The Political Economy of Natural Resource Revenue Funds

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Abstract

In this paper we argue that the economic case for putting in place natural resource funds (NRFs) does not provide a sufficient rationale for establishing these institutions. The importance of funds, we argue, lies in the effects that their existence has on political actors. By providing guarantees to governments that *future* governments will be constrained in their expenditure decisions, *present* governments can choose better policy options. For these effects to work, withdrawals from funds should be made using institutions that represent the interests of diverse political constituencies, withdrawal procedures should provide for high levels of transparency—in particular by operating through a unified budgetary process, by using a balance of rules and discretion, by public reporting of payments, holdings and investments, by insulating the management of funds from political processes, and, in cases where domestic institutions are weak, by importing institutional strength from overseas. For many of these desiderata, we suggest, a market exists for the establishment of professionally run natural resource fund schemes by third parties.

I. Introduction

Research on natural resource funds does not find evidence that the presence of funds leads to better management of natural resources (Davis et al. 2003; Fasano 2000). Funds are employed in countries that use revenues well and countries that use them badly. While they may restrain government over-expenditure in some cases, in other cases fund rules are changed or the funds themselves are raided when governments wish to increase expenditure. In cases where there appears to be a positive relationship between the presence of funds and expenditure smoothing it is not clear that the funds themselves, rather than other features of a country's political system, are responsible for the policy choices. Norway, for example, is often cited as a country with a highly effective fund, yet inferring a causal effect for the Norwegian case is difficult: the restrictions imposed upon policy makers by the Norwegian fund are extremely weak.[1]

One reason for the poor empirical relationship between funds and effective policy, we argue in this chapter, is that the economic logic used to justify the use of funds does not, by itself, establish the necessity of funds (section II). Optimal expenditure profiles can be run with or without formal funds. More important than the economic rationale, we argue, are political economy considerations. We develop the logic of political economy arguments for the creation of resource funds and demonstrate that a natural resource fund does not automatically change the political economy incentives for "misbehavior". The value of a fund lies not in the existence of a fund, but in the details of a fund's institutional procedures and on how these affect the political incentives facing policy makers.

It is therefore crucial for designers of natural resource funds that they take into account the political economy context within which the resource fund is to be set up. This context is of course unique to every country, nonetheless we aim to illustrate various types of political economy effects that are likely to operate quite generally and show how they create incentives against the prudent management of natural resource wealth (sections III and IV). In Section V we suggest a series of ways in which one might mitigate such harmful

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[1] For details about the Norwegian fund, see http://www.norges-bank.no/english/petroleum_fund/.

incentives, emphasizing a role for joint decision making or a separation of powers in withdrawal decisions and a high level of transparency in fund operation.

II.   Economic case for accumulation and natural resource funds (NRFs)

The core economic arguments for natural resource funds provide a rationale for the principle of expenditure smoothing, rather than a rationale for new government institutions. The argument runs as follows. In low- or middle-income countries whose main exports consist of fuel or mineral resources, governments often face revenues that are both large (as a share of the country's economy or compared to the government's other sources of public revenues) and extremely unstable. The instability of natural resource rents derives in the short run from the high volatility of world commodity prices, and in the longer run from the fact that natural resources are depletable and therefore cannot be exploited in perpetuity. These features create a special problem for fiscal policy.[2]

Formally, the argument can be made by considering the case of a benevolent social welfare maximizer that seeks to maximize a utility function of the form:

$$V\left(X_1, X_2, ..., X_\infty\right) = \sum_{t=1}^{\infty} \delta^{t-1} u\left(X_t\right)$$

Where X_t is public spending in period t, the social benefit of which is given by $u(X_t)$ and is discounted by a discount factor δ less than one. The present value of all future spending must not exceed the sum of current wealth, A_0, and the present value of future incomes, Y_t, given the interest rate r. This can be expressed as an intertemporal budget constraint of the form $\sum_{t=1}^{\infty}\left(1+r\right)^{t-1} X_t \leq A_0 + \sum_{t=1}^{\infty}\left(1+r\right)^{t-1} Y_t$. The solution to this problem is expressed in what is known as the "Euler equation," which holds at all times t:

$$\frac{u'\left(X_t\right)}{u'\left(X_{t+1}\right)} = \delta\left(1+r\right).$$

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[2] The particular challenges of fiscal policy in natural resource-rich countries has been thoroughly analysed from an economic point of view. For a recent collection of insightful essays, see Davis *et al.* (2003).

The Euler equation implies that the rate of change in spending should not vary from year to year (so long as the interest rate is unchanging). This could involve a falling or rising spending profile, but in any case the adjustments from one year to the next are regular, and spending should not go up and down. In the particular case where $\delta = 1/(1+r)$, the optimal policy holds spending *constant* from year to year.[3] Note that when revenues are front-loaded, as is often the case with natural resource revenue streams, the optimal rule does double duty, as it fulfils both a savings function and a stabilization function.

There can of course be reasonable disagreements about the details of the optimal spending path (Engel and Valdés 2000 discuss several views), but the general lessons of the economics of fiscal policy in natural resource-rich countries are quite clear. The first is that it is desirable to avoid large fluctuations in public (and, for that matter, private) spending from year to year. The second is that it is desirable to make the exploitation of natural resource wealth benefit future generations as well as current generations, and indeed benefit the current generation beyond, say, the decade or two in which a natural resource boom occurs.

The main point to note is that the optimal pattern of public spending is *independent* of the shape of the revenue stream. The implication is that the public administration in such situations faces a challenge in managing the mismatch between incomes and expenses, to save in years of plenty to compensate for meager years, so to speak. The difficulty of this challenge is illustrated by the dramatic failures of most natural resource-rich countries once the meager years set in.

