the primary balance is given by:

$$PB_t = TR_t - GPr_t, \quad (8)$$

where  $TR$  = Total primary revenues of the public sector,  $GPr$  = Primary expenditure.

For the purposes of this paper we will not distinguish between current and capital outlays, although, as we shall mention briefly, the composition of expenditure will affect the determination of the sustainability of the fiscal stance when a broad definition of public sector assets is considered. Given the countries we intend to analyze, we are, however, interested in distinguishing between oil revenues and other public revenues.

$$TR_t = T_t + P_t, \quad (9)$$

where  $T$  = Non-oil revenues,  $P$  = Oil revenues.

Both non-oil revenue and oil revenue are considered to be policy variables, although policies designed around oil revenue are subject to many constraints. Abstraction will be made of changes in the prospective price of oil, and it will be assumed that the oil price is not affected by policy decisions. We can therefore concentrate on the oil-extraction decisions of the government as the sole determinant of oil revenue.

We assume that the government chooses an extraction rate such that oil revenues remain a constant fraction of GDP until oil reserves are completely exhausted. Given the initial level of oil reserves and of oil revenues,

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1/ For simplicity, unless explicitly stated, all magnitudes are expressed as a percentage of GDP. Also, we are assuming that interest is earned (or paid) on the financial position existing at the beginning of the period. While the algebraic formulation would be slightly different if end of period or average stocks of financial assets and liabilities were used, the conclusions would be essentially the same.

there is an implicit "extraction horizon," that is, the number of years after which the reserves will have been exhausted. Oil extraction has to satisfy the following constraint:

$$R_0 = \sum_{j=0}^n X_j,$$

where  $R_0$  = Initial level of oil reserves (in barrels),  $X_j$  = Oil extraction in year  $j$  (in barrels),  $n$  = Extraction horizon.

Because prices are constant throughout the extraction horizon and the government intends to keep a constant oil revenue-to-GDP ratio,

$$X_j = X_{j-1}(1+g),$$

it follows that:

$$R_0 = X_0 \sum_{j=0}^n (1+g)^j = X_0 \frac{(1+g)^{n+1} - 1}{g}, \quad (10)$$

Solving for  $n$ , we find the extraction horizon. Alternatively, if the government chooses a certain horizon as a policy variable, equation (10) gives the initial extraction volume compatible with a constant oil revenue-to-GDP ratio.

Given the assumptions, oil revenues as a percentage of GDP are, as expected, constant and given by:

$$P_j = Z_0 P_p, \quad (11)$$

where  $P_p$  = Price of oil,  $Z_0$  = Oil extraction in the initial year (in barrels per unit of GDP).

Combining equations (11), (10), (9), and (8) in (7) we obtain

$$ST_t = ST_{t-1} \left[ \frac{1+i}{1+g} \right] + T_t - GPr_t + Q_0 Pp \left[ \frac{g}{(1+g)^{n+1} - 1} \right], \quad (12)$$

where  $Q_0$  = Volume of initial oil reserves (in barrels per unit of GDP).

This equation gives the time path of the net financial position as a function of conditions in financial markets (the interest rate), discretionary fiscal policy (e.g., the tax burden and the level of primary expenditure), and the oil extraction horizon.

The relationship between the net financial position and the fiscal variables in equation (12) is intuitive. A higher level of taxes, for example, will lead to an improved financial position for the public sector in the future. Everything else being equal, higher taxes would translate into a better overall balance and thus into a larger accumulation of financial assets in the case of a surplus, or into lower recourse to debt financing in the case of a deficit. The negative relationship between primary expenditure and the net financial position is a mirror image of the relationship with tax revenues. A higher level of expenditure will worsen the overall balance, leading to a deterioration of the net financial position.

The case of oil revenues is somewhat more complicated. We are assuming that it is desirable to maintain a stable level of oil revenues, so oil revenues will remain constant as a ratio to GDP until the complete exhaustion of reserves. The government thus decides simultaneously on the initial level of oil revenues  $P_0$  (in the same way as the tax burden or primary expenditure are discretionary fiscal variables) and the extraction horizon  $n$ . Our framework was built to consider explicitly the horizon as the policy variable. The negative relationship between the extraction horizon and the net financial position can be interpreted as follows. Given an initial level of oil reserves, a longer extraction horizon would imply that, both the extraction rate and the desired level of oil revenues should be smaller in order to keep oil revenues constant throughout the period. This lower desired level of oil revenues would affect the net financial position in the same way as the other fiscal revenues described above.

The positive relationship between the net financial position and the interest rate is also clear. However, because it relates to the stock of net financial assets in the preceding period, it will have an asymmetric impact depending on whether the public sector is a net creditor or a net debtor. Indeed, a higher interest rate will lead to higher interest earned (or paid) and thus to an improvement (or worsening) of the net financial position in the current period.

Given the assumptions we have made and the expected values for the interest rate and the growth rate of GDP, equation (12) excludes oscillatory time paths. Depending on the value of the parameters, however, the equation

can describe convergent or divergent trends with respect to a steady state equilibrium. While convergence would not guarantee that the steady state is sustainable, an increasingly negative net financial position would certainly imply an unsustainable fiscal stance. In Section IV.3, we use equation (12) to project the net financial position of the public sector for a sample of countries and derive conclusions regarding the potential of this indicator for assessing fiscal sustainability.

## 2. Oil as an asset: Net wealth indicator of sustainability

In the case of oil-exporting countries, part of the variation in the net financial position was financed by selling an asset, oil. In this circumstance, trying to assess the sustainability of fiscal policy with an indicator of the net financial position can be misleading. As previously discussed, the exhaustible character of oil reserves justifies considering oil revenue as a portfolio transaction rather than as current revenue. This being the case, an analysis of the impact of oil sales on the "net wealth" of the government should be made. The ideal case would be to include all real assets of the public sector in the definition of net wealth: given data limitations and the focus of this paper, however, we will concentrate on oil reserves. We will build a simple indicator of net wealth of the public sector by adding to the net financial position the value of oil reserves.

We assume that the present value of future oil revenue flows is a good approximation to the value of oil reserves: 1/

$$VR_t = Q_0 P_p \left[ \frac{g}{(1+g)^{n+1} - 1} \right] \left[ \frac{1+i}{i-g} \right] \left[ 1 - \left( \frac{1+i}{1+g} \right)^{t-n-1} \right]. \quad (13)$$

It can be shown that under our assumptions, the present value of oil reserves is a diminishing function of time. This reflects the fact that extraction will end by completely exhausting the reserves. Thus, in the year after the extraction horizon, when  $t = n + 1$ , the value of oil reserves will be zero.

A sound fiscal policy should take this into account; over time, government income and expenditure should be managed to compensate for the depletion of oil reserves. Adding the value of oil reserves to the financial position, we obtain an equation depicting the evolution of this simple indicator of government "net wealth."

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1/ For a detailed derivation of equation (13), see Appendix I.



$$NW_t = ST_t + VR_t$$

$$NW_t = ST_{t-1} \frac{1+i}{1+g} + T_t - GPr_t + Q_0 Pp \frac{g}{(1+g)^{n+1} - 1} \left[ 1 + \left( \frac{1+i}{1+g} \right) \left( 1 - \left( \frac{1+i}{1+g} \right)^{t-n-1} \right) \right] \quad (14)$$

The relationships between tax revenues, primary expenditure and net wealth are the same as for the net financial position. Higher taxes or lower expenditure will lead to an improvement in the overall balance, in the net financial position, and therefore in the net wealth indicator. The length of the extraction horizon affects the net wealth indicator with respect not only to current oil revenues, but also to the present value of total oil reserves. In both instances, there is an inverse relationship with net wealth. Given the assumption of a constant ratio of oil revenue to GDP, a longer extraction horizon implies lower initial oil revenues and a less favorable overall balance and net financial position.

In a similar vein, the interest rate affects net wealth not only in the same way it affects the net financial position, but also through its impact on the calculation of the present value of future oil revenues. In the case of a public sector with a net creditor position, a higher interest rate implies higher interest receipts, and an improved financial position. Nevertheless, the effect of a higher interest rate on the value of oil reserves will be negative, as a higher discounting factor will result in a lower present value of future oil revenues. Depending on the relative sizes of oil reserves and financial assets, the net impact of variations in the interest rate on net wealth can be positive or negative. In the case of a public sector with a net debtor position, however, a higher interest rate will have an unambiguously negative effect on net wealth.

Equation (14) is a simplified version of the one used in the empirical analysis that follows. Through it, we can also focus on changes in the financial position of the public sector that result from portfolio decisions, that is, changes in the composition of *stocks* of assets or liabilities, and not only from the normal recurrent *flows* of revenues and expenditures. While this approach does not provide conclusive evidence on the appropriateness of fiscal policy in the countries in the sample, the net wealth indicator does provide additional information with which to assess fiscal sustainability. Even in this simplified form, a net wealth indicator can be used to make inferences on how asset management has been conducted and, in particular, if the Hotelling-Hartwick conditions for optimality were at least partially satisfied.

#### IV. Fiscal Policies in a Sample of Oil-Producing Countries

Using the framework developed above, this section examines the implications for fiscal sustainability of policies pursued by a sample of six oil-producing countries: Egypt, Indonesia, Mexico, Nigeria, Saudi

Arabia, and Venezuela. These countries were selected because they cover a broad geographic distribution, are diverse in their dependence on oil, and have pursued different policies in response to sharp fluctuations in oil prices in the last decade and a half.

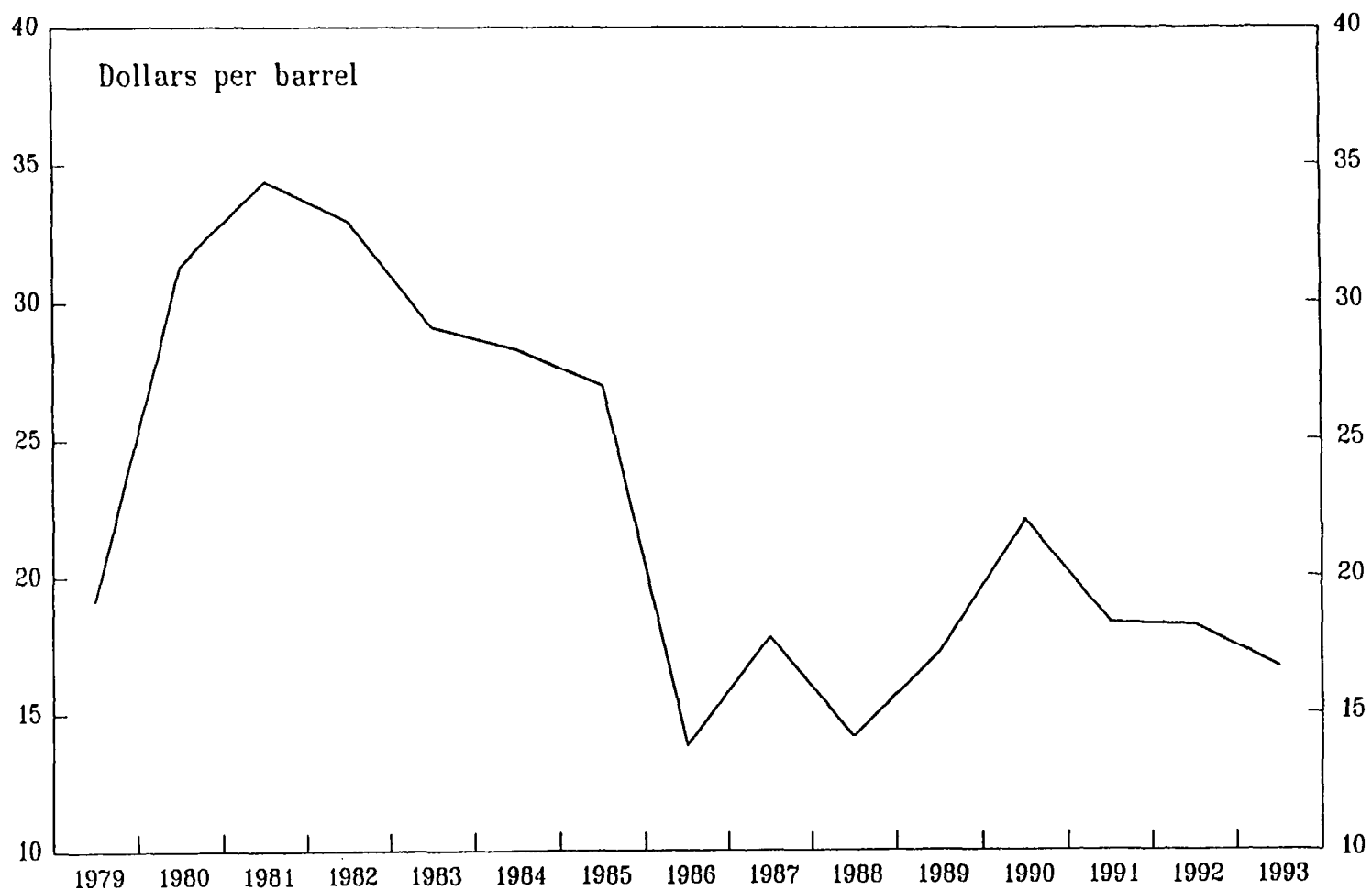
The policy implications for fiscal sustainability are examined by applying the analytical framework described in Section III. The framework, which provides a way of projecting the net wealth and the financial positions of the public sector given a particular policy stance, was used to generate projections of these variables for the above countries. Net wealth is defined, as in the previous section, as the sum of the net financial position and oil wealth. The main components of the government's net financial position are, on the domestic side: domestic public debt and net domestic assets of the central bank (claims by the monetary authority on the public sector less central bank deposits of the public sector and reserve money); and on the external side: external public debt and net foreign assets of the central bank. Projections were made to provide two baseline positions for analysis: "high" oil prices, using the period 1980-82, and "current" oil prices, using the period 1991-92 (see Chart 1). These projections were used to try to answer the questions: (1) how well did these oil-producing countries adjust their fiscal policies to fluctuations in oil prices over the sample period (1980-92); and (2) based on present policies, where are the net government wealth positions of these countries headed?

#### 1. Overview of country characteristics

We are interested in highlighting how differences in natural resource endowment (in this case oil reserves) can affect economic policy. The countries included in the sample have diverse endowments of oil resources, as can be seen in Table 1. These differences relate not only to the volume of resources available in each country, but also to the time horizon over which these resources can be exploited at the current extraction rates. By far the most "oil-rich" country of the sample is Saudi Arabia with over 260 billion barrels in reserves, which at current production levels should last for almost 90 years. At the other end of the scale, Egypt has a little over 6 billion barrels that could last for 18 years. Indonesia, while having somewhat larger reserves than Egypt, is exploiting them at a faster rate, so if the extraction trend were to continue, they would be exhausted in 13 ½ years.

