

# Direct Redistribution, Taxation, and Accountability in Oil-Rich Economies: A Proposal

**Shantayanan Devarajan, H el ene Ehrhart,  
Tuan Minh Le, and Ga el Raballand**

## Abstract

To enhance efficiency of public spending in oil-rich economies, this paper proposes that some of the oil revenues be transferred directly to citizens, and then taxed to finance public expenditures. The argument is that spending that is financed by taxation—rather than by resource revenues accruing directly to the government—is more likely to be scrutinized by citizens and hence subject to greater efficiency. We develop the case as follows: First, we confirm that public expenditure efficiency is lower in oil-rich countries compared with other developing countries. Second, we develop a theoretical model to explain why citizens’ scrutiny over public expenditure can be increased by transferring oil revenues to citizens and then taxing them. By receiving transfers and then paying taxes, citizens are better informed about the level of government revenue, and they have an incentive to ensure that their taxes are spent on public goods. Third, we show empirically that enhanced citizens’ scrutiny is associated with more efficient government spending decisions and that accountability is stronger in countries that rely more on taxation to finance public spending. We conclude that, while it may be difficult to implement such a proposal in existing oil producers, there is scope for introducing it in some of Africa’s new oil producers.

**JEL Codes:** Q32, Q33, H20, H23

**Keywords:** oil, taxation, redistribution of oil revenues, accountability

## Direct Redistribution, Taxation, and Accountability in Oil-Rich Economies: A Proposal

Shantayanan Devarajan  
Hélène Ehrhart  
Tuan Minh Le  
Gaël Raballand

Shantayanan Devarajan: chief economist, Africa Region, World Bank; Hélène Ehrhart: Center for Studies and Research on International Development (CERDI), University of Auvergne, France; Tuan Minh Le: senior economist, Africa Region, World Bank; Gaël Raballand: senior economist, Africa Region, World Bank.

The authors would like to thank Patricia Macchi and Barbara Lantz for excellent research assistance, Xiao Ye for inputs and Jean-Louis Combes, Vianney Dequiedt, Anke Hoeffler, Eoin McGuirk, Mick Moore, Youssef Saadani, Justin Sandefur and Radek Stefanski, as well as participants at the 2010 CSAE Annual Conference and the International Conference on the Environment and Natural Resource Management in Developing and Transition Economies held at CERDI for comments and suggestions. The views expressed are the authors' own and not necessarily those of the World Bank. Corresponding author: Gaël Raballand, [graballand@worldbank.org](mailto:graballand@worldbank.org).

CGD is grateful for contributions from the Australian Agency for International Development and the Norwegian Ministry of Foreign Affairs in support of this work.

Shantayanan Devarajan et al. 2011. "Direct Redistribution, Taxation, and Accountability in Oil-Rich Economies: A Proposal." CGD Working Paper 281. Washington, D.C.: Center for Global Development. <http://www.cgdev.org/content/publications/detail/1425822>

**Center for Global Development**  
**1800 Massachusetts Ave., NW**  
**Washington, DC 20036**

202.416.4000  
(f) 202.416.4050

**[www.cgdev.org](http://www.cgdev.org)**

The Center for Global Development is an independent, nonprofit policy research organization dedicated to reducing global poverty and inequality and to making globalization work for the poor. Use and dissemination of this Working Paper is encouraged; however, reproduced copies may not be used for commercial purposes. Further usage is permitted under the terms of the Creative Commons License.

The views expressed in CGD Working Papers are those of the authors and should not be attributed to the board of directors or funders of the Center for Global Development.

## Foreword

The discovery of oil in a developing country is potentially beneficial and, simultaneously, potentially calamitous. While countries could put oil revenues toward building much-needed schools and roads, fixing and staffing health systems, and policing the streets, many resource-rich states fare little better—and often much worse—than their resource-poor counterparts. Too often public money is misallocated and funds meant to be saved are raided, and those living in poor resource-rich countries pay the price. While this so-called resource curse is well established in the literature, solutions to counteract its corrosive effects remain highly elusive.

CGD's [Oil-to-Cash initiative](#) is exploring one policy option that may address the root mechanism of the resource curse: using cash transfers to hand the money directly to citizens and thereby protect the social contract between the government and its people. Under this proposal, a government would transfer some or all of the revenue from natural resource extraction to citizens in universal, transparent, and regular payments. The state would treat these payments as normal income and tax it accordingly—thus forcing the state to collect taxes, and adding additional pressure for public accountability and more responsible resource management.

This paper by Shanta Devarajan, Hélène Ehrhart, Tuan Minh Le, and Gaël Raballand, commissioned by CGD as part of Oil-to-Cash, examines the theoretical and empirical foundation for the link between taxation and accountability. Devarajan et al. develop a theoretical model to explain why distributing oil rents to citizens and then taxing them should increase citizen scrutiny over public expenditure. When they then test their model empirically, they find that (1) increased citizen participation is associated with improved spending outcomes in education, and (2) that a country's tax levels are significantly and positively associated with more accountability. Devarajan et al.'s paper provides additional reasons to think that the idea of distributing oil rents to citizens may be worth considering. This contribution helps to build the case that reliance of taxation may in fact lead to more accountability, and thus ultimately more development-friendly spending.