The need to separate the pattern of spending from the pattern of income in countries with large natural resource wealth entails that revenues at certain times ought to be accumulated for future use. This means that there should be a "fund," at least in a notional sense. However, the optimal expenditure profile described above does not require that natural resource monies be administratively separated in any way from other government assets. In other words, there is no *economic* need for new institutions or rules governing the

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[3] This simple example is merely illustrative. A proper technical analysis of optimal fiscal strategy in natural resource exporting countries can be found in Engel and Valdés (2000).

accumulation of revenues—there is just a need for accumulation according to some optimal policy.[4]

Nevertheless, several countries have sought to establish formal natural resource revenue funds to tackle the fiscal policy difficulties. The experience with funds goes quite far back, with Kuwait's General Resource Fund having been established in 1960, and Kiribati's Revenue Equalization Reserve Fund for phosphate revenues, which was established in 1956. Many currently active funds have been in existence for several decades—two examples considered relatively successful are the Alaska Permanent Fund (established in 1976) and the Norwegian State Petroleum Fund (established in 1990, although it did not receive any inflows until 1995). In the past few years, there has been quite a scramble among natural resource producers to set up natural resource funds. Some of these are new producers (such as São Tomé e Príncipe, which passed legislation establishing a permanent fund in December of 2004[5]) while others are experienced producers, many of which have experienced political transitions in the recent past (for example, Azerbaijan established its State Oil Fund in 1999, Kazakhstan set up its National Fund in 2001,[6] and East Timor is currently in the process of setting up a Petroleum Fund after the Norwegian model[7]).

The purpose of these funds is to facilitate the accumulation of large, volatile, and temporary revenues when times are good, stabilize public spending, and finance public spending when natural resource revenues are no longer flowing in. The reality is more worrying. Studies show that it is difficult to detect a consistent improvement of fiscal policy in countries with funds relative to those without them. Fasano (2000) examines the natural resource revenue funds of Norway, Chile, Alaska, Venezuela, Kuwait, and Oman, and finds that the outcome is "mixed," which reflects in part "the challenges in adhering to the operational rules" and the "overall fiscal discipline in the country." Davis et al. (2003) carry out an econometric

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[4] Nor is there any obvious economic reason *not* to to have a fund. Once the optimal policy is determined, it is relatively straightforward to design a fund with rules that in principle carry it out (see Engel and Valdés 2000, section 7, and the studies cited there).

[5] Information about oil revenue management in São Tomé e Príncipe is available on http://www.earthinstitute.columbia.edu/cgsd/STP.

[6] The International Monetary Fund's country reports on Azerbaijan and Kazakhstan (International Monetary Fund 2003; International Monetary Fund 2004) provide information on these funds.

[7] The proposed East Timorese law establishing a Petroleum Fund, as well as background information, is available on http://www.mopf.gov.tp/tax_policy.htm.

analysis of the effect of natural resource funds on the effect of revenue variations on changes in public expenditures. They find that while some countries with funds tend to exhibit a lesser sensitivity of government expenditure to natural resource revenues than countries without funds, that was already the case before the countries set up their respective funds. There is therefore no evidence that the establishment of natural resource revenue funds in these countries contributed to the soundness of their fiscal policies.

We see that in practice, natural resource revenue funds rarely make it any easier for large amounts of money be accumulated in the orderly fashion the normative model discussed above calls for. This reflects the fact that the incentives surrounding the choices of politicians do not conform to the idealized economic model. For fiscal policy to be correct, it is not sufficient to get the economics right. One must also get the political economy right, and as much as possible align the political economy incentives of decision-makers with what is good policy for the country.

Related experience in primary commodity-dependent economies also provides grounds for caution. The experience of African states with institutions similar in principle to natural resource funds—the primary commodity marketing boards of the 1970s and 1980s—was especially bitter. These institutions, established with the purpose of smoothing income fluctuations, building up savings and facilitating local investment, became a tool for governments to generate private gains at a cost to economic producers (Bates 1981). The failure of these boards lay in part in the fact that their design ignored the incentives facing the political leaders that controlled them.

III.   Political economy challenges to prudent policy: Analysis

In this section we discuss what political economy incentives may face politicians in countries with accumulated revenues—whether or not they are formally a "fund". In order to set up institutional solutions that make it more likely a beneficial spending path will be followed, it is necessary to understand the incentives that make it unlikely in the first place. Why do decision-makers tend to be impatient—why are they so likely to spend the money that is

there instead of leaving it for harder times and future generations? Understanding the underlying incentives that encourage the typical imprudent behavior is necessary to find the most appropriate institutional arrangements for a natural resource-rich country.

We now consider several reasons why policy makers have bad incentives to spend natural resource wealth faster than is good for the country. First, we show in a simple model that overspending can occur as a result of power rivalry between representatives of different groups. Next, we discuss how overspending can be exacerbated by a range of factors: politicians may gain political support through public expenditures; increased public spending may be privately valuable for the politician (independently of any political support it buys him); and accumulated revenues may provide an incentive to undermine the "rules of the game" embodied in the country's governing institutions.

Interest-group politics with power rivalry. Political competition often consists of the contest between representatives of different interest groups to control the public purse and use it to the benefit of their own group. The nature of the different groups varies across different countries: The dividing lines can be based on class, ethnicity, language, religion, or other traits. The severity of the divisions, and the extent to which political competition follows interest-group lines, are also different in every country.

The degree to which politicians compete for the opportunity to favor their own group at the expense of others will affect the fiscal policies of the state. Dixit *et al.* (2000) show how the division of the budget in an electoral period depends on the nature of the political competition, in particular the likelihood of a change in government in the next period. When the sitting government decides how much of the budget to allocate to its own group, it must take into account how the opposition will behave as a result if they take power next. A similar dynamic can affect the *total* amount of spending natural resource-generated wealth. A government may ideally want to spread spending evenly across all periods, but the possibility that another government takes power in the next period, and one's own group loses out as a result, creates an incentive to spend too much one's own constituency now, thereby reducing the amount the other group will have to spend both constituencies later.