While the above indicators can give a clear picture of the relative abundance of oil resources in these countries, they do not provide information on the dependence of the economy on these resources. For example, while Mexico and Venezuela have comparable oil reserves and extraction horizons, the importance of the oil sector for these economies is quite different. In general, it can be said that the degree to which a country is dependent on its oil resources is closely correlated to the share of oil production in GDP. Economies can be dependent on oil from two different perspectives. The higher the share of oil in total exports, the higher will be the external dependence of the economy, that is, the more it

Chart 1. Oil Price 1/



1/ Simple average of the U.S. dollar spot prices of U.K. Brent, Dubai, and Alaska North Slope crude oil.



relies on oil exports to obtain foreign exchange. On the other hand, the higher the share of oil taxes and royalties in total fiscal revenues, the greater the fiscal dependency, that is, the more the public sector has to rely on oil revenues to finance its operations.

Table 1. Selected Oil-Producing Countries  
Oil Reserves and Extraction Horizon

|              | Oil Reserves<br>(Billions of Barrels)<br>1/ | Extraction Horizon<br>(Years)<br>2/ |
|--------------|---|-------------------------------------|
| Egypt        | 6.2   | 18.1                                |
| Indonesia    | 6.6   | 13.5                                |
| Mexico       | 65.0  | 64.2                                |
| Nigeria      | 17.9  | 25.8                                |
| Saudi Arabia | 260.3                                       | 87.0                                |
| Venezuela    | 64.5  | 64.5                                |

Sources: Organization of Arab Petroleum Exporting Countries, *Secretary General's Annual Report*; and IMF staff estimates.

1/ Oil reserves are end-of-year values reported for 1991.

2/ At extraction rates of 1992.

As expected, there is a strong correlation between external oil dependency and fiscal oil dependency. Chart 2 clearly shows the differences in oil dependency of the countries in the sample. Nigeria, Saudi Arabia, and Venezuela are the most oil dependent, with over 60 percent of export earnings and fiscal revenue deriving from oil during 1980-92. Mexico and Egypt are the least dependent, showing less than 30 percent of both exports and fiscal revenue associated with the oil sector. Indonesia ranks somewhere in the middle.

However, as shown in Chart 3, there seems to be no strong correlation between oil dependency and the fiscal stance, as measured by the overall balance of the public sector. For example, Mexico and Saudi Arabia have run significant fiscal deficits on average in 1980-92, despite substantial differences in oil dependency. Countries with low deficits, Indonesia and Venezuela, also differ drastically as to their reliance on oil. This suggests that factors other than oil price effects have influenced the fiscal stance in these countries. In particular, factors relating to structural characteristics of the economies and to political choices are important.

From 1980 to 1992, the international oil price suffered a major decline, which had significant effects on the public sectors of the oil-exporting countries. The price for the average of the last three years of the sample (1990-92), including an exceptionally high price resulting from the Gulf war, was only 58 percent of the observed price in the first three years (1980-82). Although the collapse in oil prices should affect each

country in proportion to its oil dependency, a comparison of the overall deficit observed in the beginning of the period with that at the end shows significant differences in how each country reacted and adapted to the changed oil market conditions. These differences cannot be explained solely by the differences in oil dependency.

While Egypt and Mexico improved their average overall balance in excess of 10 percentage points of GDP, Indonesia showed only a small improvement of somewhat more than 1 percent. Venezuela and Nigeria, despite wide variations, ended the period with overall deficits not substantially different from those at the beginning of the period. Finally, Saudi Arabia suffered a considerable deterioration in the overall balance of the public sector during the period; much of this deterioration was due to the significant negative impact of the Gulf war on the country's budget (see Table 2). As a result of the observed fiscal stance, and in some countries owing to the effect of significant exchange rate adjustments on the stock of foreign debt, the net financial position of all the countries deteriorated during the period.

Table 2. Overall Balance

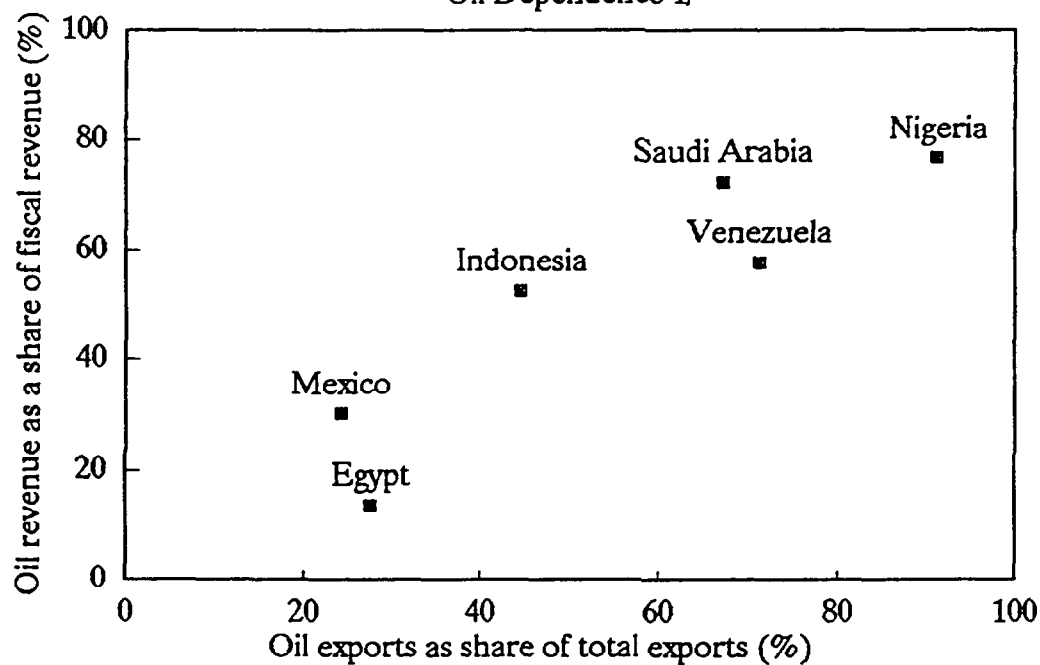
(Percentages of GDP)

|              | Average<br>1980-82 | Average<br>1990-92 | Difference |
|--------------|--------------------|--------------------|------------|
| Egypt        | -27.9              | -9.1               | 18.8       |
| Indonesia    | -1.7               | -0.3               | 1.4        |
| Mexico       | -12.8              | -0.5               | 12.3       |
| Nigeria      | -6.3               | -6.5               | -0.2       |
| Saudi Arabia | 12.3               | -13.0              | -25.3      |
| Venezuela    | -4.0               | -3.6               | 0.4        |

Source: IMF staff estimates.

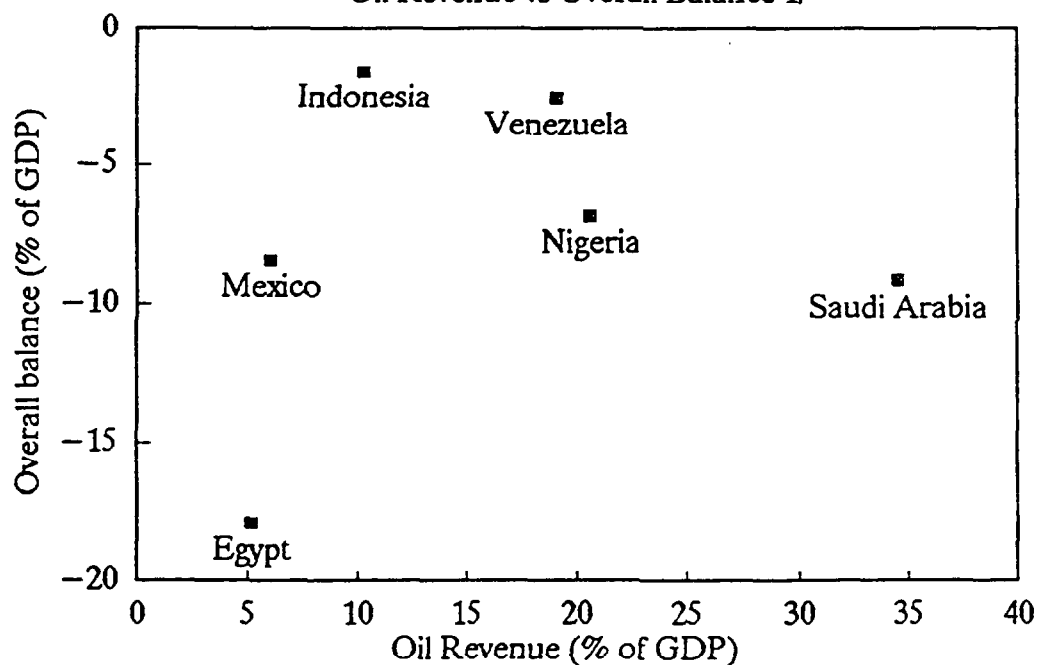
Egypt and Mexico were able to achieve the most significant improvement in their overall balances during the period. These two countries are the least oil dependent, and it can be argued that because of this a deterioration in the price of oil would not affect them as much as the other countries. Nevertheless, it is also true that Egypt and Mexico started with the largest imbalances and thus required the largest adjustment. What is clear from this comparison is that changes in the overall balance are not necessarily a good indicator of fiscal effort. The case of highly oil-dependent countries is particularly illustrative. Despite similar degrees of oil dependence, Saudi Arabia registered a substantial deterioration in its overall balance whereas Nigeria and Venezuela managed to end the period with practically the same overall balances as in the early 1980s. But this tells us little about the way fiscal policy was managed or the role of oil in that management.

Chart 2. Selected Oil Producing Countries  
Oil Dependence 1/



1/ Averages over the period 1980–1992.

Chart 3. Selected Oil Producing Countries  
Oil Revenue vs Overall Balance 1/



1/ Averages over the period 1980–1992.





A clearer picture of the underlying policy response to oil price fluctuations can be seen in the evolution of the non-oil balance (overall balance excluding oil revenue). As shown in Chart 4, in nearly all cases the non-oil balance eroded in the early part of the decade, as high levels of expenditure, boosted by the large increases in revenue from the oil shock of 1979-80, were not reduced despite collapsing oil prices. With some delay, expenditure was cut and some adjustment in the non-oil balance can be seen already in 1985 in most countries.

Comparing the non-oil balance observed in the first years of the period with that of the last years (Table 3) confirms some issues highlighted by the analysis of the overall balance and affords clearer information as to the adjustment efforts of the economies. Once again, Mexico and Egypt, the least oil-dependent countries, show the largest improvement in the non-oil balance, confirming the importance of fiscal adjustment in these countries. Venezuela, and especially Indonesia, show a more significant improvement in the non-oil balance than that observed at the overall level. However, the most interesting information provided by the analysis of the non-oil balance refers to Saudi Arabia and Nigeria. On the one hand, Saudi Arabia showed a significant deterioration in the overall balance while almost no change in the non-oil balance. The deterioration in the overall fiscal position was mainly due to the impossibility of adjusting expenditure fully to the lower levels of revenue, and not to additional expenditure pressure. On the other hand, in Nigeria the overall balance worsened only slightly, but a larger deterioration in the non-oil balance was registered. This reflects major expenditure overruns that were only partly compensated by other policy actions.

Table 3. Non-oil Balance

(Percentages of GDP)

|              | Average<br>1980-82 | Average<br>1990-92 | Difference |
|--------------|--------------------|--------------------|------------|
| Egypt        | -38.1              | -13.9              | 24.2       |
| Indonesia    | -16.4              | -7.5               | 8.9        |
| Mexico       | -17.8              | -5.5               | 12.3       |
| Nigeria      | -26.8              | -33.9              | -7.1       |
| Saudi Arabia | -42.1              | -42.7              | -0.6       |
| Venezuela    | -4.0               | -24.1              | 4.1        |

Sources: Data provided by national authorities; and IMF staff estimates.

## 2. Overview of policies

All the countries included in the sample undertook economic adjustment at some point during 1980-92, and many of these adjustment efforts were supported by stand-by and extended arrangements with the Fund. In some

cases the adoption of adjustment policies represented a last-ditch effort to stave off economic crisis, and the adjustment effort slackened as soon as economic conditions improved (Venezuela, Nigeria). In other cases (Mexico after 1987, Indonesia and Egypt since 1990), adjustment efforts were more deeply rooted in structural measures designed to place the economy on a sustainable growth path for the future and therefore had a more lasting impact on the fiscal accounts and the economy at large. Compared with the other countries in the sample, Saudi Arabia represents a special case because of the unique limitations imposed by the country's resource base and the impact of the Gulf war. These exogenous circumstances constrained the authorities' adjustment efforts in many respects.

Some of the countries in the sample tried to smooth oil export earnings by establishing oil contingency funds or government investment funds. These efforts were generally unsuccessful as political objectives or urgent revenue needs depleted government savings that were preserved in this form. For example, the Venezuelan Investment Fund was established in the early 1970s to act as the repository of the windfall from nationalization of the oil industry and the increase in oil prices in 1973-74. <sup>1/</sup> Its resources were soon diverted toward equity stakes in public enterprises, many of which turned out to be loss makers. During 1990-92, however, some enterprises were sold and the proceeds totalling US\$2.3 billion were used to service the public debt and finance other budgetary spending including certain social and investment projects. Most of the companies established with the windfall revenue of the mid-1970s are still operating as public enterprises, however. An additional attempt was made to save the windfall from the increase in oil prices during 1991-92 through the creation of an oil contingency fund, administered by the central bank. This scheme had limited success, in part because the mechanism itself was complicated to administer and in part because of pressing expenditure needs.

a. Revenue policies

Non-oil taxes

Although the governments of all the countries reviewed here recognized at some point during the sample period the need to diversify government income toward non-oil sources of revenue, only Indonesia and, to a lesser extent, Mexico embarked on this strategy early on in the period. The tax reform process in Indonesia, initiated in 1981, gained momentum during 1983-84 with the introduction of an income tax, a value-added tax, and a sales tax on luxury goods. Other reforms followed in the second half of the 1980s. As a result, the share of government revenue derived from non-oil taxes doubled from an average of 25.9 percent during 1980-82, to 55.8 percent during 1990-92 (Table 4).

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<sup>1/</sup> At various times, Indonesia also experimented with oil contingency funds.