Todd Moss  
Vice President for Programs and Senior Fellow  
Center for Global Development



## 1. Introduction

Oil-rich developing countries have typically experienced problems with macroeconomic stability, growth and, especially, governance. The great majority fail to diversify their economies. Oil booms have led to wasteful spending and corruption. The combination of these difficulties has led to the concept of the “natural resource curse” (see, for example, Sachs and Warner, 1995, 2001, Gylfason et al., 1999, Leite and Weidmann, 1999, Auty, 2001, Najman et al., 2007 and Moore, 2007), although according to Lederman and Maloney (2007), the resource curse is not a “destiny”.

To address these problems, the main policy recommendations for oil-rich economies have been threefold: (i) save oil revenues for future generations and mitigate the detrimental impact of volatility of oil revenue flows by appropriate fiscal stabilization mechanisms; (ii) increase transparency and efficiency of oil revenue collection and spending; and (iii) redistribute oil revenues to citizens to limit embezzlements of public funds (Sala-i-Martin and Subramanian, 2003, Birdsall and Subramanian, 2004, Geld and Grasmann, 2010, Sandbu, 2006, Moss, 2010). Segal (2011) finds that the implementation of such redistribution schemes could largely decrease poverty in developing countries.

The weak relationship between oil booms and good governance is connected to another literature, which makes the link between taxation and accountability of public spending. Taxation sets up the interaction, usually referred to as a *fiscal contract*, between citizens and the state with the former holding the latter accountable. Brautigam (2008) stresses that ‘state-building is shaped by societies, and taxation is a strategic nexus between the state and society’ (p.25). What Karl (2007) calls the *participation deficit*, “a lack of connection between subjects and the state, which breaks any sense of ownership of public resources or consequent citizen engagement” seems to be one of the most important challenges for oil economies.

The linkage has been highlighted as central to avoiding the resource curse (OECD, 2008). Governments in oil-rich countries gather less revenue from domestic taxation (Ehrhart, 2009, Henry and Springborg, 2001). Capacity in tax administration is also more problematic (Knack, 2008) and there emerge needs for states to enhance tax policy efficiency and administration (Levi, 1988, and Bates and Lien, 1985). As governments in oil-rich countries do not rely as much on revenues raised by taxing their citizens, they are not held as accountable as their counterparts in resource-poor countries (Bornhorst et al., 2009, Moore 2007, and McGuirk, 2010, Bird et al., 2008).

However, in policy recommendations for oil-rich economies, the fiscal contract is absent in the sense that the taxation of citizens is not considered, possibly because (i) the tax base is limited; (ii) tax administration capacity and governance are weak; and (iii) states do not need revenues from individual taxes.

There is therefore a vicious circle, which is difficult to break: less taxation of citizens implies less accountability and public scrutiny of public spending and low efficiency and poor service delivery, which further limits possibilities to tax citizens. The purpose of this paper is to try to break that vicious circle by making the case for having some of the oil revenues transferred directly to citizens, and then having the state tax citizens to finance public spending<sup>1</sup>.

We build the case for our proposal in four steps. In section 2, we show that high levels of oil revenues are associated with low levels of transparency in public budgets and efficiency in public spending. In section 3, we show in a theoretical model how distributing oil revenues directly to citizens and then taxing them can increase citizens' scrutiny of public spending. In section 4, an empirical investigation confirms that without taxation of citizens, accountability of public spending is necessarily limited and without government accountability vis-à-vis citizens, public spending efficiency is likely to remain low. We analyze in section 6 the practical issues of our proposal and suggest some potential candidates. Section 7 presents some concluding remarks.