We illustrate these features using the following simple model. Suppose a country has a "fund" of accumulated past natural resource revenues. We denote the total amount of money in the fund by X, and we set $X = 1$ for simplicity. The politicians must select some share of X to allocate to projects benefiting two groups in each of two periods. Denote by $x_{i,t}$ the allocation to projects benefiting groups $i = a,b$ in periods $t = 1,2$, and let the period benefit of project $x_{i,t}$ to group i be given by $x_{i,t}^{\rho}$ with $0 < \rho < 1$. That is: The more money the government spends on group i in a given period, the larger is group i's benefit, but each additional dollar generates a diminishing benefit.

Suppose there are two potential policy makers a and b, with divergent preferences over te welfare of two different constituencies. We assume that each policy maker's objective function can be written as $v_i = v_{i,1} + \delta v_{i,2}$, where $\delta \in (0, 1)$ is a common discount rate, reflecting the impatience of governments. We further assume that the "period utility" of the policy maker, $v_{i,t}$, is a weighted average of the payoffs to the two groups with weights α for policy maker a and β for policy maker b. Assume that $\alpha > \beta$ so that a places greater weight on the welfare of group a than does b.[8]

Without loss of generality, suppose policy maker a is in power in both periods, and decides the within-period allocation at the beginning of each period. Defining $X_1 = x_{a,1} + x_{b,1}$ note that once period 2 arrives, some amount $X_2 \equiv 1 - X_1$ is available for spending. Conditional on X_1, therefore, policy maker a will choose the allocation that maximizes $v_{a,2}$ subject to $\sum_i x_{i,2} \leq X_2$. Given the objective function, this entails spending a fixed fraction $\lambda(\alpha)$ on group a and the rest, fraction $(1 - \lambda(\alpha))$ on group b.[9]

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[8] Note that under this formulation the policy maker's per period payoff can be interpreted as a constant elasticity of substitution utility function defined over the *expenditure* allocations to the two groups with distributive weights α or β and elasticity parameter $1/(1-\rho)$.

[9] The function $\lambda(z)$ is given by: $\lambda(z) = \dfrac{z^{\frac{1}{1-\rho}}}{z^{\frac{1}{1-\rho}} + (1-z)^{\frac{1}{1-\rho}}}$

It is easily shown that this share function, $\lambda(z)$, has the properties that players allocate a larger share to groups that they care more about (that is, $\partial\lambda(z)/\partial z > 0$), but also, that they choose more unequal distributions (in favor of their preferred group) the greater is the elasticity parameter ρ (that is, $\partial\lambda(z)/\partial\rho \geq 0$ if and only if $z \geq .5$).

Similarly, if policy maker b were to decide the allocation in period 2, conditional on the total amount X_2 left over from period 1, her choice would be to spend a share $\lambda(\beta)$ of X_2 on group a and share $(1 - \lambda(\beta))$ on group b.

The same solutions hold for the allocation across groups in period 1, conditional on the total amount $X_1 \leq 1$ to be spent in that period. We can therefore simplify policy maker a's situation to simply choosing X_1 and therefore implicitly X_2. Knowing which allocation between the two groups she will choose at the beginning of each period given the amount she gets to spend in that period, she can optimize the division of the fund between the two periods. If she does indeed get her preferred within-period allocations, her task is simply to maximize the *between*-period allocation of aggregate spending.[10] This problem is solved by:

$$X_1 = \frac{1}{1 + \delta^{1/1-\rho}}, X_2 = \frac{\delta^{1/1-\rho}}{1 + \delta^{1/1-\rho}}.$$

It is easy to check that this set of allocations is efficient in the sense that there is no allocation that can allow any one group to do better without making the other group worse off. Furthermore, it is optimal for policy maker a in the sense that there is no other allocation across groups and over time that would make *her* better off, even at the cost of making the other policy maker better off. One implication of this is that the policy is *time consistent*—the sequentially decided policy is the same that policy maker a would choose if she could commit to the entire time path of spending allocations (that is, for both periods) at the beginning of period 1. In other words, although some aspects of fiscal and monetary policy that rely on responses by the private sector or other actors may generate inconsistency over

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[10] That is, she maximizes the objective function

$$v_a = \left[\alpha\lambda(\alpha)^\rho + (1-\alpha)(1-\lambda(\alpha))^\rho \right]X_1^\rho + \delta\left[\alpha\lambda(\alpha)^\rho + (1-\alpha)(1-\lambda(\alpha))^\rho \right]X_2^\rho$$

subject of course to $X_1 + X_2 \leq 1$, $X_1, X_2 \geq 0$.

time (Dixit and Londregan 1995; Garfinkel and Lee 2000; Kydland and Prescott 1977), this simple expenditure problem does not: with correct anticipation of her own choices in the second period, the staggering of the decision making process has no impact on the policy maker's choices.

Now consider a situation in which the policy maker is uncertain over the choices that will be made in future periods. For concreteness assume that with some exogenous probability q she will be turned out of office and be replaced by a rival policy maker of type b. In this case, policy maker a's expected value $E(v_a)$ of the allocation path, as seen from the beginning of period 1, is given by the probability weighted average of the two possible states of the world.[11]

The solution to this problem is:

$$X_1^* = \frac{1}{1 + \left[(1-q)\delta + q\psi\delta\right]^{1/1-\rho}}, X_2^* = \frac{\left[(1-q)\delta + q\psi\delta\right]^{1/1-\rho}}{1 + \left[(1-q)\delta + q\psi\delta\right]^{1/1-\rho}}$$

where

$$\psi \equiv \frac{\alpha\lambda(\beta)^\rho + (1-\alpha)(1-\lambda(\beta))^\rho}{\alpha\lambda(\alpha)^\rho + (1-\alpha)(1-\lambda(\alpha))^\rho} \leq 1$$

is the ratio of the marginal value (to policy maker a) of a dollar spent in a period where policy maker b decides the allocation to the marginal value (to policy maker a) of a dollar spent when policy maker a decides. In other words, it is policy maker a's marginal rate of substitution between spending according to her own preferences and according to the preferences of policy maker b. This is a measure of the degree of *policy conflict*.