# Chart 4. Non-oil Overall Balance

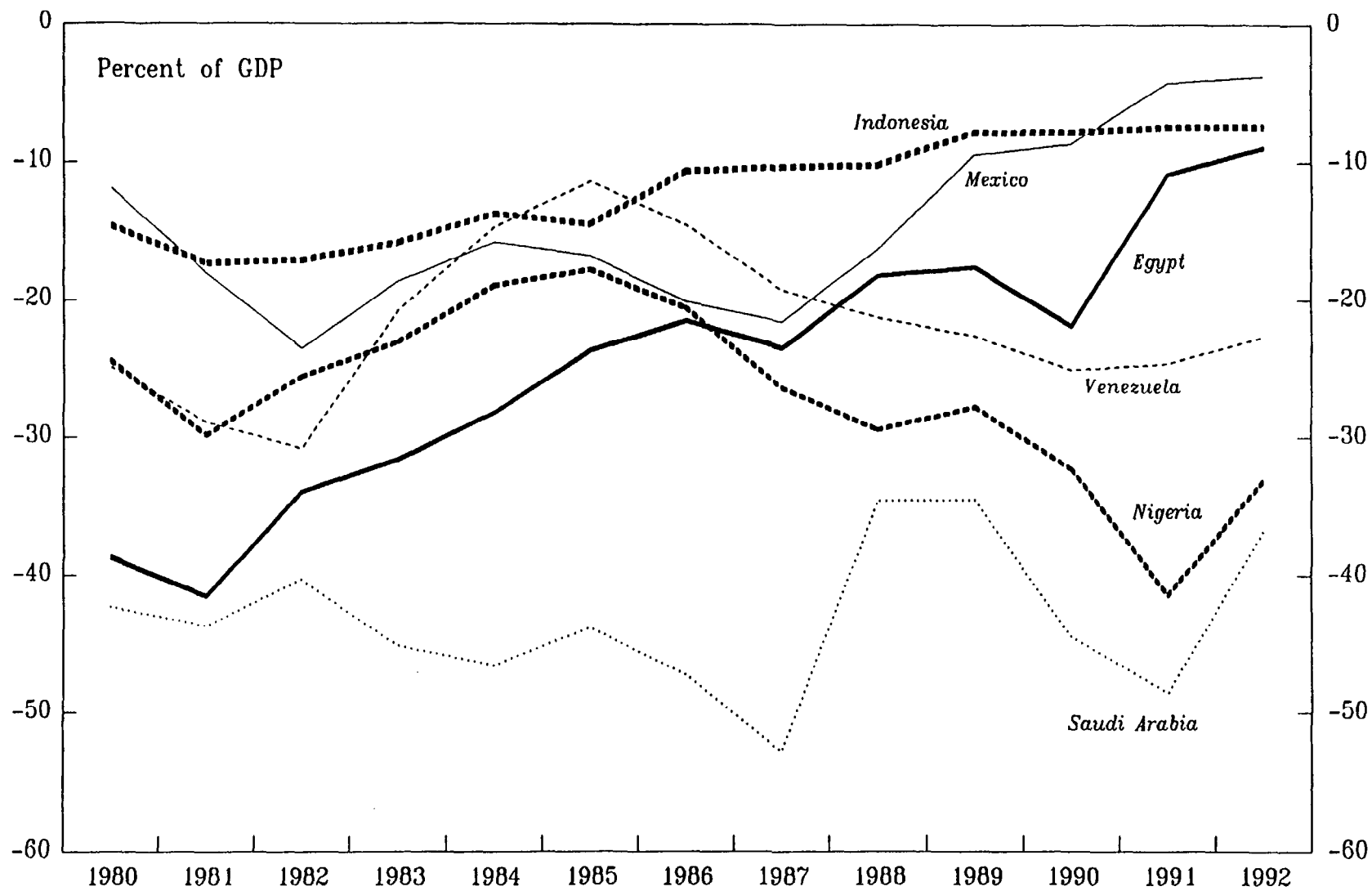




Table 4. Composition of Government Revenue

(Percent of total)

|              | Average 1980-82 |         |               | Average 1990-92 |         |                |
|--------------|-----------------|---------|---------------|-----------------|---------|----------------|
|              | Oil             | Non-oil |               | Oil             | Non-oil |                |
|              |                 | Tax     | Nontax        |                 | Tax     | Nontax         |
| Egypt        | 23.1            | 62.3    | 14.6          | 14.3            | 52.3    | 33.4 <u>1/</u> |
| Indonesia    | 65.7            | 25.9    | 8.4           | 37.2            | 55.8    | 7.0            |
| Mexico       | 28.7            | 60.7    | 10.6          | 21.8            | 53.7    | 24.5 <u>1/</u> |
| Nigeria      | 74.9            | 20.2    | 4.9           | 84.1            | 13.0    | 2.9            |
| Saudi Arabia | 85.5            | 9.0     | 5.5 <u>2/</u> | 76.8            | 13.8    | 9.4 <u>2/</u>  |
| Venezuela    | 67.9            | 19.9    | 12.2          | 71.9            | 15.7    | 12.4 <u>1/</u> |

Source: IMF staff estimates.

1/ Includes revenue from privatization of government-owned companies.

2/ Includes investment income, revenue from the sale and rental of property, operating surplus of public corporations, and revenue generated from the sale of goods and services.

Tax reform in Mexico began in the early 1980s with the introduction of the value-added tax and the development of federal/state revenue-sharing arrangements. The impact of high inflation on real tax payments spurred another reform effort during 1986-88 that focused on recovering the real value of tax revenues and reducing the distortionary elements of the tax system (Shome (1994)). This was followed by another set of reforms in 1989-92, designed mainly to lift revenue through measures to control tax evasion. In contrast to the experience of other countries in the sample, the focus of the tax reform in Mexico concentrated on the income tax rather than on consumption taxes.

In Egypt, non-oil tax revenue declined steadily during most of the 1980s, reflecting the prevalence of specific rather than of ad valorem taxes, the impact of the overvaluation of the exchange rate on customs duty receipts, and foreign exchange shortages which in turn depressed import duty revenue. Comprehensive reform measures--part of a broad economic adjustment program--were taken beginning in 1991 which addressed these problems. In addition, a new income tax and a value-added tax were introduced, and non-oil tax revenue began to recover. In Saudi Arabia, the limited revenue base constrained the authorities' efforts to raise non-oil tax revenue. Nevertheless, such revenue rose to 13.8 percent of total government revenue in 1990-92, from 9.0 percent in 1980-82, owing to improved tax collection and increases in import duties.

In contrast, efforts to raise non-oil tax revenue were sporadic and largely ineffective in Venezuela and Nigeria and their share in total government revenue declined during the period. Venezuela implemented a value-added tax in 1993, but it was replaced in August 1994 by a general sales and luxury tax that maintains a VAT structure with multiple rates.

In Nigeria, attempts were made to improve non-oil taxation, including broadening excise taxes in 1984 and increasing withholding taxes in 1985. However, improvements in non-oil revenue were stymied by weak growth.

#### Domestic petroleum taxes

A common policy in the sample group of countries was subsidization of domestic oil prices. This policy, among other things, reduces revenue from oil produced for domestic consumption, encourages wasteful use of this resource, increases pollution, and diverts oil from exports to domestic use. Data for 1991--the latest available--suggest that subsidization is highest in Nigeria, Venezuela, and Saudi Arabia (Table 5). In these countries, the after-tax price of gasoline was less than 20 percent of the average level in OECD countries. Commitments to raise domestic gasoline prices to levels close to U.S. prices were featured in Fund-supported adjustment programs with Venezuela and Nigeria in 1989-92. However, these commitments were eventually abandoned because of strong popular opposition. Domestic gasoline prices in Egypt, Indonesia, and Mexico were less than 40 percent of the OECD average, but were relatively close to the level prevailing in the United States.

Table 5. Gasoline Prices in 1991

|                   | Pre-tax<br>Price <u>1/</u> | Tax<br>(percent) | Inclusive<br>Price <u>1/</u> | <u>As percent of price of</u><br>United States OECD <u>2/</u> |       |
|-------------------|----------------------------|------------------|------------------------------|---|-------|
| Egypt             | 0.22                       | 27               | 0.28                         | 78.9  | 35.4  |
| Indonesia         | 0.27                       | 10               | 0.30                         | 83.7  | 37.6  |
| Mexico            | 0.22                       | 15               | 0.25                         | 71.3  | 32.0  |
| Nigeria           | 0.07                       | 5                | 0.07                         | 20.7  | 9.3   |
| Saudi Arabia      | 0.14                       | 0                | 0.14                         | 39.4  | 17.7  |
| Venezuela         | 0.06                       | 17               | 0.07                         | 19.8  | 8.9   |
| Average <u>2/</u> | 0.16                       | 12               | 0.19                         | 66.5  | 40.4  |
| United States     | 0.25                       | 42               | 0.36                         | 100.0   | 44.9  |
| OECD <u>2/</u>    | 0.29                       | 172              | 0.79                         | 222.5   | 100.0 |

Source: Gupta and Mahler, "Taxation of Petroleum Products: Theory and Empirical Evidence," IMF Working Paper WP/94/32, 1994.

1/ In U.S. dollars per liter.

2/ Simple Average.

Table 6. Automotive Diesel Prices in 1991

|               | Pre-tax<br>Price 1/ | Tax<br>(percent) | Inclusive<br>Price 1/ | <u>As percent of price of</u><br>United States    OECD 2/ |       |
|---------------|---------------------|------------------|-----------------------|---|-------|
| Egypt         | 0.06                | 0                | 0.06                  | 21.5  | 13.0  |
| Indonesia     | 0.15                | 10               | 0.17                  | 59.1  | 35.9  |
| Mexico        | 0.17                | 15               | 0.20                  | 70.1  | 42.5  |
| Nigeria       | 0.06                | 5                | 0.06                  | 22.6  | 13.7  |
| Saudi Arabia  | 0.03                | 0                | 0.03                  | 10.8  | 6.5   |
| Venezuela     | 0.04                | 0                | 0.04                  | 14.3  | 8.7   |
| Average 2/    | 0.09                | 5                | 0.09                  | 33.1  | 20.1  |
| United States | 0.18                | 55               | 0.28                  | 100.0   | 60.7  |
| OECD 2/       | 0.23                | 100              | 0.46                  | 164.9   | 100.0 |

Source: Gupta and Mahler, "Taxation of Petroleum Products: Theory and Empirical Evidence," IMF Working Paper WP/94/32, 1994.

1/ In U.S. dollars per liter.

2/ Simple Average.

#### Nontax, non-oil revenue

Nontax revenue was an important source of government revenue in Egypt and Mexico. This circumstance reflected, among other things, central bank profits arising from multiple exchange rate arrangements that were in force at different times during the 1980s (Egypt), the earnings of public enterprises (Egypt and Mexico), and investment income of the government. During the latter part of the sample period, privatization of government-owned enterprises became a significant source of revenue for some countries (Mexico and to a lesser extent Egypt). In Mexico, much of the privatization revenue was used to cancel public debt. As this resulted in a reduction in both government assets and liabilities, it had the effect of preserving to some extent the net worth position of the public sector, as well as bringing the public debt burden toward a more sustainable level.

#### b. Exchange rate policy

All countries in the sample made adjustments in their exchange rates during 1980-92, and in some cases the adjustments were very large. For some countries, the exchange rate adjustments caused a sharp, positive, net improvement for the fiscal accounts, while in others, external debt service commitments and the inflationary impact of the adjustment on government wages and purchases left the government accounts worse off.

The exchange system has been a major influence on the public accounts in Venezuela. As the public sector is a net foreign exchange earner, progressive devaluations of the currency contribute strongly to raising public revenues. There were significant devaluations of the nominal exchange rate in 1984 and 1986, and a cumulative devaluation of around 100 percent during 1989-92. The devaluations initially improved the fiscal accounts, but since supportive domestic monetary, fiscal, and wage policies were not sustained, the initial gain was soon dissipated.

In the case of Nigeria and Egypt, the real effective exchange rate appreciated substantially during the first half of the 1980s, retarding development of the non-oil tradable sector and depressing oil receipts (in local currency) and customs receipts, thereby weakening the fiscal accounts. In contrast, Indonesia avoided the continuous appreciation of its currency in the early part of the 1980s by effecting a large depreciation in 1983 after the oil price boom. Another major depreciation occurred in 1986. Inflationary impacts were avoided by combining the devaluation with supporting fiscal and monetary policies, including sharp cuts in development expenditures, tax reform measures aimed at reducing oil revenue dependence, trade and investment deregulation, and liberalization of the financial system. However, a consequence of the devaluation was a sizable increase in the debt-to-GDP ratio and erosion of the net financial position, although the fiscal stance itself improved.

In Saudi Arabia, the exchange rate was modified less than in the other countries, reflecting the country's strong financial position compared with other countries in the sample and its small non-oil tradables sector. In order to support efforts to adjust to declining oil prices, the exchange rate was depreciated by about 11 percent between 1982 and 1987. It was fixed at SRls 3.745 per U.S. dollar in 1987 and has not been changed since.

c. Oil extraction policies

Oil extraction policies have varied among the countries, all of which are OPEC members except Egypt and Mexico, although as OPEC members, the countries have had relatively limited scope to set extraction policies unilaterally, with the exception of Saudi Arabia. Within these constraints, countries have, at the margin, tried to raise extraction rates to compensate for declining oil prices.

As OPEC's swing producer in the early 1980s, Saudi Arabia incurred a significant loss of market share over the first half of the 1980s as high oil prices reduced oil demand and accelerated growth in non-OPEC production. <sup>1/</sup> Since then the country has pursued pricing policies designed to regain market share, and, following the onset of the Gulf war, production increased sharply. In Venezuela, depletion of reserves is a serious concern as, in general, existing oil fields are old and require considerable investment to remain productive and developing new fields will also require heavy

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<sup>1/</sup> Linderoth (1992, p. 1079).



investment. Extraction rates were raised during 1991-92 in response to potential petroleum shortages caused by the Gulf war, which magnified the price windfall for the public sector. Nigeria has been able to improve its fiscal revenue by increasing oil production, assisted by improved oil prices in the later part of the decade. <sup>1/</sup>

d. Expenditure policy

Faced with collapsing oil revenues, all countries in the sample except Saudi Arabia reduced government expenditure as a percentage of GDP during the period. For some, expenditure retrenchment appeared to stick (Mexico, Egypt, and Indonesia), while for others, political pressures led governments to undo expenditure cuts (Nigeria and Venezuela). In other cases, external events affected the pursuit of expenditure reduction (Saudi Arabia after 1991). As might be expected, government capital investment has borne the brunt of expenditure cuts during the period.