## **2. The relationship among oil, taxes, accountability and outcomes of public spending**

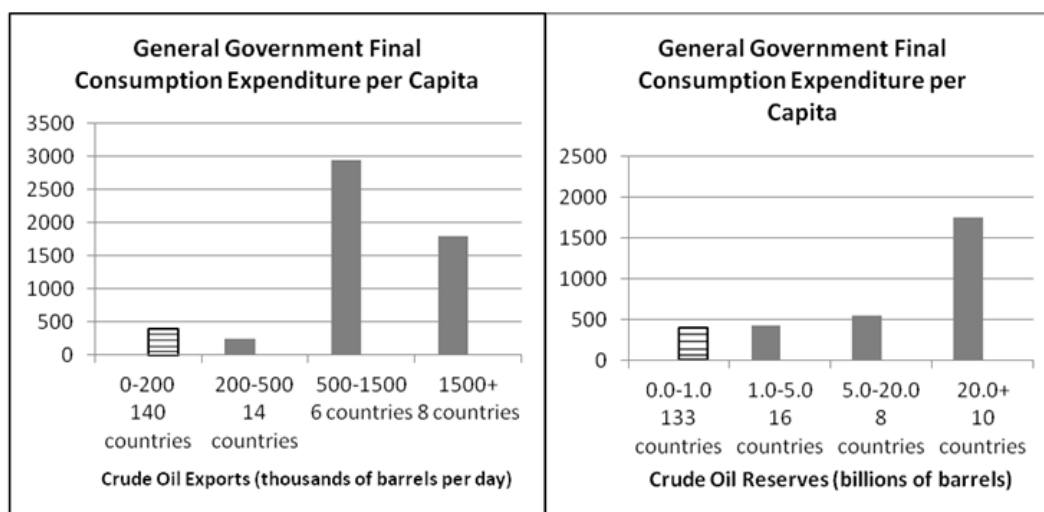
In oil-dependent countries, low levels of budget transparency are common and may lead to poor management of resource wealth over the medium to long term. Countries such as Sudan, the Democratic Republic of Congo, and Equatorial Guinea score 0 out of 100 on the Open Budget Index 2008 (Heuty et al. 2009)<sup>2</sup>. The problem is exacerbated by the fact that public spending per capita in oil-rich countries is much higher than in non-oil economies (see Figure 1). Not only are oil exports associated with higher public spending levels but the association is even higher in the case of countries with large oil reserves (over 20 billion barrels). Large reserves induce confidence over the economic future of the country and, often based on the rationale of export diversification, public spending is increased.

---

<sup>1</sup> In this regard, taxes obviously have efficiency costs but these costs are small compared to the efficiency costs of unproductive public spending.

<sup>2</sup> One of the main drivers of conflict in Sudan has been the historical concentration of wealth and power in the central government in the North, at the expense of the poor majority in the rest of the country. Since 2003, the country has been undergoing an oil and gas boom, accounting for an estimated \$2 billion in annual revenues, or nearly 70 percent of the country's exports. Despite the fact that the 2005 peace accord in Sudan mandated disclosure of the amount of oil revenues, neither the government in Khartoum nor that in Southern Sudan have provided reliable information, leading to suspicion that the money has been used for non-civilian purposes, which threatens the stability of the agreement.

**Figure 1: Public spending per capita according to oil exports and oil reserves**



Source: authors' calculations.

Despite several public expenditure reviews (PERs), usually funded by donors, oil-dependent countries appear to remain with weaker expenditure control systems (one extreme being Nigeria). Table 1 gives the average scores on three dimensions of expenditure accountability for oil producers, mineral producers and non-resource-dependent economies.

**Table 1: Performance of countries by category on budget accountability**

Categories	Oil Producers	Mineral Producers	Non-Resource Dependent Countries
Expenditure controls	22	52	48
Link policy/ planning/budget	17	37	35
Extra budgetary operations	20	31	32

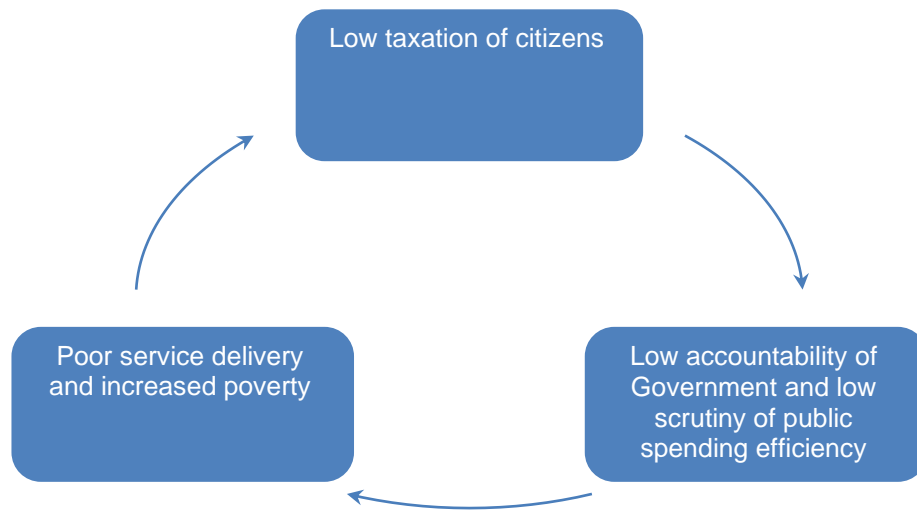
Source: Heuty et al. (2009). Note: Categories are defined as average of questions of the Open Budget Index. For more information on the Survey, and the methodology used to calculate the OBI, see [www.openbudgetindex.org](http://www.openbudgetindex.org). A score of 100 represents a fully open budget.

It is clear that oil producing countries have greater difficulty managing revenue windfalls<sup>3</sup>. The fact that revenues derived from oil production and exports are often kept out of the regular budgets of oil-rich countries can further undermine public oversight (Heuty and al. 2009)<sup>4</sup>.