From this simple model, we can draw certain immediate lessons:

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[11] That is, by :

$$E(v_a) = \left[\alpha\lambda(\alpha)^\rho + (1-\alpha)(1-\lambda(\alpha))^\rho\right]X_1^\rho$$

$$+ \delta\left\{(1-q)\left[\alpha\lambda(\alpha)^\rho + (1-\alpha)(1-\lambda(\alpha))^\rho\right] + q\left[\alpha\lambda(\beta)^\rho + (1-\alpha)(1-\lambda(\beta))^\rho\right]\right\}(1-X_1)^\rho$$

First, *the less stable is the government—in the sense that there is a higher likelihood of an imminent change in government—the stronger is the incentive for spending a lot today.* Clearly X_1 is increasing in q (and X_2 decreasing in q), which shows that as policy maker a's power becomes more precarious, she is tempted to spend more.

Second, *the deeper is the division among the groups—and the more pronounced is the tendency of politicians to favor only their own group at the expense of others—the larger will be the incentive to spend a lot while one is in power.* We see that the larger is ψ, the more today's spending will increase above the optimal level in the original without electoral competition. What does ψ depend on? If we take policy maker a's distributive parameter α (and therefore A) as fixed, we see that ψ reaches its maximum value of 1 when $\alpha = \beta$. ψ decreases monotonically as the difference between α and β increases. Hence, the distortion is greatest when rival governments have very different allocative preferences.

Third, *the instability effect and the division effect reinforce each other.* We noted that X_1 is increasing in q, hence greater uncertainty leads to earlier expenditure. The *size* of this increase depends on the size of ψ. The further ψ falls below one, the greater the increase in first period expenditure relative to the benchmark as the probability of power change rises. If $\psi = 1$, there is no difference between the two cases—because the policy maker is indifferent between her own and the rival policy maker's allocation, and the possibility of a power change has no importance. But the lower is ψ, the larger the increase in first-period spending caused by the likelihood of losing power (a nonzero q). In the extreme case, when $\psi = 0$ the policy maker will spend the entire fund in the first period if she is certain that she will lose power ($q = 1$).

Fourth, *the distortion has distributive implications: In particular, it redistributes to the first-period incumbent's group (a) from the other group (b).* From a similar derivation as before we can see that the increase in expenditure is also suboptimal from the point of view of the second player, in the following sense. Given a's optimizing behavior within each period, b would prefer aggregate expenditure to be allocated between periods would involve setting first-period spending to $X_1' \equiv 1/[1+[\delta(1-q) + \delta q[\psi']]^{1/(1-\rho)}]$, where ψ' is the ratio of the marginal value (to

policy maker *b*) of a dollar spent in a period where policy maker *b* decides the allocation to the marginal value (to policy maker *b*) of a dollar spent when policy maker *a* decides. Since this ratio is greater than one, we see that under these conditions *b* would prefer a reduction in first-period expenditure relative to the baseline, rather than an increase. As policy maker *a* protects herself against the eventuality that *b* gains power, therefore, she makes him worse off. Only if *q*=0 and there is no chance that *b* will gain office is his ideal intertemporal expenditure profile (given *a*'s distributional choices in each period) the same as *a*'s.

Fifth, *this increase in first-period spending corresponds to an* **inefficient** *expenditure profile*. In other words, there exist expenditure intertemporal profiles that can make all groups better off.[12] Two types of improvements are possible. One involves *risk sharing*: since the policy makers in this model are risk averse, each will, *ex ante*, prefer outcomes that minimize the variation in the expected second period expenditure. This could be achieved in all cases by both parties committing *ex ante*—were this possible—to give the other player an allocation with certainty, the expected value of which would exceed the expected value of the policies that would be implemented by the uncertain winner of the power contest in the second period.[13] Such risk sharing can be gainful even without any change in the *intertemporal* allocation of aggregate resources and is a feature that has been studied elsewhere in settings in which total per period allocations are fixed (See for example Alesina 1988; Dixit, Grossman, and Gul 2000). Of course the big obstacle to such joint commitments is the difficulty of making credible commitments to restrain oneself once one is in a position to take advantage of one's power.

The second type of improvement involves intertemporal smoothing of aggregate expenditure. From the point of view of our examination of funds, these concerns are especially interesting. Inefficiency arises in part because the first period government increases the expenditure beyond her own optimum; this rise in expenditure implies a loss for her relative to the situation where her return to office is guaranteed. But as noted above, this loss for the first government does not imply a gain to the second period government

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[12] There are other channels through which the availability of natural resource rents can lead to inefficiency in production—Torvik (2002) for example considers a model in which the presence of resource rents induces entrepreneurs to leave productive activities to lobby for distributional benefits from the political process.

[13] Formally, because the policy makers' utility functions are concave, the policy vector $((1\text{-}q)\lambda(\alpha)X_2 + q\lambda(\beta)X_2, (1\text{-}q)(1\text{-}\lambda(\alpha))X_2 + q(1\text{-}\lambda(\beta))X_2)$ is preferable for both parties to the enactment of $(\lambda(\alpha)X_2, (1\text{-}\lambda(\alpha))X_2)$ with probability $(1\text{-}q)$ and $(\lambda(\beta)X_2, (1\text{-}\lambda(\beta))X_2)$ with probability q.

since the increase is in the direction of distributive allocations favored by the first player only. The implication is that if government *a* were to remain in office, the expenditure path is *ex post* inefficient—in this case a reduction in period 1 expenditure could unambiguously be better for both players. In particular, if the shares were less unfavorable to *a* in the event that *b* gains power in the second period, *a* would find it advantageous to shift more spending from period one to period two, making herself better off and more than compensating *b* for his lower share. Again, the downside of such a solution is the commitment problem—a promise by player *b* not to take full advantage of being in power in period 2 is not credible. Yet in contrast to the previous solution, only *one* party's commitment is required here, which seems more realistic than if all players needed to make credible commitments.