In some countries (Mexico and Egypt) disengagement of the public sector from many activities through privatization of public sector firms was an effective expenditure policy tool. This permitted savings in both current and capital transfers as governments no longer had to subsidize losses or underwrite public enterprise investment programs. Increases in administered prices were another policy tool used to improve public finances. Such increases helped those firms that remained in the public sector to be more profitable, thereby reducing the need for transfers to cover losses (Egypt, Venezuela, and Mexico). Some of the countries in the sample also tried to effect savings by holding down the public sector wage bill through stringent wage policies (Mexico and Venezuela). Attempts to control the wage bill by reducing employment were relatively unsuccessful, however.

e. Government debt and asset management

Debt policies and asset management differed significantly across countries. In the early part of the decade debt-to-GDP ratios increased for all the countries (except Saudi Arabia which had no debt of any significance). Both Mexico and Venezuela got into serious debt problems early in the decade by accumulating large amounts of short-term external debt in the early 1980s, and, because of high international interest rates and declining oil revenues, a debt crisis ensued. However, a combination of debt relief and interest rate reduction has contributed to easing the debt-to-GDP ratios and thus the net financial position for these countries. Indonesia, which has a large foreign external debt, by adhering to the "dynamic balanced budget" rule, where budgeted expenditures must be programmed to equal the sum of domestic revenues and foreign borrowing,

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<sup>1/</sup> Oil production approached capacity in 1991 and an investment program is underway to augment sustainable capacity by 0.5 million barrels per day by 1995.

avoided sustained domestic borrowing. 1/ Moreover, a significant portion of Indonesian external debt is on concessional terms which has helped the country avoid interest payment problems. In Saudi Arabia, financial assets were drawn down over the decade to finance balance of payments deficits, reflecting, in part, negative government savings.

### 3. Sustainability of current policies

The different fiscal policies described in the preceding section reflect decisions taken in a context of wide fluctuations in the international oil price as well as other international and domestic shocks. As previously discussed, the result of fiscal policies is reflected in changes in the net financial position of the public sector. On the other hand, changes in nonfiscal variables or in the macroeconomic environment will also affect the net financial position. In order to assess the appropriateness of a given fiscal policy and its implications for sustainability, it is important to distinguish how much of the change in the net financial position is due to fiscal policy and how much is due to other factors.

#### a. Evolution of the net financial position

A brief overview of the net financial position of the countries included in the sample shows that, with the exception of Saudi Arabia, all countries suffered enormous fluctuations. The very high dependence of Saudi Arabia on oil and the relative stability of the non-oil balance throughout the period allow us to use this country as a benchmark for the analysis of the other cases.

During 1980-82, Saudi net public financial assets averaged almost 60 percent of GDP. 2/ They continued to increase during the first years of the period and peaked in 1984 at a level of 85 percent of GDP, despite the collapse in the oil market in 1982, as a result of the surpluses in the overall balance in those years. This trend also reflects the fact that GDP

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1/ The balanced budget rule does not, of course, necessarily ensure fiscal discipline, as long as higher expenditure can be financed by higher external debt. Nevertheless, if the authorities have a binding external debt target, the balanced budget rule can serve as a useful policy framework. In the case of Indonesia, despite its shortcomings, the balanced budget rule played an important role in limiting the buildup of public debt. Since the late 1980s, the authorities have aimed to reduce foreign debt exposure, especially for commercial debt. Moreover, the requirement that the budget be always balanced may have strengthened the ability of policymakers to make decisive cuts in expenditure during times of declining oil revenue.

2/ The net financial assets of the public sector, for all countries, are defined as: net foreign assets of the monetary authority less the external debt of the public sector, plus the net domestic assets of the central bank, less the domestic debt of the public sector.

(the denominator of the ratio) suffered a sharp contraction during 1983-85. <sup>1/</sup> The financial position deteriorated over the rest of the period covered by this study. The stability of the non-oil balance (a deficit of 42.1 percent of GDP in 1980-82 compared with 42.7 percent in 1990-92) and the relative stability of the exchange rate compared to the other countries in the sample suggest that the deterioration reflects mainly a lack of adjustment in response to the change in the international price of oil.

The smooth trend in the net financial position of the Saudi public sector contrasts with strong fluctuations observed in all the other countries. In contrast to Saudi Arabia, at the beginning of the period the public sectors of all the other countries in the sample were running overall deficits that were aggravated by the collapse in the oil price and these deficits were reflected in a deterioration in their net financial position. In some cases, however, the deterioration was sharper than in others, revealing differences in policy choices and domestic shocks.

Of particular importance are exchange rate shocks. Given that in some countries a significant part of the public debt is foreign, or denominated in foreign currency, a devaluation of the exchange rate will induce important variations in the net financial position that have no correlation with changes in the fiscal stance. We do not mean by this that exchange rate variations are independent from the fiscal stance. In effect, the observed devaluations in the countries of the sample were frequently a result of an excessively expansionary fiscal stance. Rather, we are referring here simply to the variations in the stock of public assets and liabilities that are not due to actual revenue and expenditure flows, but to the accounting effect of exchange rate variations. This effect can be seen quite clearly in the case of Mexico in 1982 and 1986, Venezuela in 1986 and 1989, Indonesia in 1986, Nigeria in 1986, and Egypt in 1991.

Privatization and debt relief also affect the net financial position. As in the case of exchange rate shocks, the net financial position will register significant variations that do not result from normal revenue and expenditure flows. For example, the liquidation of debt by means of privatization explains an important part of the improvement in the financial

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<sup>1/</sup> In this case, it would seem that the "broad" indicator of the fiscal situation (the net financial position) gives misleading information in the short term. With a collapse in oil prices, one should expect a deterioration in the fiscal situation, as is very clearly shown in the evolution of a more "narrow" indicator: the overall balance. This conventional measure of the fiscal situation drops from a substantial surplus of 22.7 percent of GDP in 1980 to a small surplus of only 0.3 percent of GDP two years later. This divergence only confirms that any indicator of the fiscal stance is partial, and that more than one indicator is needed in order to adequately assess the fiscal situation.

position of the Mexican public sector after 1988. That debt relief has also played an important role in the evolution of the net financial position is particularly evident in the case of Mexico after 1988 and Egypt after 1991.

b. Projections of net financial position as sustainability indicators

It is clear from the description of the net financial position, that by 1990-92, all the countries in the sample are worse off than at the beginning of the period of analysis. But it is not clear how much of this situation is due to nonfiscal shocks and how much to inappropriate policies. To assess sustainability, we need to isolate the nonfiscal effects from the net financial position. Using the analytical framework developed in the previous section, we make a 10-year projection of the net financial position that would have resulted if macroeconomic conditions were unchanged and the fiscal stance pursued during the years of "high" oil prices (1980-82) had been continued. The results of this projection for each of the countries in the sample are plotted in Charts 5a to 10a, as well as the observed evolution of the net financial position and another projection using 1990-92 as base.

For all the countries in the sample, except Saudi Arabia, the projected net financial position from 1980-82 has a declining trend. In the case of Saudi Arabia, the fiscal stance, combined with the relatively high price of oil would have allowed a continued accumulation of assets. For the other countries, the downward trend could be interpreted as meaning that given the macroeconomic environment of the beginning of the 1980s--including the high price of oil--the fiscal policy pursued would have led to a deteriorating financial position. In other words, the continuation of the fiscal policies of the beginning of the decade could only have been possible with increasing levels of indebtedness or even higher oil prices. For all these countries, the observed net financial position deteriorated faster in the first years of the period than might have been expected from the projection, because the macroeconomic environment suffered unfavorable changes, mainly the collapse of oil prices and the increase in international interest rates. In some countries, these unfavorable external factors were compounded by inappropriate domestic policies.

The policy recommendation for these countries was obvious. Despite the high price of oil in international markets, the average fiscal stance of 1980-82 would sooner or later have led to an unsustainably high level of debt. Fiscal adjustment was required. In some countries the adjustment would have to be substantial, not only because the imbalance was large (Egypt, Mexico), but also because the level of debt relative to GDP was significant (Egypt, Nigeria, and Venezuela). The adjustment in the case of Indonesia would seem easier as both the deficit and the level of debt were not as large as in the other countries. Finally, if the macroeconomic environment would not have changed, the fiscal stance in Saudi Arabia would not have posed a problem from the point of view of the net financial position.