Low productivity of PERs in these countries could also probably be explained by the fact that these states usually do not need much external funding (except during a period of low international oil prices) and therefore, external pressure from donors is unlikely to bring about results. Moreover, as documented by Bornhorst et al. (2009), domestic taxation effort is also significantly lower in oil-rich economies because they do not need to resort to this source of financing given their oil rents.

In short, oil-rich economies are caught in a vicious circle: citizens are hardly taxed, scrutiny of public spending and government accountability is low, which induces poor service delivery and maintains poverty at high levels, which in turn further impedes taxation of citizens (see Figure 2).

**Figure 2: The Vicious Circle of Oil-rich Economies**



How to break the vicious circle? One needs to start by increasing the taxation of individuals. But in oil-rich countries taxation can only happen after having redistributed part of the rent. That is the principle of the proposal developed in the next section.

---

<sup>3</sup> These countries, for instance, score 25 out of 100 on revenue volatility and forecasting—significantly lower than mineral producers (which score 63 out of 100) and non-resource dependent countries (54).

<sup>4</sup> However, the OBI 2008 results also show that countries can be transparent and accountable to the public despite substantial natural resource endowments. For example, South Africa, Norway, Botswana, and Peru all show strong performance on the OBI relative to other hydrocarbon and mineral producers.



### **3. Oil redistribution schemes: A way of increasing citizens' scrutiny on public spending?**

While there have been many oil redistribution schemes proposed, they have not been combined with a fiscal contract. At most, policy makers and researchers advocate for directly redistributing revenues from oil extraction to citizens (proposals from Sala-i-Martin and Subramanian, 2003, for Nigeria; Birdsall and Subramanian, 2004, for Iraq). Collier et al., 2010, consider the option of transferring some fraction of resources revenue to individuals as a good way to manage resource revenues. In all these proposals, the intent is to allowing citizens to decide how much oil revenues should be spent and how much saved; there is no mention of taxing the transfers. This is probably because, in developing countries, tax evasion is likely to be high (Newbery et al. 1987, and Bird et al., 2008) and direct taxation is relatively small. Therefore, higher direct taxation must be put in place *after* a higher redistribution share. The main strength of oil economies lies in the fact that they benefit from sufficient revenues that they can share a part to citizens.

In the real world, the Alaska Permanent Fund is one of the few examples of oil redistribution schemes (Anderson, 2002). Despite evidence of its effectiveness and good governance, the current redistribution scheme is increasingly coming under criticism. It appears as if there is a growing apathy from the population on public spending scrutiny and gradually, investment in public goods is neglected. Some voices in Alaska are calling for the introduction of new taxes on individuals in order to create a fiscal contract.

In order to explicitly take account of the relationship between redistribution and taxes, we present some characteristics of another option. A share of oil revenues would be redistributed annually to any eligible citizen of the state/country, and from this amount, one part would be taxed to increase public scrutiny and broaden the tax base<sup>5</sup>. In the next subsection, we show why taxation would increase public scrutiny.

#### **3.1. Taxation and citizen scrutiny: a theoretical model**

Having confirmed that oil producing countries have generally weaker expenditure efficiency and accountability, we will now investigate how the proposed redistribution scheme may help strengthen them. More precisely, we develop a theoretical model to help understand the relationship between efficient provision of public goods and our proposal of redistributing to citizens a share of oil revenues and then taxing this amount.<sup>6</sup> Since the level of oil revenues accruing to the government is frequently unknown to most citizens, we develop a model where the citizen is uncertain about the level of oil revenue. We assume further that the citizen can learn about the exact amount of oil revenue if he incurs an information cost.

---

<sup>5</sup> A major share of oil rents would be saved and for the spending share (based for instance on permanent income hypothesis), one part would be allocated to citizens with a small share taxed.

<sup>6</sup> We are aware that several political aspects of importance, such as interest groups, cannot be captured in our model but this simple model does point to some very significant issues.

The model is composed of two agents, a government and a representative citizen. We first consider the current situation in most oil-rich countries where oil revenues accrue to government with no direct redistribution to citizens and where the income of the vast majority of citizens is not subject to taxation. We then compare the outcome in terms of the level of citizens' scrutiny with the situation where a share of oil revenues is transferred to citizens and then taxed.

Case 1: No redistribution of oil revenues and no taxation

*The Government:*

The government's derives utility from both its own private consumption  $s$  and the through the provision of public spending,  $g$ . In common with the literature (see for instance Barro, 1973, or Treisman, 2007 p.31), the objective function can be written as:

$$\varphi = \ln(s) + g \quad (1)$$

The government's budget constraint is such that the policy-maker uses oil revenues  $R$  to finance both his own consumption and spending on the public good.

$$R = s + \frac{1}{\gamma e} g \quad (2)$$

The cost of private consumption is normalized at 1 whereas the cost of spending money on the public good is  $\frac{1}{\gamma e}$  to reflect the fact that the relative price of spending on public good  $g$  rather than on private consumption  $s$  is lowered by the level of effort  $e$  that the citizen puts into monitoring the government<sup>7</sup>. Equivalently, when the level of monitoring is high it is relatively more costly for the government to spend on its private consumption because it has to resort to more costly mechanisms to be able to divert money. The parameter  $\gamma > 0$  captures the effectiveness of the monitoring effort. Thus, the higher  $\gamma$ , the more effective the monitoring is in inducing governments to spend on public goods rather than on private consumption.