A fund could place a cap on expenditures in each period, which, if implemented, could return the society to an efficient expenditure profile, but that would *not necessarily be one that Pareto dominates the situation which would otherwise obtain*. In other words, imposing a limit on how much *a* is allowed to spend in the first period will reduce her expected welfare, and she therefore has a strong incentive to resist it and not comply with such a rule. A fund design that did not take account of this would risk being unsuccessful and more generally undermine the force of law.

In fact, in this situation an efficient allocation that Pareto dominates the Nash equilibrium would require some form of contract enforcement *across* governments in which present governments that cap present expenditure are compensated by actions of future governments that provide benefits to their own constituents. The implication is that stability might require not simply caps on *how much* can be spent, but also guarantees regarding *on what* the saved money is to be spent. Implicit in our analysis is also that the problem is likely to be worse, the lesser are the constraints on what any sitting government can do. If the opposition, say, could prevent the worst excesses of the sitting government, the latter would be forced to take into account the interests of the former.

More can be derived from models of this form the more we know about the details of political systems. In particular, the political incentives outlined above are likely to be particularly strong in polities in which (i) political support is determined more by the

allocation of material goods than by ideological choices; (ii) there are large private gains from public spending; and (iii) the institutions of the state are weak**.**

(i) Buying political support. There are multiple reasons why a politician may be rewarded for a policy that deviates from the optimal for the population. One is that the voters themselves may be myopic, and therefore ignore the long-term consequences of a policy that is satisfying in the short term. There is strong evidence from social psychology that such impatience (or "hyperbolic preference") is a very common trait among the majority of people (Ainslie and Haslam 1992). Such a tendency is likely to be reinforced by lack of transparency if it is the case that voters only feel the immediate benefits of increased spending and are not informed about the long-term fiscal consequences of the government's policy. Another reason why politicians' fortunes might be served by spending more is when the political context (e.g. the electoral system in a democracy) gives disproportionate influence to the support of a small part of the population. In such a situation, that small part of the population might count on always being favored by the spending policies of the government and be saved the burden of future spending cuts. Put differently, the future negative consequences of profligate spending today may be insufficiently internalized by the politically most powerful group. A third and important mechanism for political support is that larger budgets allows a government to employ more civil servants, which in turn may lead to political support. We refer to Robinson *et al.* (2005) for an incisive analysis of the effect of natural resource booms on the incentives for bloating the public sector with inefficient patronage jobs. Their model produces the same general pattern as ours: The ability to strengthen one's political support by expanding the public sector leads to an inefficiently high level of extraction of the depletable natural resources. The more the power prospects can be manipulated in this way, of course, the higher the extraction/depletion rate.

The simple model we have been using can also shed light on these cases where political support can be "bought." The discussion above was generated for cases where the probability of reelection is independent of policy choices. The situation is not clearly improved if the probability of re-election depends on fiscal policy. If the likelihood of reelection is improved by expansionary policies, as suggested by the literature on political business cycles and public debt (see section 13.3 of Persson and Tabellini 2000 for a

discussion of conditions under which this is likely to hold), then the problem is in fact exacerbated.

To illustrate, we continue with the previous example, and make the probability q of a change of government depend on the amount of spending in period 1. Assume the probability of a power change depends negatively on spending in the first period, $q = q(X_1) \in (0,1)$ with $q'(X_1) < 0$. It is shown in the appendix that the level of X_1 that is optimal for policy maker a is above the level that would be optimal with a fixed probability of power change. Moreover, the more sensitive is the power change probability to first-period spending (the more negative is $q'(X_1)$), the more inefficiently high is first-period spending.

We venture some conjectures about when current spending will have a stronger effect on the probability of retaining power. This effect is likely to be stronger, first of all, the more the population discounts the future relative to the immediate present. This could be particularly true in countries where a large part of the population lives in poverty and is likely to have very high discount rates. Aside from actual time preferences, people will presumably care less about future consequences of today's fiscal policy when there is little transparency or information about them, or the general education level is low so that the consequences are more difficult for the public to understand. Secondly, the incentive problem is likely to be more severe the more a politically pivotal group can transfer the negative future consequences on others, and the easier it is for political leaders to acquire political support through patronage.

(ii) Private gain from public spending. Public spending may give politicians other benefits than stronger political support. There may be private benefits to spending more, because larger budgets—and consequently higher public employment—may give the members of the government social status and prestige, and greater opportunity for patronage. This could be seen as a personal investment good for the politician in question, since it might create a source of goodwill and return favors once he or she is out of office. It therefore creates a separate incentive for spending even when there is no political competition, and the office-holder is certain that his or her successor will be from the same party or represent the same interest group.

This effect is likely to be especially important when the end of the politician's term in office is imminent, as can be the case with defined term limits. More generally, the shorter is the average tenure of office, the stronger will be the incentive to boost the rate of public spending. The incentive is also likely to be stronger in societies where patronage positions and favors are important parts of the social fabric, and where meritocracy is weak, so that a politician's future welfare more strongly depends on the friendships and relationship he has established while in office.

(iii) Incentives to change the rules of the game.

In institutionally weak environments the presence of large resource rents can also provide a "prize value" to state capture (Fearon and Laitin 2002). In cases in which violence or extra-constitutional means can be used to overturn a sitting government, the holding of valuable assets by weak political actors can be an especially risky enterprise. In terms of our model above, this effect can be captured (as we did for the case of endogenous re-election probabilities) simply by treating the probability of termination of office (now by constitutional or extra-constitutional means) at the end of the first period as an increasing function of the remaining assets. As before this leads to a rise in first period expenditure. Note however that in this case the logic implies that this should occur if and only if coup makers can expect to have easy access to government revenues upon overthrowing the sitting government.