Chart 5a  
**EGYPT**  
Net Financial Position

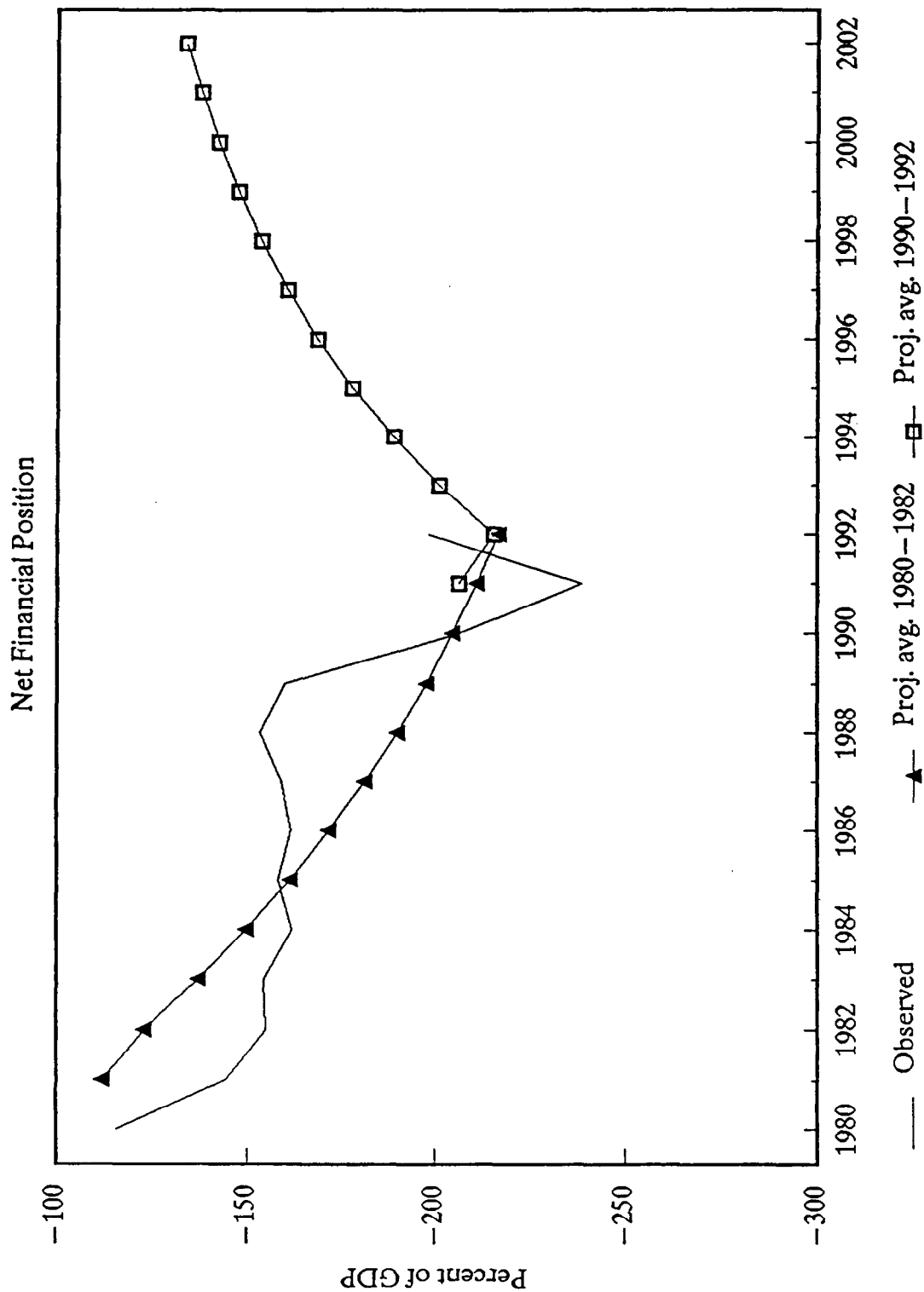




Chart 6a

# INDONESIA

Net Financial Position

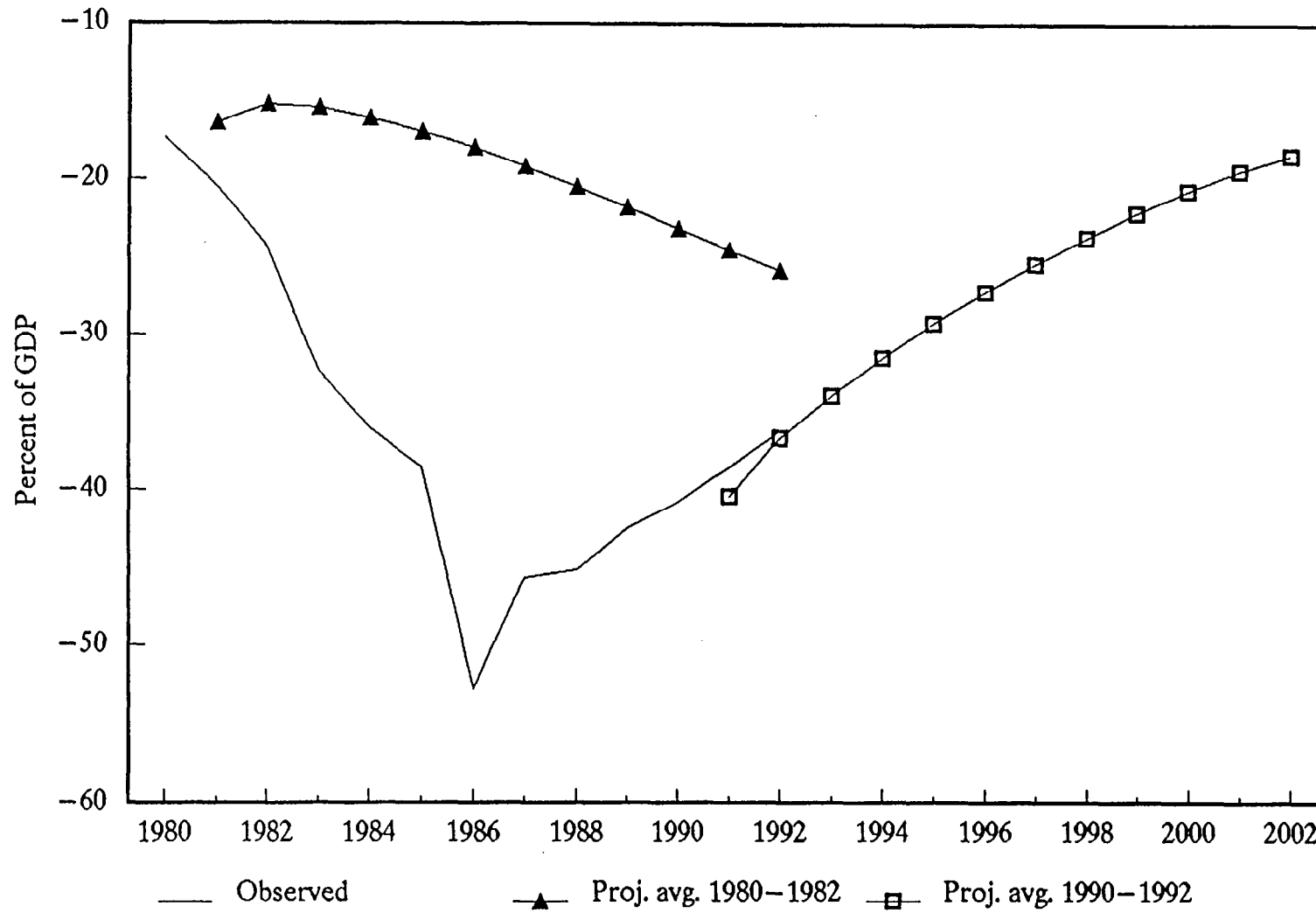






Chart 7a

# MEXICO

Net Financial Position

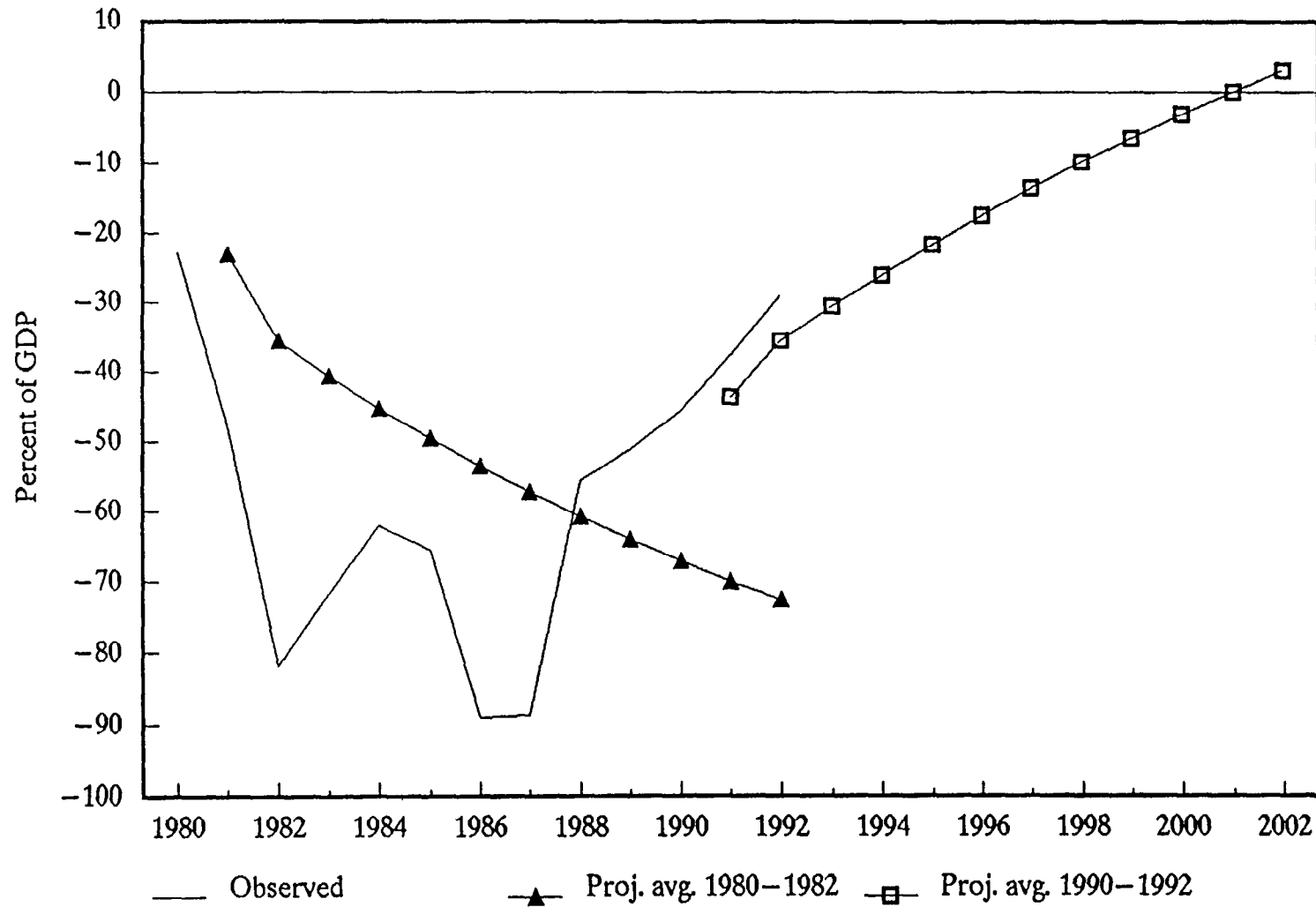




Chart 8a

# NIGERIA

Net Financial Position

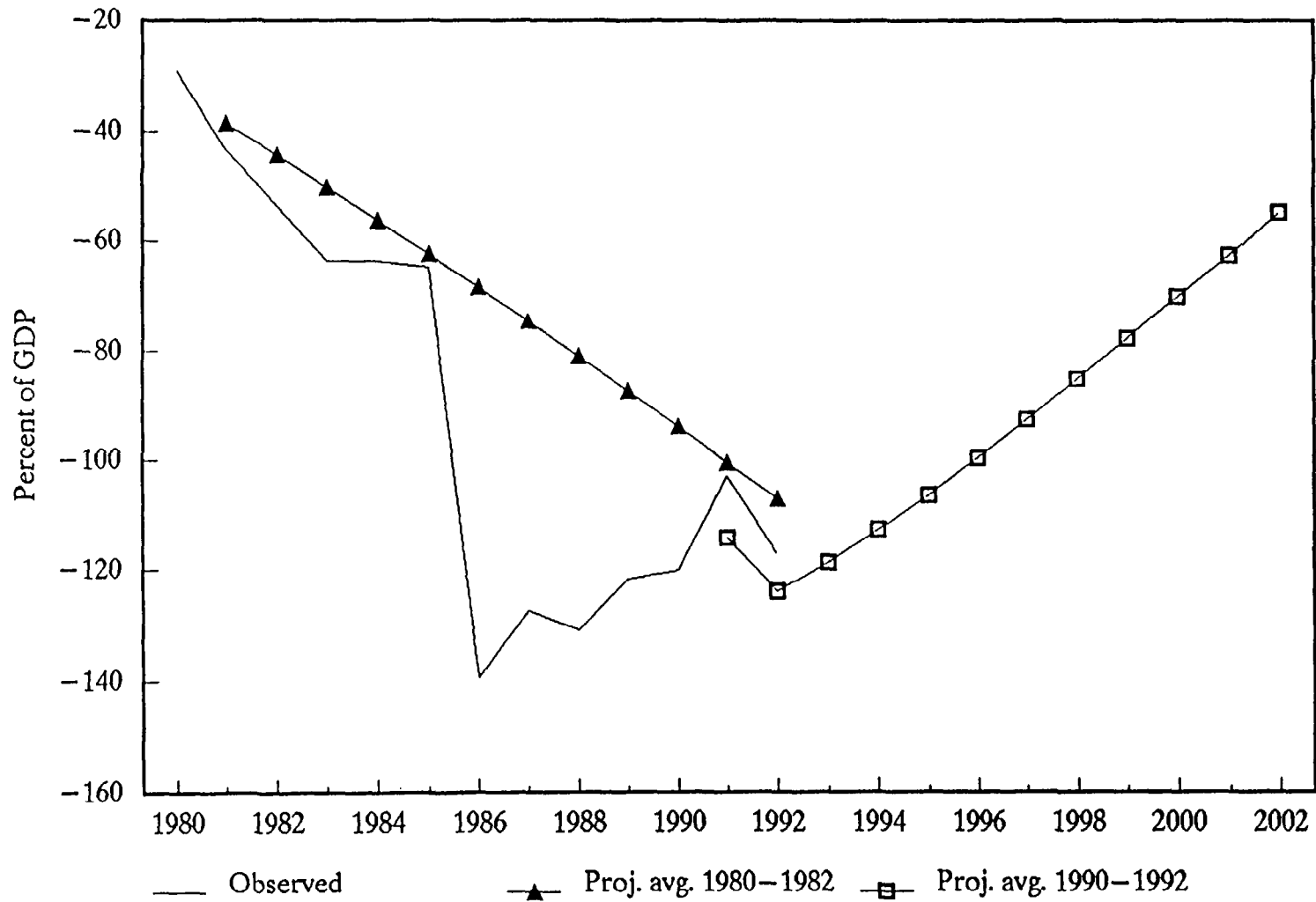




Chart 9a

# SAUDI ARABIA

Net Financial Position

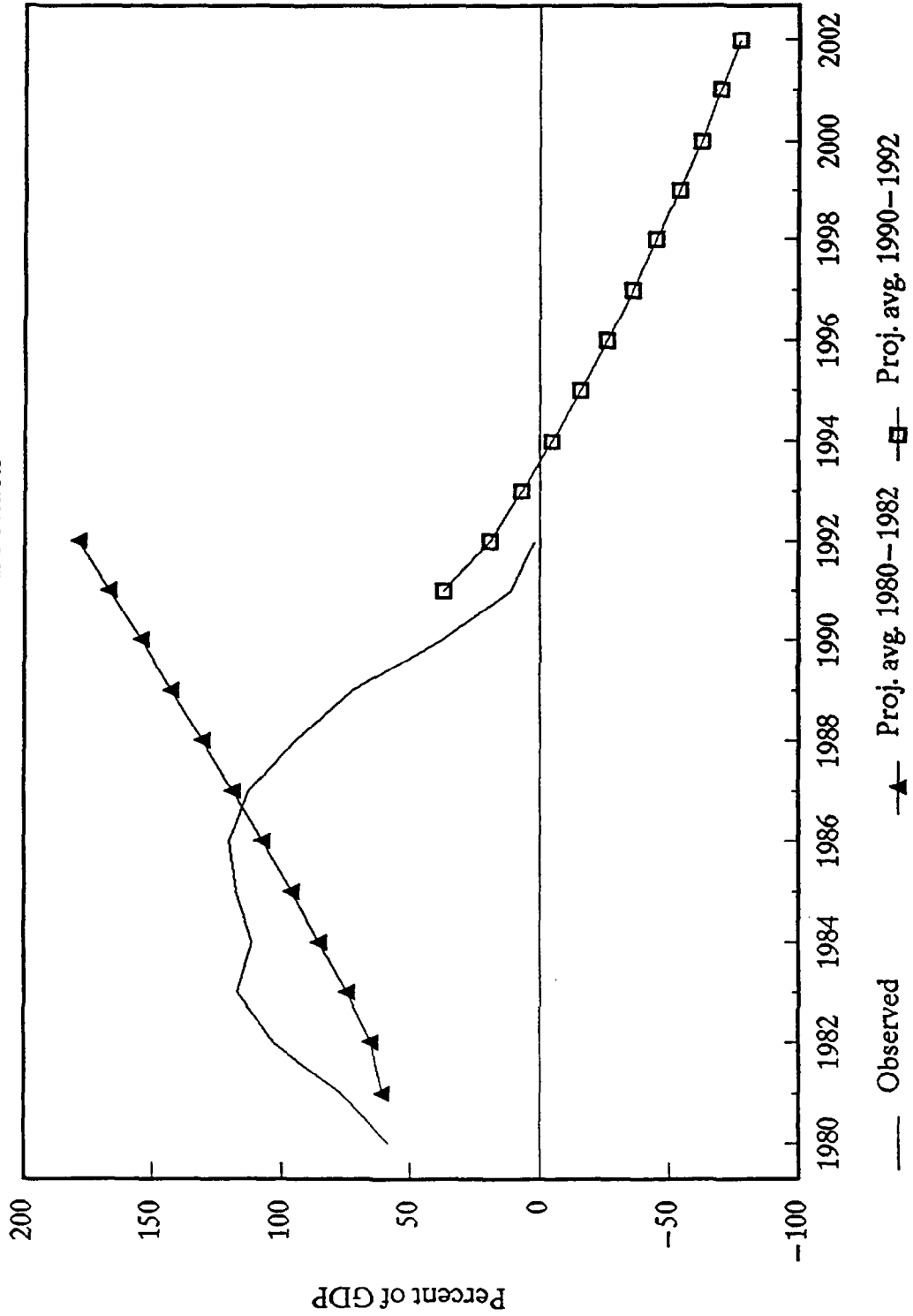
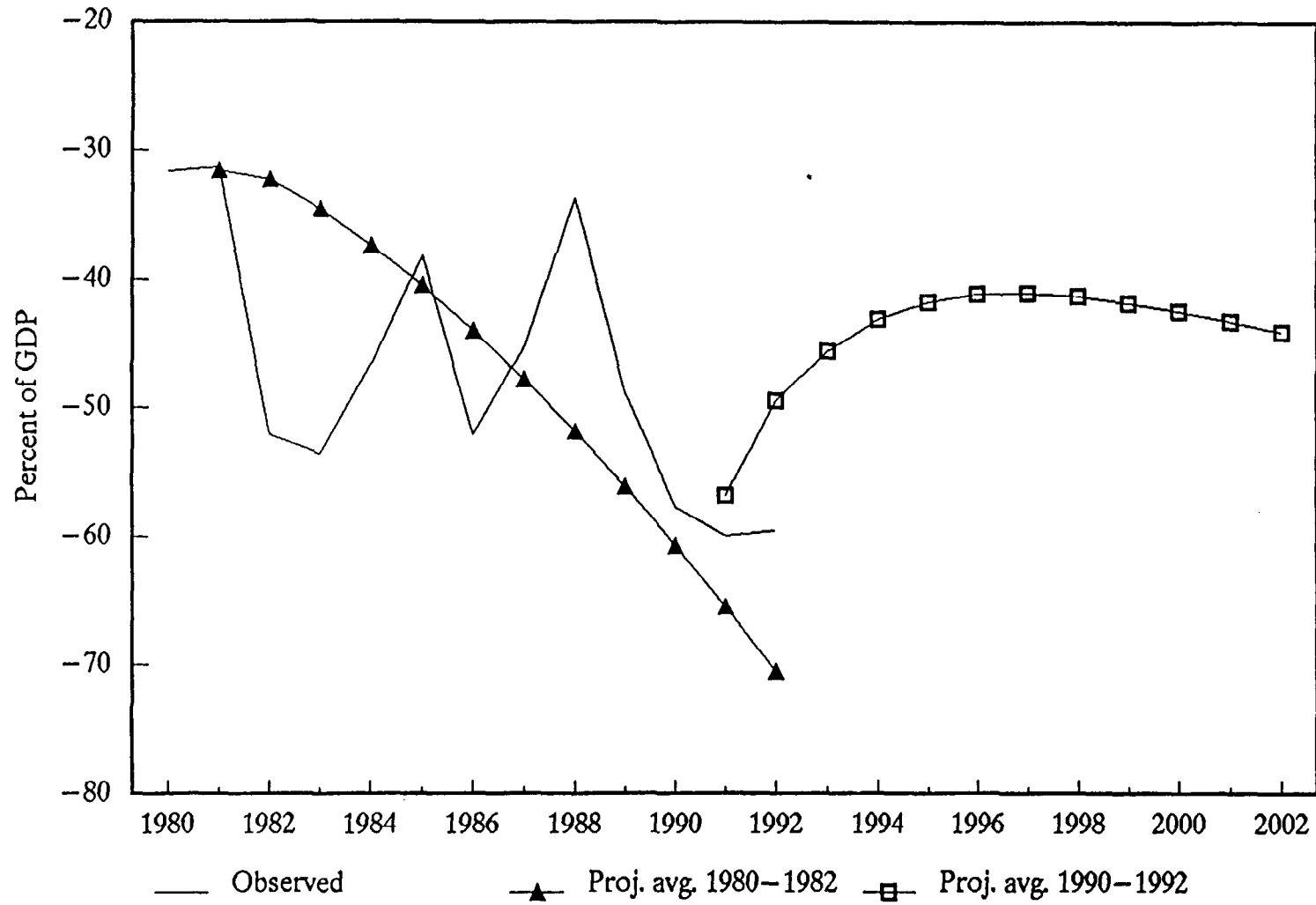