*The representative citizen:*

The representative citizen knows that the government is not fully benevolent and that in order to get more public goods he should spend on monitoring how public authorities are using public revenue. However, the government has an informational advantage over citizens because the level of oil rents that it earns is its private information and citizens are uncertain about this level. The citizen derives utility from the consumption of a private good  $c$  and from the consumption of the public good  $g$ :

---

<sup>7</sup> We do not assume that citizens will become self-conscious and activist-citizens. We demonstrate that despite the costs of scrutiny, it is optimal for them to monitor use of public revenues to a large extent.

$$W = V(c) + U(g) \quad (3)$$

The utility function  $V$  respects the standard assumption that  $V'(c) > 0$  and  $V''(c) < 0$ . Given the uncertainty over the government budget, the level of public spending  $g$  provided by the government is also uncertain. Thus, we need to make assumptions citizens' attitude towards risk. We assume constant relative risk aversion, so that, as in Alesina et al. (1999), the utility derived from public goods takes the form  $U(g) = g^a$  with  $0 < a < 1$  where  $(1-a)$  is a measure of the Arrow-Pratt concept of relative risk aversion. The budget constraint of the citizen is such that he spends his exogenous income  $Y$  on the private good  $c$  and on exerting effort  $e$  to monitor the government:

$$Y = c + e .$$

*Equilibrium:*

We now characterize the equilibrium for the non-cooperative game between the government and the citizen. The citizen pre-commits to a monitoring level  $e$  and the government decides the level of public goods that it will provide. Using backward resolution, the government decides the optimal level of public goods  $g^*$  by maximizing its utility (1) subject to the budget constraint (2).

$$\text{Max } \varphi = \ln \left( R - \frac{1}{e\gamma} g \right) + g$$

The first-order condition yields the optimal level of public goods:

$$g^* = \gamma e(R) \quad (4)$$

This equation gives rise to the first result of our model which will be empirically tested in the next section:

**Proposition 1.** The level of public goods provision by the government rises with the level of citizens' monitoring  $e$  over the utilization of public funds.

Moreover, it can be noted that the more effective is the monitoring ( $\gamma$  high), or the higher the level of government resources  $R$ , the higher public spending will be. We can also derive the corresponding level of resources diverted by the government,  $s$ , which is decreasing with the level of citizens' scrutiny:

$$s^* = \frac{1}{\gamma e} \quad (5)$$

The citizen decides his level of monitoring by maximizing his utility and taking into account the reaction function (4) of the government. The level of government revenue from oil is a random variable  $\tilde{R}$  to the citizen. The citizen knows the reaction function of the government but because of uncertainty about the level of the government budget, he is also uncertain

about the level of public spending the government will provide if he monitors. Therefore the return on monitoring in terms of public spending is uncertain and the citizen maximizes his expected utility subject to his budget constraint.

$$\text{Max } E[W] = V(Y - e) + EU(\gamma e \tilde{R}) \quad (6)$$

The first-order condition for utility maximization is found by setting the derivative of (6) with respect to  $e$  equal to zero. The optimal level of monitoring must satisfy

$$V'(Y - e) = \gamma R E[U'(\gamma e \tilde{R})] \quad (7)$$

From Rothschild and Stiglitz (1971), whether an increase in the risk over the government budget decreases or increases the optimal level of monitoring  $e^*$  of the citizen depends on whether  $\gamma R U'(\gamma e R)$  is concave or convex in  $R$ . In our case, the first and second derivatives with respect to  $R$  are

$$\begin{aligned} \frac{\partial(\gamma R U'(\gamma e R))}{\partial R} &= \gamma a (\gamma e R)^{a-1} + \gamma R a (a-1) (\gamma e R)^{a-2} \gamma e \\ \text{and } \frac{\partial^2(\gamma R U'(\gamma e R))}{\partial R^2} &= \gamma a (a-1) (\gamma e R)^{a-2} (1 + 2\gamma e) < 0 \end{aligned} \quad (8)$$

According to (8),  $\gamma R U'(\gamma e R)$  is concave in  $R$  implying that an increase in the risk over the government budget will decrease the optimal level  $e^*$  of citizens' monitoring over public spending. Conversely, a decrease in the risk over the return on monitoring will increase the optimal effort of monitoring the government,  $e^*$ . The intuition is that with greater uncertainty, the returns to investing in monitoring the government are lower, and hence citizens exert less effort.