IV.   Political economy challenges to prudent policy: Empirical Results

A key result in our analysis above is that a high degree of discretion by a single political constituency may lead to inefficiently high levels of public expenditure or resource revenues. Here we present some empirical results that suggest that this relationship holds in practice as well as in theory. The data suggest that there is a strong relationship between the strength of the institutional environment and the effect of oil revenues on spending. As discussed above, the optimal economic policies should not let year-to-year government expenditures vary much in response to oil revenue fluctuation. To examine the extent to which countries

follows such policies we consider a simple econometric model of government consumption in a sample of oil producing countries. In this model we relate change in government consumption (as recorded in the World Bank's World Development Indicators 2002) to an indicator of the value of receipts earned annually from a county's oil industry, as recorded by published sources (for more information on the oil measure see Humphreys 2005).[14]

	Year-to-year change in government consumption, %	Year-to-year change in government consumption, %
Year-to-year change in GDP, %	0.663	0.644
	(0.000)***	(0.000)***
Year-to-year change in oil revenues (dOIL), %	0.009	0.092
	(0.411)	(0.003)***
CHECKS×dOIL		-0.090
		(0.003)***
Checks and balances (CHECKS)		0.001
		(0.957)
Constant	0.013	-0.031
	(0.631)	(0.199)
Observations	2118	1284
Number of countries	94	91
R-squared	0.113	0.106

Fixed effects regression (country fixed effects). Yearly change variables measured with one year lag. Controls not reported: Year dummies. P-values in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

The first column shows that on average, there is no pass-through of year-on-year oil revenue changes to aggregate government consumption. The picture changes dramatically, however, when we differentiate countries with weak and strong divisions of power in the governance systems. The variable used, CHECKS, is drawn from the Database of Political Institutions

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[14] Note that the oil measure employed captures estimated total earnings from national oil production rather than government revenue from oil alone.

(Beck et al. 2000) and is based upon the number of independent parts of the political process. It uses information regarding the number of different parties in a governing coalition and the extent to which there is a competitive legislature independent of the president or prime minister's party, indicating whether a country is marked by a higher degree of divided power or not.

The importance of the institutional environment for how oil revenues are managed is vividly brought out by a simple scatterplot of the change in government consumption against the change in oil sales. This scatterplot is done separately for countries with weak checks and balances and for countries with strong checks and balances:

Graphs by Binary Checks and Balances measure
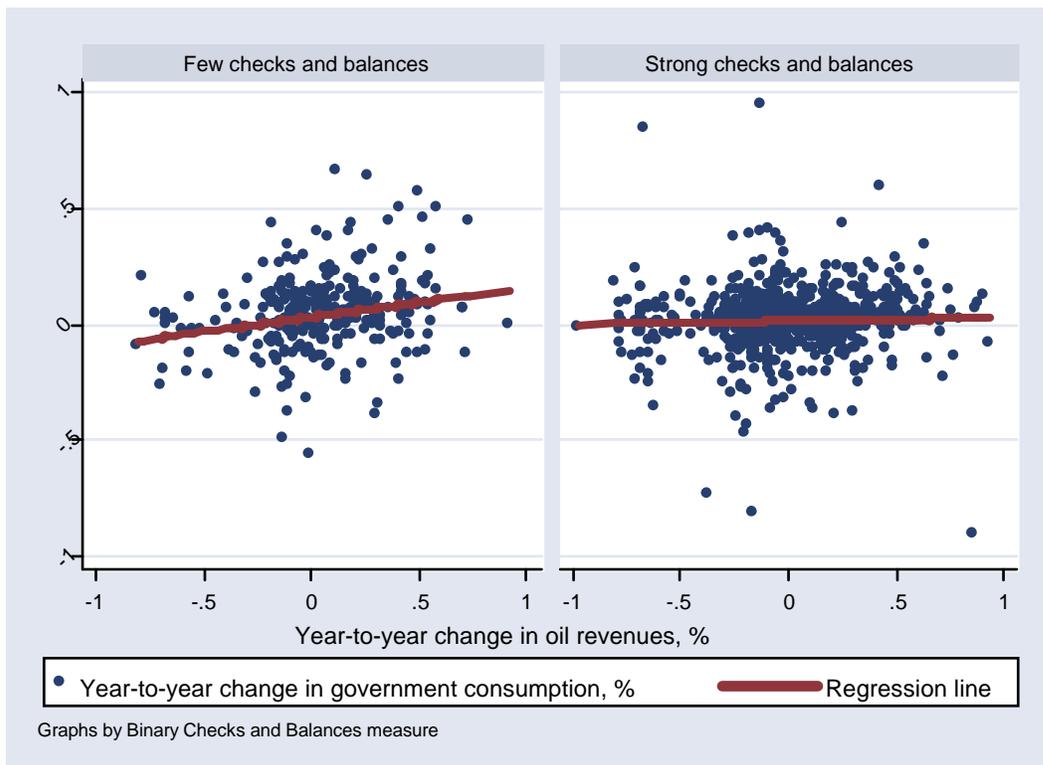
The graphs bring out the essential finding of the second regression. In countries with strong checks and balances oil sales volatility has little effect on government consumption; however, there is a strong effect in countries with worse governing systems. The elasticity of the change in government consumption with respect to the change in oil sales is 0.092 in countries with few checks and balances, meaning that for a doubling of oil sales, government

consumption in such countries increases on average by 9.2%. This implies a high rate of pass-through of oil revenue changes. Suppose that one-third of government consumption is financed by oil and oil sales double. If *total* government consumption increases by 9.2%, this means more than 27% (9.2% × 3) of the additional money is consumed away within a year.[15]

V.   Political economy challenges to prudent policy: Policy Implications

We have argued that political economy incentives result in inefficient expenditure profiles in situations where large stocks of assets are available and tenure in office is uncertain. We can summarize the sources of such incentives that we have touched on in the following table:

Source of incentive	Political context	Effect on excess
Depth of division between groups	Interest group rivalry	Exacerbating
Instability of tenure by party or group	Interest group rivalry	Exacerbating
Checks on sitting executive's power	Interest group rivalry	Attenuating
Ability to make and monitor binding commitments	Interest group rivalry	Attenuating
Impatience in population	Buying political support	Exacerbating
Ability of politically pivotal segment of population to externalize future consequences	Buying political support	Exacerbating
Understanding of fiscal challenge by population	Buying political support	Attenuating
Social importance of patronage	Buying political support/ Private gain of public spending	Exacerbating
Length of tenure by individuals	Private gain of public spending	Attenuating
Vulnerability of state	Changing the rules of the game	Exacerbating
Access of leaders to public wealth	Changing the rules of the game	Exacerbating

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[15] This calculation assumes that oil sales and oil revenues are proportional to each other.