Chart 10a

# VENEZUELA

Net Financial Position







Given the unsustainability of the policies in most countries in the sample, the next question that needs to be addressed is to what extent these countries adjusted to the changing macroeconomic conditions. Using the framework, we projected the net financial position that would result if the average fiscal stance of 1990-92 were pursued until the end of the century.

Saudi Arabia is once again an exception, in the sense that the projection for this country diverges from those of the other countries. The observed net financial position worsened progressively over the period. We explained this by the inability to adjust the fiscal accounts in the context of collapsing oil prices, which induced a run-down of assets, and an increase in, mainly, domestic debt to finance the growing fiscal deficit. If this fiscal stance were to continue, the net financial position would deteriorate even further. In some sense, Saudi Arabia is in 1990-92 in a situation similar to that of the rest of the countries of the sample in 1980-82.

The projections for the net financial position of the public sector for the other five countries show an improving trend, which in some cases-- Egypt, Indonesia, Mexico, and Nigeria--is quite substantial. For Venezuela, the projected net financial position improves in the first years after 1990-92, but then, owing to a high level of debt and the accumulated interest burden, it reaches a ceiling and starts to deteriorate after 1997. This would suggest that the fiscal adjustment, while in the right direction, was not sufficient to produce a turnaround in the trend of the net financial position.

As a preliminary conclusion, it could be said that fiscal adjustment in Egypt, Indonesia, Mexico, and Nigeria was successful during the sample period. Also, despite the larger levels of indebtedness owing in part to exogenous effects, the average fiscal stance of 1990-92, if maintained, was such that the net financial position of the public sector in these countries would improve and even become positive at some future date. In the case of Venezuela, the 1990-92 position would need to be strengthened to ensure an improvement in the net financial position. The measures taken up to 1990-92 would induce a temporary improvement but would eventually prove insufficient for a viable fiscal position.

However, the conclusion that the adjustment process has been successful in some of the countries in the sample, and that the fiscal stance is now sustainable, must be made with caution. Indeed, traditional accounting includes oil revenue as part of recurrent revenues, which can be misleading in assessing the sustainability of the fiscal stance. Because oil reserves are ultimately going to be exhausted, governments should not rely on oil revenue to improve their net financial position over the long run. Within the broader perspective discussed above, oil revenues should be considered as the sale of an asset, and therefore the changes in the net financial position would not be the relevant indicator of improvement or deterioration of the fiscal situation. Instead, the analysis should center on the changes of a broader definition of wealth. In the "successful" countries of the sample, the level of public indebtedness was reduced, but so were oil

reserves. The next question that should be addressed is in what measure was the decline in oil reserves compensated by the reduction of debt. In other words, was it worth paying off a liability by selling an asset? The answer should be sought in the evolution of what we have defined as "net wealth." <sup>1/</sup>

c. An alternative view: Net wealth indicator of sustainability

Charts 5b to 10b show the evolution of observed net wealth for the countries in the sample and two projections of this indicator using as a base, as in the case of the projections for the net financial position, the average fiscal stance during 1980-82 and 1990-92.

With the exception of Egypt, the value of oil reserves compensates for the negative net financial position, resulting in positive net wealth for the rest of the countries in the sample throughout the period. Since the volume of oil reserves in Egypt is small and the level of indebtedness of the public sector large, the evolution of net wealth is mostly determined by changes in the net financial position. For the rest of the countries, the observed evolution of net wealth shows a very irregular pattern, differing in some cases substantially from the path of the net financial position. This is because variables affecting the value of oil reserves--discovery of new oil fields, extraction rates, and mostly international prices--suffered substantial changes during the period.

The effects of changes in the price of oil can be clearly identified. Net wealth decreased significantly for all the countries in the sample as a consequence of the collapse of oil prices in 1986. Symmetrically, the sharp increase in prices during the Gulf war of 1990-91 resulted in higher values of the net wealth indicator, which are particularly visible in the case of Venezuela and Nigeria.

We have previously mentioned that exchange rate variations could have significant effects on the net financial position. In the case of net debtor countries, an exchange rate depreciation worsened the financial position. However, exchange rate movements also affect the measurement of oil reserves and do so in the opposite sense, given that oil is an asset. The exchange rate effect can even compensate for variations in the oil price. For example, despite the collapse in oil prices in 1982-83, the net wealth for Mexico experienced a marked increase, while in the rest of the countries the indicator registered a reduction. This discrepancy is explained by a fivefold depreciation that increased the domestic currency valuation of oil reserves in Mexico. In the three countries with the smallest variation in exchange rates during the period--Saudi Arabia, Indonesia, and Egypt--the net wealth indicator has a clear downward trend, reflecting on the one hand the increased levels of indebtedness and on the other hand the physical depletion of oil reserves. In contrast, Mexico,

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<sup>1/</sup> Equal to the net financial position plus the value of the oil reserves.