Case 2: redistribution of a share of oil revenues,  $\alpha R$ , to citizens with taxation

We now investigate the effect on the optimal level of citizen's monitoring over public spending if the government redistributes a share of oil revenues  $\alpha R$  to citizens and taxes this amount back at rate  $t$ . The government's budget constraint is therefore given by:

$$(1 - \alpha)R + \alpha R t = s + \frac{1}{\gamma e} g \quad (10)$$

Maximizing government utility subject to this budget constraint yields the following optimal level of public spending:

$$g^* = \gamma e (\alpha R t + (1 - \alpha)R) \quad (11)$$

The positive relationship between public goods provision and monitoring highlighted in proposition 1 is unchanged. In this case, the government budget is modified because the budget is no longer solely constituted of natural resources revenue but also of the taxes paid

by citizens. The risk of the return on monitoring in terms of public goods delivery is therefore lowered through two means and will lead to an increase in the optimal monitoring level  $e^*$  compared to the no redistribution, no taxation case. First, given that an amount  $\alpha R$  is redistributed, the variance of the remaining share of oil revenue belonging to the government,  $(1 - \alpha)R$ , is lowered. Indeed, the variance of the uncertain random variable in the government budget is lower in case 2 than in case 1:

$$V((1 - \alpha)R) = (1 - \alpha)^2 V(R) < V(R)$$

Secondly, government revenue is, with the introduction of taxation, composed of a part  $\alpha R$  which is certain for the citizen since it is the amount of taxes paid. Thanks to this certain amount taken from the citizen, the level of revenue controlled by the government is no longer totally uncertain. This will therefore decrease the risk over the return on monitoring in terms of getting public goods and will lead to an increase in the optimal level of citizen's monitoring in case 2 compared to case 1.

In this context of uncertainty over the level of oil revenue, our proposition of redistributing a share of oil revenue and taxing back an amount of it reduces the uncertainty over the level of government revenue and therefore over the return on monitoring in terms of public goods. The proposal therefore strengthens incentives for the citizen to increase his scrutiny over the utilization of public funds.

To test the robustness of the previous result, we consider the case where information about the government budget can become transparent if the citizen spends money on auditing. The government's objective function is the same as in the previous sub-section where it derives utility from its own private consumption  $s$  and from the social utility by spending on the public good  $g$ . The government budget constraint remains as in (10) and the maximization of government utility yields  $g^*$  as expressed in (11).

In the absence of uncertainty, we do not need specific assumptions over the citizen's behavior regarding risk and can therefore resort to a utility function from which we will be able to derive analytical results. The citizen's utility is represented by a standard quasi-linear utility function with decreasing marginal utility from private consumption  $c$  and constant marginal utility from public consumption  $g$  (as in Persson and Tabellini, 2000, chap.4 p.82; or Besley, 2006 p.178).

$$U = \ln(c) + g \quad (12)$$

By spending on auditing, information about the government budget can become transparent. We assume the same auditing technology as in Bernanke and Gertler (1989) which costs  $\mu$  but reveals the government revenue without error. This cost  $\mu$  depends on two aspects. First, the cost of learning about the level of government revenue is higher the less information about the government revenue you already possess. The cost is therefore a decreasing function of the level of information about the government revenue that you can

already infer without any cost, namely the amount of taxes you paid. Secondly, the cost is an increasing function of the degree of opacity  $\delta$  over the government budget. The less transparent the level of oil revenue earned by the government, the more costly it will be to succeed in learning about the government revenue. A potential expression for the cost of auditing government revenue is therefore:

$$\mu = \frac{\delta}{\alpha R t} \quad (13)$$

The budget constraint of the citizen is such that he spends his after-tax income on the private good and on exerting effort  $e$  to monitor the government, having previously spent  $\mu$  to acquire information about the level of government revenue:

$$(\alpha R)(1 - t) + Y = c + (\mu + 1)e \quad (14)$$

### *Equilibrium*

The relationship between the government and the representative citizen is, as previously, a non-cooperative game. The timing of action is as in a principal-agent model, with the citizen (the principal) moving first by choosing his level of monitoring and the government (as agent) moving second by responding to the citizen's monitoring level. The maximization of citizen utility (12) subject to his budget constraint (14) and taking into account (13) and the government optimal level of public spending (11) gives the following first-order condition with respect to the effort of monitoring  $e$ :

$$\frac{(\delta + \alpha R t)}{\alpha R(1 - t)\alpha R t + Y\alpha R t - (\delta + \alpha R t)e} = \gamma[\alpha R t + (1 - \alpha)R]$$

Since monitoring is costly, the optimal level of monitoring rises when the marginal benefits of monitoring, on the right-hand side, equals the marginal cost of an additional unit of monitoring, on the left-hand side. Consequently, we derive the optimal level of monitoring,  $e^*$ :

$$e^* = \frac{(\alpha R)^2 t(1 - t) + \alpha R t Y}{\delta + \alpha R t} - \frac{1}{(\alpha R t + (1 - \alpha)R)\gamma}$$

Our interest principally is in the effect of taxation on the level of monitoring, because this is the main contribution of our proposal compared to existing oil revenue redistribution schemes. Given this expression for the optimal level of monitoring  $e^*$ , we can derive the following result presented in proposition 2.