In spite of these challenges, we have also shown that it can be in the interest of all parties to find institutional arrangements that encourage a slowing down of spending. The model presented above produces inefficiency results because individual policy makers cannot commit to undertake a given set of actions in the future. The commitment problem is however one that can be overcome in some settings. In an environment in which, rather than persisting for only two periods, the decision-making processes described above were repeated indefinitely, a form of tacit coordination across policy makers can under certain conditions emerge in which each policy maker moderates expenditure in anticipation of retaliatory action by future policy makers should she overspend. Such tacit coordination does not *require* the existence of formal institutions to ensure compliance; it does however depend on conditions that can be *promoted* by the existence of funds.

For that to happen, the multiple sources of "bad" political economy incentives for politicians must inform the work of any designers of natural resource revenues funds. First, of course, the designers must determine the economic question: What is, economically speaking, the optimal time path of spending the revenues generated by natural resource exploitation, and in particular, how does that path differ from the expected path of revenue inflows? The answer to that question will give a picture of how the country ought to accumulate its revenues in a notional or institutional "fund." The main message of this chapter is to emphasize that this is only the first half of the job. Equally important is to analyze the country's political economy. One must investigate the incentive structure inherent in the country's political system, and in particular map which of the aforementioned (or other) incentives for excess spending prevail and with what strength. The choice of whether to have a fund at all, and if so, which institutional shape it should take, must not simply facilitate the optimal economic and fiscal policy; it must aim at minimizing the incentives to deviate from that policy. At any point in time, which policy is adopted—or whether a rule is complied to—will depend on the choices of the agents entrusted with carrying out the policy or executing the rule, and therefore on the incentive structure within which they make those choices. New institutions can allocate powers in new ways, and

natural resource revenue funds should be designed so as to align the political economy incentives with the fiscal policy decisions that would be best for the country.

The preceding discussion suggests that one way to remedy the commitment problem is to *separate the authority to decide how much is to be spent from the authority to decide on what it is spent*. If the incumbent policy maker *a* could be certain that the future policy maker *b* will not take full advantage of his power (or indeed if his future powers to allocate spending were reduced), then she would not take full advantage of hers to spend more today. If it is possible to vest these two types of decisions in different actors, the harmful incentives analyzed above can be mitigated. A second lesson concerns the crucial role of *information and transparency*. It is well known from the economics of information that when information is scarce and asymmetric, efficient outcomes are more difficult to sustain. In this particular context, the inability of policy makers to commit to certain policies in the future is clearly not improved when it is impossible after the fact to verify whether or not the policy maker complied with her commitment. Conversely, the more information is common knowledge (that is, the more information is not only publicly known, but also publicly known to be publicly known, and so on) the easier it should be to monitor how others fulfill their commitments. This could contribute to a more cooperative equilibrium over time, in which policy makers refrain from spending too much today, in the expectation that future governments will not abuse their ability to allocate spending differently.

We wish to finish with a survey of the resources a country's political economy may offer to address the kind harmful incentives we have described. What are the available institutional "fixes" that can instantiate the two principles (separation of powers and transparency) in particular cases? A full answer to this can of course only be given by practitioners with an intimate knowledge of the local political economy, but we can list what type of solutions one might want to use if they are available.[16] We start by listing ways of moving the decision of *how much* to spend away from those who have the most incentive to overspend:

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[16] Joseph C. Bell and Teresa M. Faria's chapter in this volume also lists a range of possible institutional arrangements.

(i) **Political power-sharing:** The fund can be set up so that it divides the authority to make (or approve) spending decisions across political constituencies. Such a division could take different forms, such as:

- Requiring both the executive and the opposition (or some other combination of political constituencies) to sign off on spending decisions every year before the fund can disburse anything
- Require the assent of a supermajority of the legislature for spending decisions
- Give the decision about how much to spend and on what to spend it to different branches of government. For example, the national executive could decide on the aggregate amount, while the allocation to different projects could be (at least partly) decided by local governments. In bicameral legislatures the two decisions could be vested in separate chambers.

(ii) **Deferred spending:** A different type of power-sharing is to divide authority between current and future executives. This could be done by requiring the government to choose how much to spend in a given year several years in advance. Depending on the dynamics of power changes, a different political constituency could be in place for the time when the allocation of the already decided total amount to projects should be done.

(iii) **Codified spending rules:** Another strategy is to simply remove the government's discretion over spending decisions, and instead enshrine the spending rules more or less strictly in the law. This would come at the cost of less flexibility, and may not be realistically feasible in countries with small governing classes and weak institutions. At principle, however, the menu of spending régimes is a continuum between the purely discretionary and the unchangeably rule-based. It might be useful to consider the examples in the following table:

Pure discretion

Norway	Outflows from fund covers balance of government budget, decided by Parliament. Parliament unconstrained, but politicians have committed to an informal "handling rule" not to spend more than 4% of the balance of the fund per annum.
East Timor	Outflows from fund covers balance of government budget, decided by Parliament. Parliament unconstrained, but special reporting and justification procedures must be followed if amount higher than the highest amount that can be sustained forever. Formula is given by law.
Sao Tome e Principe	Outflows from fund cannot exceed the highest amount that can be sustained in perpetuity. Formula is described in the law.
Alaska	A formula governs the amount of money that can be paid out from the fund, and those outflows can only go to citizens in the form of "permanent fund dividend" checks. Parts of the rules are enshrined in the State Constitution.

No discretion

As these few examples illustrate, each real-world institutional set-up has both discretionary and rule-based elements, and mix is different in every case. So the range possible régimes is wide, and there is no "one size fits all"-solution.