Chart 5b

# EGYPT

Net Wealth

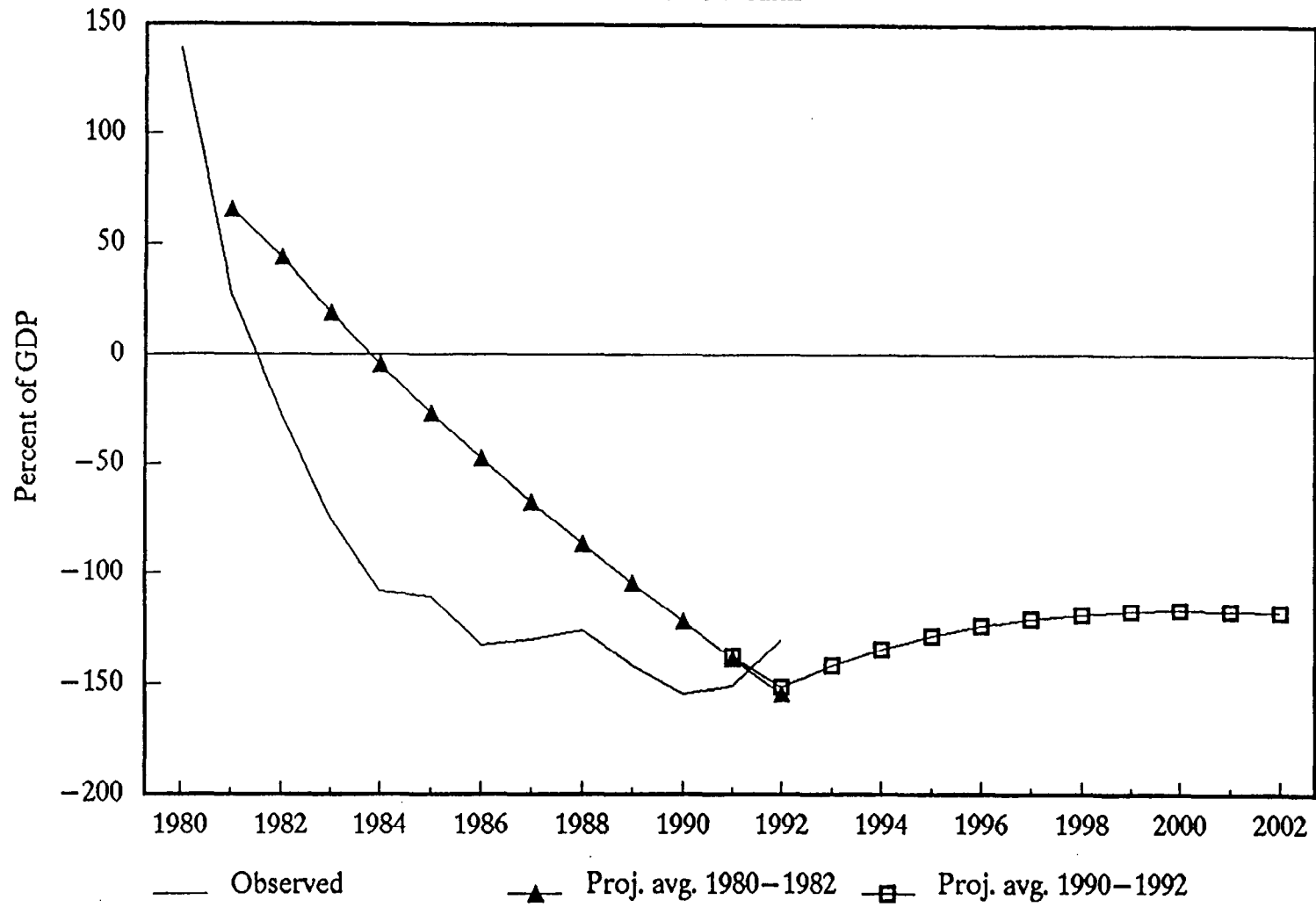




Chart 6b

# INDONESIA

Net Wealth

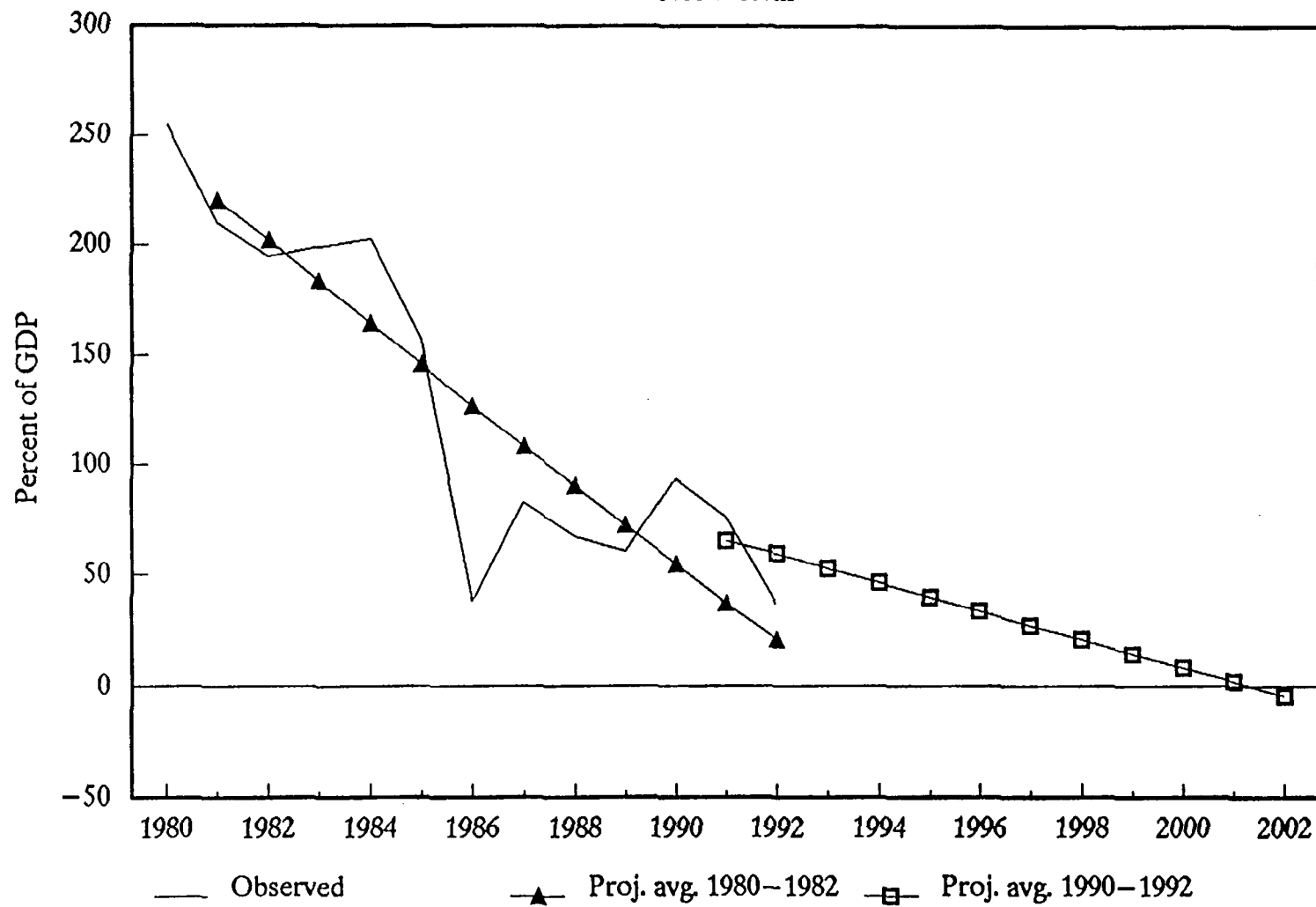




Chart 7b

# MEXICO

Net Wealth

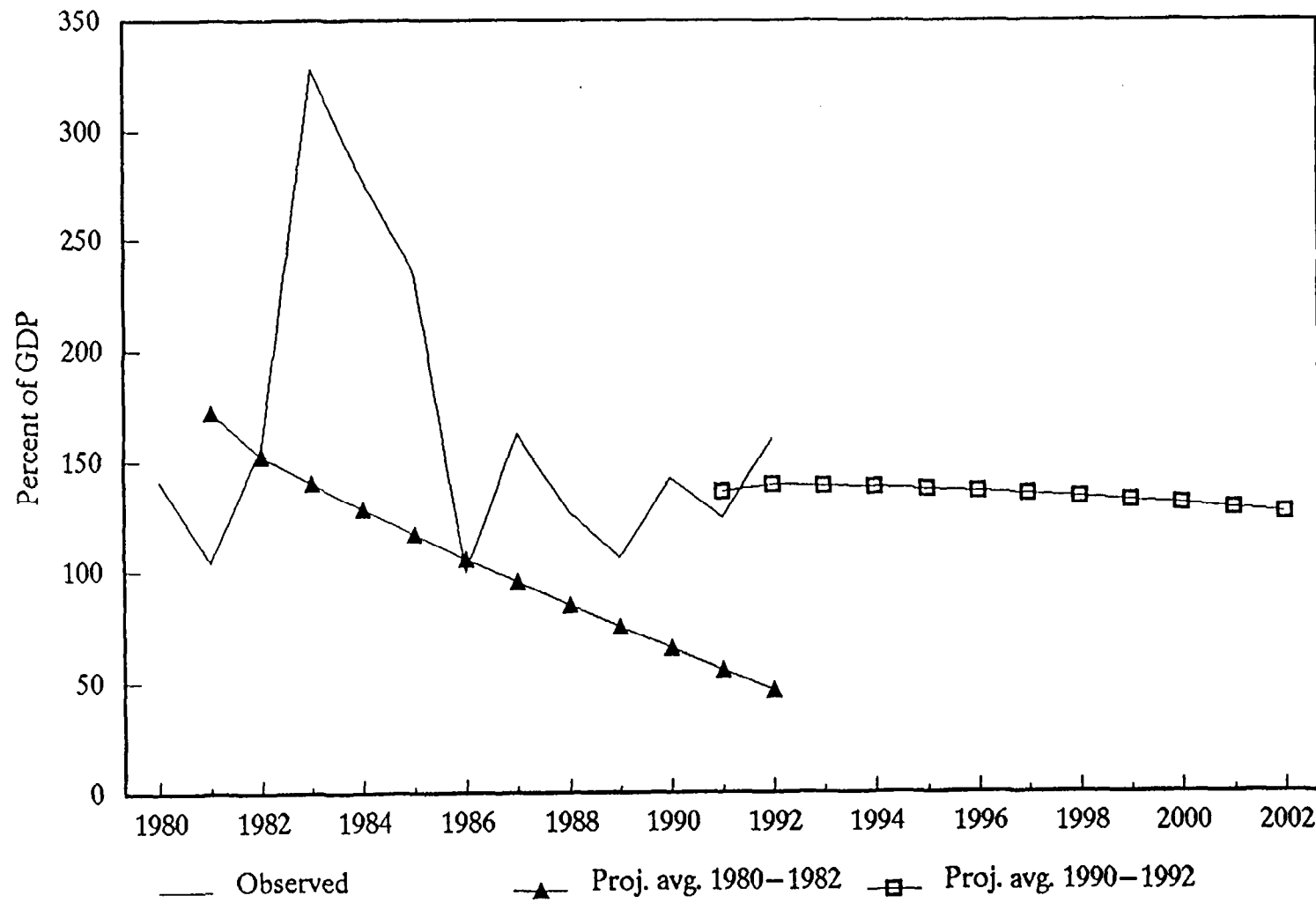






Chart 8b

# NIGERIA

Net Wealth

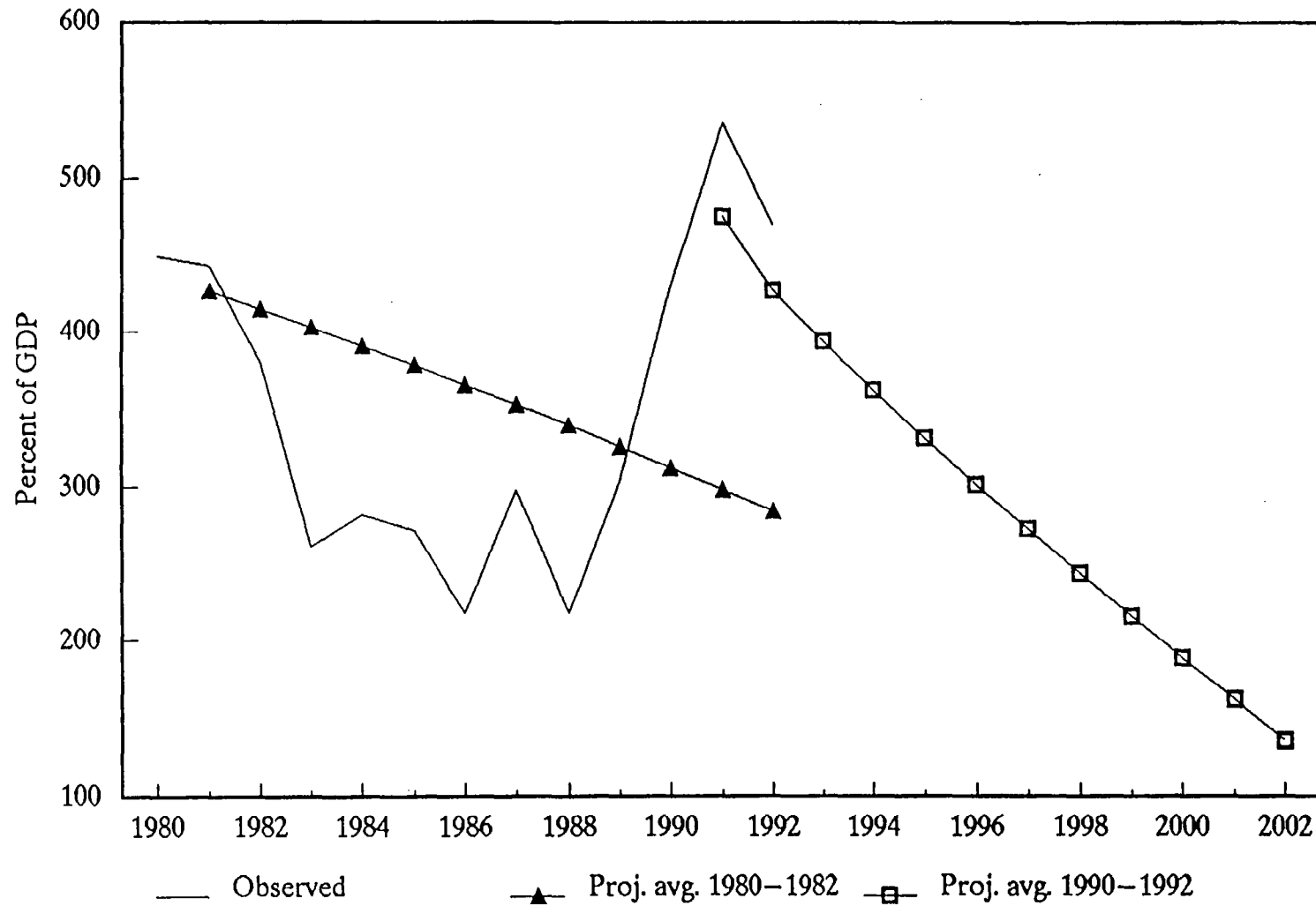




Chart 9b  
**SAUDI ARABIA**  
Net Wealth

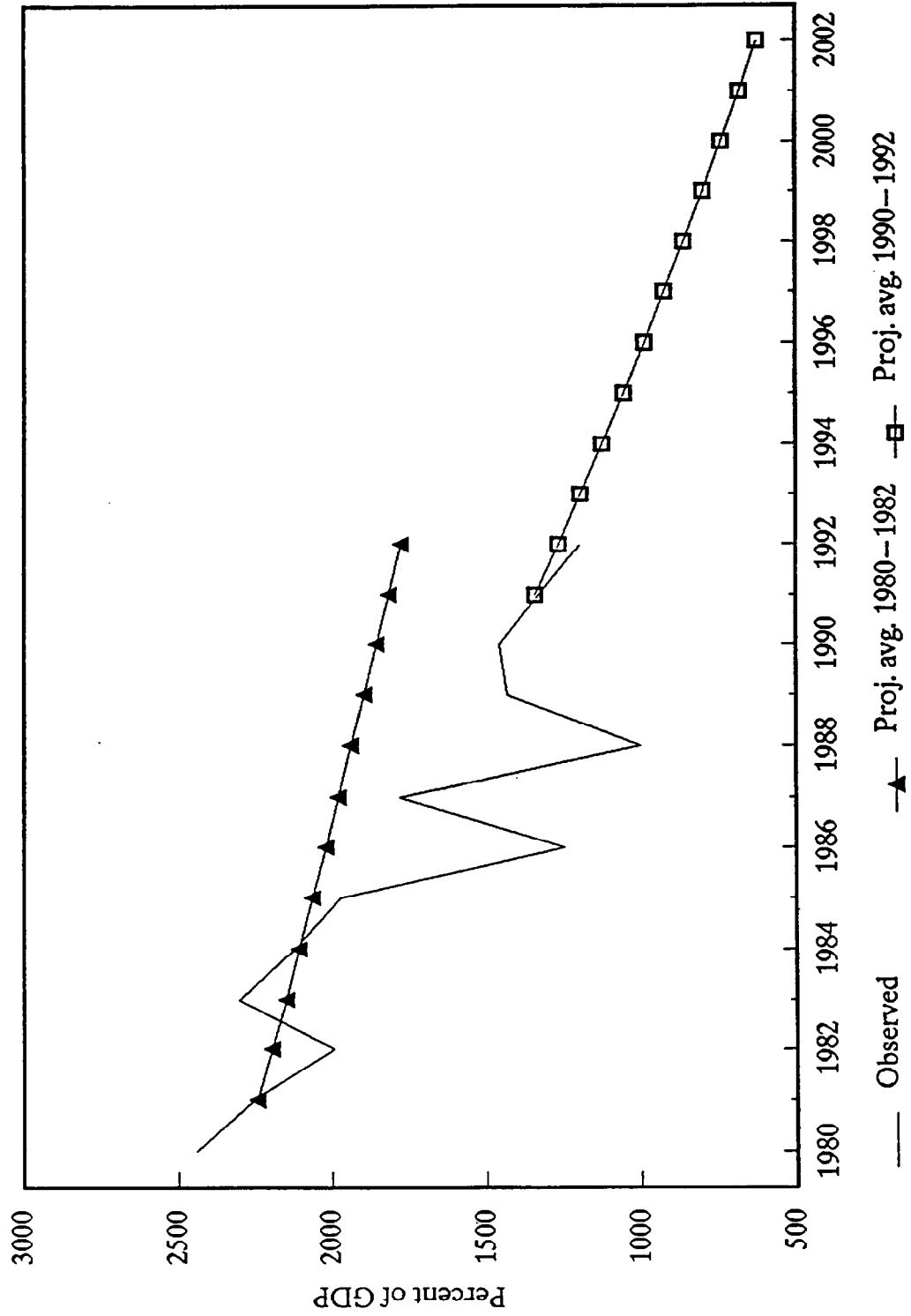
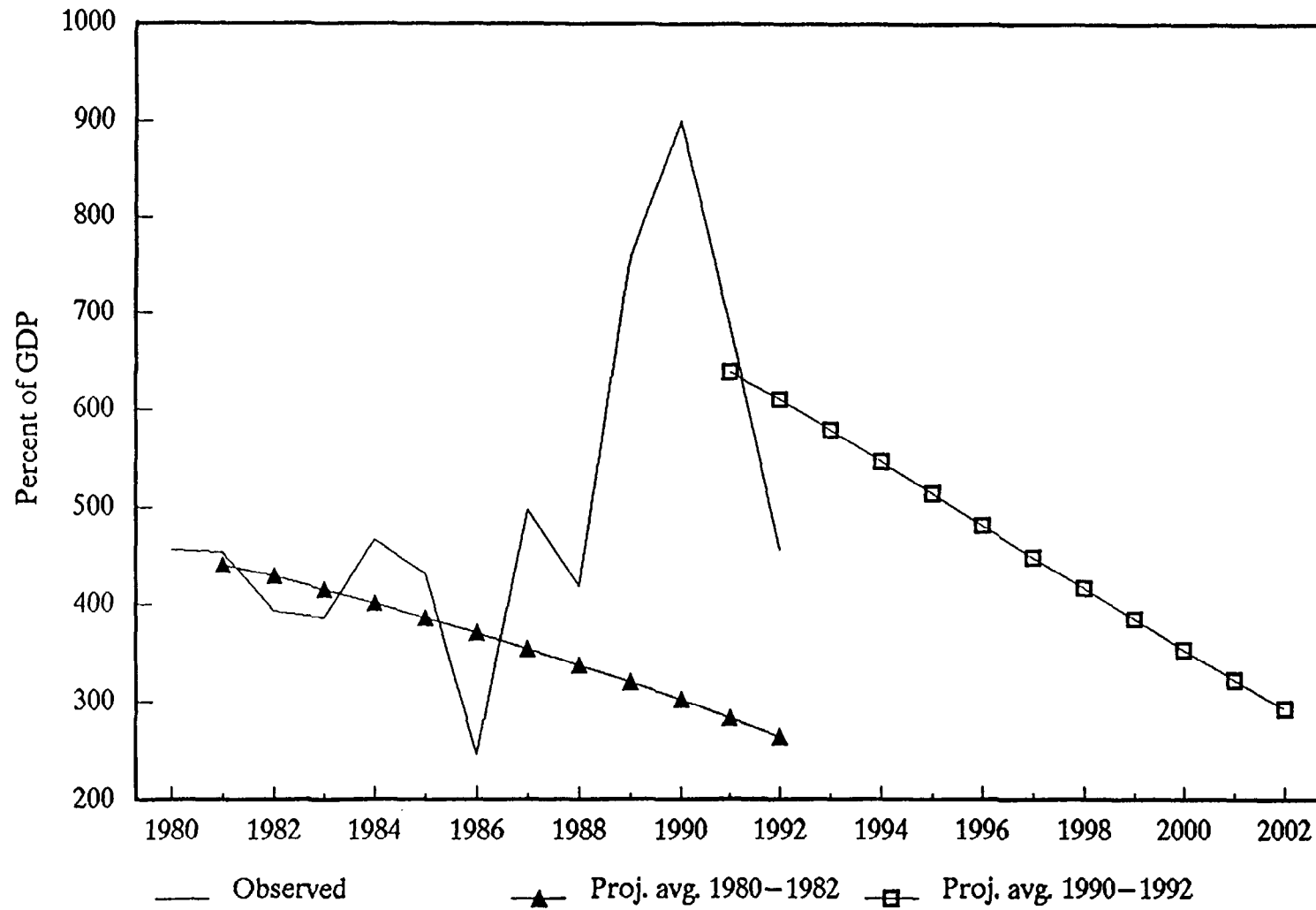




Chart 10b

# VENEZUELA

Net Wealth





Nigeria, and Venezuela experienced very large exchange rate depreciations, which resulted in a fluctuating level of net wealth throughout the period, ending at a slightly higher level in 1992 than in 1980. This accounting effect hides the fact that the physical volume of oil reserves actually diminished in these countries.