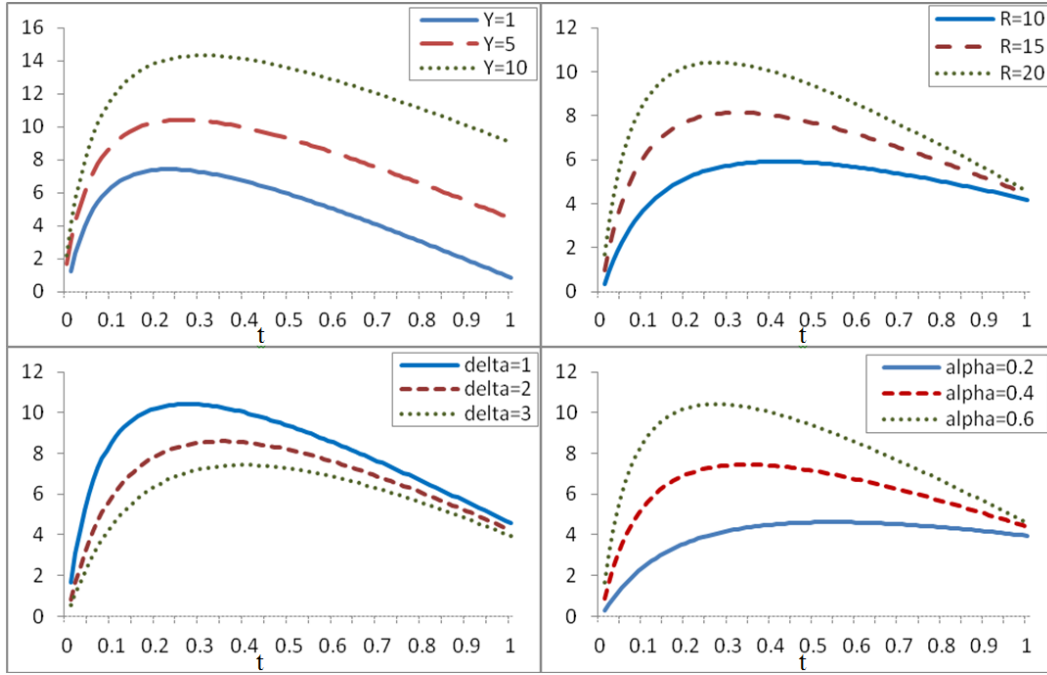
**Proposition 2.** The effect of taxation on monitoring effort is non linear and depicts an inverted U-curve. For low levels of taxation, the citizens' scrutiny is increasing with the tax level but after a threshold, for high tax rates, the effect of taxation on scrutiny becomes negative.

In Figure 3, we plot a simple simulation of the relationship between the level of monitoring and the tax rate, for different levels of the parameters, to illustrate this result. The level of monitoring  $e$ , on the y-axis, according to the level of tax rate  $t$  follows an inverted U-curve.

**Figure 3: The relationship between taxation rate  $t$  and monitoring level  $e$**

For  $R=20$ ;  $\alpha = 0.6$ ;  $\delta = 1$ ;  $\gamma = 1$

For  $R=20, Y=5, \delta=1, \gamma=1$



For  $R=20$ ;  $\alpha = 0.6$ ;  $\delta = 1$ ;  $\gamma = 1$

For  $R=20, Y=5, \delta=1, \gamma=1$

At low tax rates, below about 20% with these simulations, higher taxation leads to an increase in the citizen's scrutiny. The marginal cost of monitoring is decreasing with taxation because the citizen can infer costlessly a part of the government revenue which is the level of taxes he paid and that he can make sure the government will spend on public goods. However, a countervailing effects is that when the tax rate gets higher, the citizen's disposable income to spend on monitoring decreases and therefore after a certain threshold, this negative effect will dominate, and any increase in taxation will lead to a decrease in the monitoring level.

Therefore the introduction of taxation on the redistributed amount of oil revenue is a trigger for enhanced citizen's scrutiny but cannot be imposed at confiscatory rates. Otherwise it could have a disincentive effect on monitoring effort.

Interestingly, other variables can foster the positive impact of taxation on citizen's scrutiny over public expenditures. Indeed, the more income the citizen possesses, either exogenous income  $Y$  or redistributed income  $\alpha R$ , the more resources he will be able to spend on

monitoring the government in order to ensure that the taxes he paid, which are part of government revenue, will be transformed into public goods.

The citizen's monitoring effort is also higher the less opacity about government revenues there is (low  $\delta$ ). Therefore existing initiatives trying to promote transparency over government revenues, namely the Extractive Industries Transparency Initiative (EITI) or more generally freedom of information legislation enhance citizen's scrutiny because they make information over government revenues more easily available to citizens.