The challenge of perverse political economy incentives is obvious in discretionary systems: If fiscal policy is determined by the ongoing choices of the sitting executive, those in charge must have incentives to do the right thing. But even in more rule-based systems, there is an incentives challenge. One can set up laws and rules governing the spending of natural resource revenues—but does the executive have an incentive to obey the rules and comply with the law? The authority of the law is a real problem in many countries, and a law that the government has an incentive not to follow may not be complied with. Therefore, rules that are too rigid may be brittle, in the sense that they may be flouted at the first fall in commodity prices. Worse, they may also, by rule-breaking precedent, weaken the force of law overall.

Rules, like funds, are therefore not by themselves enough. They cannot simply state the optimal policy, but must strike a compromise between creating incentives for the right policy *and* incentives to comply with the rules themselves.

(iv)   **Prededicated Expenditures:** An alternative to codified rules for the amount of aggregate spending, one could establish rules for how the money is to be spent. Chad's oil revenue management law, for example, provides for percentage allocations of oil revenues to special "priority sectors" such as health and education. For transparency reasons, however, one should avoid setting up parallel budgets, by which expenditures from the fund bypass the regular budget mechanisms (more on this below).

(v)   **Independence:** There is an alternative to the two extremes of, on the one hand, involve more political constituencies, and on the other, resorting to strict law-based rules. The authority to decide spending could remain discretionary, but that discretion could be vested in independent or technical bodies (if such exist), or civil society representatives. Even if the decision-*making* power remains with the executive, independent bodies could have the power to assent or reject the decision. Examples include:

- Give courts, if they are independent, the authority to review compliance with the spending rules/funds. Alternatively, the Central Bank, if sufficiently independent, could be given a role
- Create new technical body not beholden to executive, and give this authority to determine spending cap
- Give civil society representatives decision-making authority or supervisory power (such as in Chad) over how much to spend or how to spend it or both
- Write spending rules into contract with bank holding the fund

(vi)   **Importing institutional strength:** Countries with weak institutions could *in extremis* consider "contracting out" some of its political economy in the following sense. If the institutional resources at home do not prevent overspending, a foreign institution might be better suited to enforce commitments by politicians. For example, the fund

could be held at a foreign financial institutions, and the spending rules could be written into the contract:

- Rich countries could finance a "global clearing house" for natural resource revenue funds. This clearing house could deal with the logistical issues, but far more importantly, with the commitment issues. It could do this by only accepting accounts which would require very strong conditions to be fulfilled before disbursements, *e.g.* that the amount not be higher than what the optimal policy requires.

- To avoid the temptation to take over the state, discussed above, the global clearing house could commit to not disbursing a country's monies to the new rulers after a non-constitutional power change. That for example, the account could be frozen in the case of a coup, until the régime was recognized as legitimate by an appropriate international institution.

As a general point, we note that in developing countries with weak institutions, many of these functions might be easier to secure with the help of a foreign institution such as the suggested global clearing house. This institution might be better placed to stand firm in the face of attempts to circumvent the various possible constraints we have sketched. For example, the contract with the global clearing house might stipulate that disbursements only be made with the required signatures of several branches of government, or only pursuant to the assent of an independent control/oversight committee, *et cetera*. The global clearing house might then be prosecuted under the laws of its home government in the case of breach of contract, which could be a stronger legal régime than that of the country owning the fund.[17]

We now list a few mechanism for increasing transparency and information around spending decisions; our second general principle. However, it bears emphasizing that all the aforementioned mechanisms for dividing power are also transparency-promoting. If concentration of power increases the incentive for the power-holder to abuse it, then it also increases his incentive to hide what he does. Conversely, a more balanced distribution of power might reduce the relative attractiveness of secretiveness, perhaps by increasing people's stakes in what the executive is doing and therefore their pressure on the executive

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[17] We recognize, of course, that this proposal may run up against problems of sovereignty.

to release information. But these are not sufficient, and other methods should should also be adopted to promote transparency:

(vii) **Transparency:** Information about the natural resource fund and decisions relating to it are made public.
- Require payers of natural resource revenue to publish detailed payments
- Require fund to publish details of all transactions
- Allow monitoring body to halt transfers out of fund in case of insufficient information
- Create information office under other branch than executive

(viii) **Unified budgets:** To keep public finances orderly and transparent, it is vital that a fund only transfer funds directly to the national budget:
- Fund should not have own spending authority, but only transfer money to the budget.
- There should be a single budget; no separate budgets for oil-derived revenues.

We finish by noting that these transparency conditions could also be well handled by a global clearing house. An international agency may simply be better equipped for such a task in purely logistical terms, compared to some of the poorest natural resource-exporting countries. And as with the power-sharing mechanisms, the transparency mechanisms could be included in the contract setting up the account for the fund.

VI.   Conclusion

We have argued that there is a simple reason why natural resource revenue funds do not on average contribute to better fiscal policy in countries heavily dependent on natural resource exports. The reason is that the economic considerations that are usually used to motivate funds only support a certain optimal fiscal policy, and are silent on the optimal institutional framework for implementing that policy. We showed that how the political economy of power rivalry can create incentives for overspending natural resource revenues; simply

setting up a fund does not do away with those incentives. Consequently, designers of natural resource revenue funds should pay close attention to the political incentives in their country, and attempt to design a fund that not only approximates the optimal fiscal policy, but more importantly, creates political incentives (or at least mitigates political disincentives) for complying with the fund's rules.

Future research should be aimed at deepening our understanding of why funds seem to fail. An important research question is exactly how funds interact with the overall institutional structure of the country. More research is also needed on the possible institutional solutions to the political economy problem that we listed. We argued that in various context, some of these might encourage more cooperative behavior on the part of policy makers over time by dividing authority and increasing transparency and information. Both theoretical and empirical would be needed to establish with more certainty the expected effects of each specific proposal. In particular, it would be informative to investigate in more detail our conjecture that many of the domestic incentive problems could be alleviated by a global clearing house which would take on the responsibility of running the fund, partly sheltered from the incentives prevailing in the domestic political economy of the country.

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