For all the countries except Saudi Arabia, the projections of net wealth based on the average fiscal stance of 1980-82 confirm the insights provided by the projections of the net financial position, namely that the fiscal stance of the beginning of the 1980s, if continued, would have led to an unsustainable situation. For all these countries, net wealth would have been eventually depleted.

In the case of Saudi Arabia, the projection of the net financial position had an upward trend revealing that the fiscal stance and the macroeconomic environment of 1980-82 would have allowed for a continued accumulation of financial assets. However, once oil wealth is taken into account the projection of net wealth has a negative slope despite the accumulation of financial wealth, meaning simply that over the very long run, the net wealth of the public sector would face a declining trend as oil reserves were exhausted.

In the case of Venezuela, where the projection of the net financial position pointed toward an insufficiently restrictive fiscal stance, the net wealth projection shows a more serious situation. Contrary to the stable situation projected for the net financial position, net wealth decreases sharply in the medium term, and as in the case of Saudi Arabia, even at a faster rate than what was implied by the fiscal stance of 1980-82.

An even more radical turnaround is shown in the cases of Nigeria and Indonesia. For these countries, the projection of the net financial position showed a clear improvement, while the projection of net wealth shows a deterioration. These are clearly cases in which the improvement in the financial position would be achieved by selling oil, and it is not certain that in the medium term they would be better off. Interesting details become apparent with this indicator. For example, while in Nigeria net wealth would decrease at a faster rate than in 1980-82, showing a loosening of the fiscal stance, in Indonesia the rate of reduction of net wealth slowed down, suggesting improved fiscal management.

Finally, the cases of Mexico and Egypt are also quite illustrative. The projections for the net financial position showed marked improvements, while the net wealth indicator was only stabilized during the period. Cancellation of debt by selling oil would seem to explain this stabilization. However, once again, a broader picture of net wealth of the public sector could offer a different view. To the extent that at least some public expenditure is devoted to investment, including the stock of public capital would reveal an upward trend in the net wealth indicator. If this was to materialize, we would have more elements to qualify the adjustment process in these two countries as successful, that is, as leading

to a sustainable increase in public wealth. If the data were available, this observation would probably hold true in the other sample countries as well.

## V. Conclusion

This paper has argued that for countries which derive a significant proportion of government revenue from the exploitation of an exhaustible natural resource, the sustainability of a given fiscal policy should be assessed in the context of the prospective evolution of government net wealth, including the imputed wealth from reserves of exhaustible resources. In an ultra-rational world, governments would manage the whole portfolio of public sector assets and liabilities, guided by the expected returns/costs of the future stream of government revenue and obligations. But is there evidence to show that policymakers really behave in such a far-sighted way?

A review of the experience over 1980-92 of the countries included in the sample suggests that in some respects they may behave in this way. Efforts to diversify the sources of government revenue were taken early on in the period in Indonesia and Mexico, as were a number of other measures designed to make their economies less dependent on oil. In other countries, such as Venezuela and Nigeria, the record was mixed. There was also recognition that government privatization receipts should be used, at least to some extent, to reduce government debt (Mexico and Egypt), rather than to finance current spending, suggesting that government asset management could be used as an active policy tool.

It is difficult to find much evidence of the use of petroleum extraction as a fiscal policy variable in the classic Hotelling-Hartwick sense in the countries included in the sample, with the exception of Saudi Arabia because of its pivotal role in OPEC. The limitations imposed by OPEC production quotas and the constraints on non-OPEC producers (Egypt and Mexico) implicit in world supply and demand patterns for petroleum meant that the countries included in the sample were only able to use petroleum extraction policy at the margin to influence government revenue.

While there would seem to be little disagreement that countries that depend heavily on a single exhaustible resource for government revenue should factor large revenue swings into their fiscal policy decisions, is a simple net wealth indicator of the type formulated in this paper a practical tool for policymakers? Does it provide useful information, additional to that provided by the traditional budget balance measures, that would signal the need for fiscal correction?

A comparison of the different measures of the fiscal balance included in this paper suggests that the net wealth approach can provide a good indication of fiscal problems that may be on the horizon for countries that depend on a single natural resource. However, some caveats apply. Perhaps the most important limitation of the net wealth indicator is its sensitivity to exchange rate depreciation. Countries that have effected large nominal



depreciations have seen the value of oil reserves rise dramatically in local currency terms. Depending upon the size of oil reserves, this revaluation effect can swamp the negative impact of the devaluation on the stock of external debt, thus boosting government net wealth in local currency terms. Policymakers might conclude that, because net wealth had increased, expansionary fiscal policies could be pursued, when in fact the opposite might be called for.

While the exchange rate effect warrants caution in assessing changes in the *observed* level of net wealth, the *projected* trends of this indicator can be unambiguously interpreted, providing useful information that is not revealed through the analysis of narrower fiscal indicators. For example, the net wealth projections presented in this paper strongly suggest the need for adjustment after 1980-82 in all the countries in the sample, including Saudi Arabia.

While the net wealth indicator has limitations, if used in conjunction with other fiscal indicators, it can provide policymakers in countries that depend heavily on a single natural resource with some insight into whether current fiscal policies can be sustained in the long run.

### Model Specifications

This appendix provides a more detailed description of the derivation of the equations used in the paper to project the paths of the net financial position and net wealth for the six countries in the sample.

There are two main differences between the equations described in Section III and those presented in this appendix. First, for presentation purposes, the equations in Section III do not consider explicitly that governments can borrow from (or lend to) foreigners. The immediate implication of relaxing this simplifying assumption is that the net financial position, and therefore also the net wealth indicator will have a domestic and a foreign component. In the case of the net financial position:

$$ST_t = SD_t + SF_t, \quad (17a)$$

where  $ST$  is, as in Section III, the net financial position,  $SD$  the domestic component, and  $SF$  the foreign component.

We have assumed that the change in the foreign component of the net financial position is determined exogenously by the investment opportunities abroad (in the case of a positive variation) or by the availability of funds in the international markets (in the case of a negative variation):

$$SF_t = SF_{t-1} + XF_t. \quad (18a)$$

It follows that the variation in the domestic component is equal to the overall balance of the public sector minus the variation in the foreign component:

$$SD_t = SD_{t-1} + OB_t - XF_t. \quad (19a)$$

The second main difference is that the equations in Section III assume that interest will be earned (or paid) on the net financial position existing at the beginning of the period, while the equations used for projecting the indicators allow for net interest to be earned (or paid) on the average stock of assets (or liabilities). As we have mentioned previously, calculating interest over average stocks does not change the conclusions of the arguments, but does complicate the algebra. However, given the conditions in the countries included in the sample, in which economic parameters are suffering wide variations and the maturity structure of portfolios is dominated by short-term instruments, using average stocks of assets and liabilities for calculating the interest bill gives a more

accurate result. A further sophistication that we could have considered, but did not, is the difference between the lending and borrowing rates in financial markets.

Given our assumptions, the interest bill is given by:

$$\begin{aligned}
 IN &= IF + ID, \\
 IF_t &= r \frac{\left[ SF_t + \frac{SF_{t-1}}{1+g} \right]}{2}, \\
 ID_t &= i \frac{\left[ SD_t + \frac{SD_{t-1}}{1+g} \right]}{2},
 \end{aligned} \tag{20a}$$

where  $IN$  = Net interest bill,  $IF$  = Net foreign interest bill,  
 $ID$  = Net domestic interest bill,  $r$  = Foreign interest rate,  
and  $i$  = Domestic interest rate.

Taking into account that governments' assets and liabilities can be foreign or domestic and that interest is earned or paid on the average net financial position, and with the adequate substitutions, equation (12) in the paper:

$$ST_t = ST_{t-1} \left[ \frac{1+i}{1+g} \right] + T_t - GPr_t + Q_0 Pp \left[ \frac{g}{(1+g)^{n+1} - 1} \right], \tag{12}$$

can be rewritten as

$$\begin{aligned}
 ST_t &= SF_{t-1} + XF_t + SD_{t-1} \left[ \frac{1+i/2}{(1+g)(1-i/2)} \right] + \dots \\
 \dots &+ \frac{\left[ T_t - GPr_t + Q_0 Pp \left[ \frac{g}{(1+g)^{n+1} - 1} \right] - (1-r/2)XF_t \right]}{1-i/2},
 \end{aligned} \tag{5a}$$

which was used to project the values of the net financial position for the countries in the sample. Adding the value of oil reserves (equation (13)) to equation (5) we obtain the net wealth indicator used for the empirical analysis.

$$\begin{aligned}
 NW_t = SF_{t-1} + XF_t + SD_{t-1} \left[ \frac{1+i}{1+g} \right] + \frac{T_t - GPr_t - (1-r/2)XF_t}{1-i/2} + \dots \\
 \dots + Q_0 Pp \frac{g}{(1+g)^{n+1} - 1} \left[ \frac{1}{1-i/2} + \left( \frac{1+i}{1-g} \right) \left[ 1 - \left( \frac{1+i}{1+g} \right)^{t-n-1} \right] \right]
 \end{aligned} \tag{6a}$$

Equation (6) is comparable to Equation (14) in the main text of the paper.

### Derivation of Equation (13)

Equation (13), describing the value of oil reserves as the present value of future oil revenues, is derived as follows.

$$\begin{aligned}
 VR^*_t &= PpX_t + \frac{PpX_{t+1}}{1+i} + \frac{PpX_{t+2}}{(1+i)^2} + \dots + \frac{PpX_{n-t}}{(1+i)^{n-t}} \\
 VR^*_t &= PpX_0(1+g)^t + \frac{PpX_0(1+g)^{t+1}}{1+i} + \frac{PpX_0(1+g)^{t+2}}{(1+i)^{t+2}} + \dots + \frac{PpX_0(1+g)^n}{(1+i)^{n-t}} \\
 VR^*_t &= PpX_0(1+g)^t \sum_{j=t}^n \left( \frac{1+g}{1+i} \right)^{j-t} = PpX_0(1+g)^t \left[ \frac{1 - \left( \frac{1+g}{1+i} \right)^{n-t-1}}{1 - \frac{1+g}{1+i}} \right],
 \end{aligned}$$

where  $VR^*$  is the value of oil reserves in monetary units. Dividing the left and right hand side by GDP in period  $t$ , and knowing that, given our assumptions,

$$\frac{PpX_0}{GDP_0} = Q_0 Pp \left[ \frac{g}{(1+g)^{n+1} - 1} \right],$$

we obtain

$$VR_t = Q_0 Pp \left[ \frac{g}{(1+g)^{n+1} - 1} \right] \left[ \frac{1+i}{1-g} \right] \left[ 1 - \left( \frac{1+i}{1+g} \right)^{t-n-1} \right]. \tag{13}$$

A Note on Data Sources and Limitations

Most of the fiscal and macroeconomic data used in this paper were obtained from published sources, mainly the *Government Finance Statistics (GFS)* and *International Financial Statistics (IFS)* published by the IMF, and the *World Debt Tables* produced by the World Bank. The data coverage in these publications varies from country to country, in some cases covering the general government, in others only the central government but including the nonfinancial public enterprises, etc. Despite this diversity, we tried to retain the broadest definition of public sector available (see Table 7 below). Owing to the importance of quasi-fiscal operations of central banks in the countries in the sample, we consolidated its accounts, as reported in IFS, with those of the public sector.

Table 7. Definition of Public Sector

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|              |  |
|--------------|--|
| Egypt        | Central government, local governments, food supply authority (GASC), and investment expenditure of the public authorities; does not include investment by public sector companies.                       |
| Indonesia    | Central government operations.   |
| Mexico       | Federal government, Federal District, social security system, and nonfinancial public enterprises.   |
| Nigeria      | Federal government operations.   |
| Saudi Arabia | Central government and transfers to and from several public sector entities, net foreign assets of the Saudi Arabian Monetary Authority and autonomous government institutions.                          |
| Venezuela    | Central government, Venezuelan Investment Fund, PDVSA (National Petroleum Company), other nonfinancial public enterprises, the Venezuelan Institute for Social Security, and the Housing Guarantee Fund. |

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More detailed data on the oil sector and related fiscal revenues were obtained from IMF staff estimates reported in *Recent Economic Developments* for each country, and from the *Secretary General's Annual Report* of the Organization of Arab Petroleum Exporting Countries.

Notwithstanding the simplicity of the accounting framework developed in the paper, not all the data needed were readily found. While fiscal accounts are relatively well reported at a flow level, important gaps and inconsistencies were encountered when trying to obtain stocks of public sector financial assets and liabilities. In particular, in most of the cases, data on stocks of domestic debt were plagued with problems or were simply not available. Whenever needed, we bypassed this problem with a reasonable assumption. Because flow data are more reliable than stock data, we calculated the stock of domestic debt as the interest bill reported in the overall balance divided by a "reasonable" interest rate. If the fiscal accounts did not allow us to distinguish the domestic component of the interest bill, we calculated it by subtracting from the total interest the public sector foreign interest bill as reported in the balance of payments accounts.

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