Finally, this theoretical model highlights how the redistribution of oil revenue combined with taxation at a reasonable rate leads the citizen to increase his scrutiny on government spending. Under both uncertainty and certainty, the main results are the same: taxation leads to increased monitoring by the citizen. When they are taxed, citizen's information about the level of government revenue available for public goods increases and the citizen wants to ensure that this certain income, lost through taxation which was transferred to the government budget, will be spent on public goods. This rise in citizens' scrutiny over government spending increases the relative cost for the government of diverting resources and induces the government to increase the effective provision of public goods.

### **3.2 The links among taxation, accountability and poor outcome of public spending: A cross-country analysis**

In this sub-section, we analyze empirically the insights provided by the theoretical model. We proceed in two steps. First, we test proposition 1 by assessing whether more accountability and citizen's participation in the political process have a positive effect on the outcomes of public spending. Second, we investigate the empirical relevance of proposition 2 by testing the relationship between taxation and citizens' participation in the political process.

From the literature, we know that there is an inverse relationship between oil dependence and the level of spending in education, all other things being equal, mainly due to overconfidence in the future and less of a need to invest in human capital (Gylfason, 2001). Rajkumar and Swaroop (2008) demonstrate that efficiency of public spending in education is affected by the quality of governance (measured mainly by quality of bureaucracy and the level of corruption).

Using the Rajkumar-Swaroop specification, we introduce a measure of voice and accountability<sup>8</sup> extracted from Kaufman et al. governance indicators<sup>9</sup> and test if the quality of public spending in education is significantly correlated with citizens' participation in the

---

<sup>8</sup> Voice and accountability measures the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and free media.

<sup>9</sup> For definition and sources of variables, see annex 1. We used the voice and accountability measure and not the others because of the strong correlation between the four measures.



political process. The results of this first step are presented in Table 3. As expected, voice and accountability have indeed a strong association with the education outcome (secondary enrolment) even after controlling for spending level, GDP per capita and level of urbanization. The size of the coefficient is rather strong, an increased degree of voice and accountability by one standard deviation is associated with a rise of about 3 percentage point in the enrollment ratio. This empirical result is in line with the theoretical prediction that the greater is citizens' voice, the better is the outcome of public spending.

**Table 3: The relationship between outcome of public spending and accountability**

Dependent variable:	Gross secondary enrollment ratio	
	(1)	(2)
Voice and Accountability	3.87** (1.26)	2.73* (1.52)
Control of corruption		1.61 (1.79)
Urban population	0.25** (0.09)	0.25** (0.09)
GDP per capita	14.59** (2.02)	14.58** (2.04)
Pupil/teacher ratio, secondary	-0.44** (0.20)	-0.43** (0.20)
Public secondary education spending	0.39** (0.14)	0.37** (0.14)
Sub-Saharan Africa	-25.62** (7.08)	-23.99** (7.43)
South Asia	-32.04** (10.43)	-31.42** (10.12)
Middle East and North Africa	-27.03** (7.15)	-26.77** (7.12)
East Asia and Pacific	-21.88** (6.53)	-20.39** (6.85)
Europe and Central Asia	-29.80** (6.90)	-28.83** (7.13)
Latin America and the Caribbean	-33.49** (6.92)	-31.84** (7.25)
Constant	-45.13 (17.71)	-46.11** (17.88)
# of obs.	185	185
R <sup>2</sup>	0.77	0.77

Note: Standard deviation in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

It is worth noting that even though control of corruption is with the expected sign, it is not significant, which may be explained by the fact that control of corruption and voice and accountability are correlated.

The second step consists of examining whether taxation can improve the accountability of government when oil-dependency lowers it. Table 4 summarizes the results of past studies and experiments.

**Table 4: The effects on governance of state reliance on broad taxation**

<b>Immediate effects</b>	<b>Intermediate effects</b>	<b>Direct governance outcomes</b>
Effects on the state  The state becomes focused on obtaining revenue by taxing citizens	(i) The state is motivated to promote citizen prosperity  (ii) The state is motivated to develop bureaucratic apparatuses and information sources to collect taxes effectively	More responsiveness  More bureaucratic capability
Effects on citizens  The experience of being taxed engages citizens politically	(i) (Some) taxpayers mobilise to resist tax demands and/or monitor the mode of taxation and the way the state uses tax revenue	More accountability
Results of interaction  States and citizens begin to bargain over revenues. Taxpayers comply with tax demands in exchange for some institutionalised influence over the level and form of taxation and the uses of revenue (i.e. public policy).	(i) Taxes are more acceptable and predictable, and the taxation process more efficient  (ii) Better public policy results from debate and negotiation  (iii) Wider and more professional scrutiny of how public money is spent  (iv) The legislature (assuming one exists) is strengthened relative to the executive	More responsiveness, political and bureaucratic capability  More responsiveness and political capability  More accountability  More accountability

*Source: OECD 2008 adapted from Moore (2007).*

According to the theoretical model, more taxes being collected should be associated with increases in citizens' voice and government accountability. However, after a certain threshold of taxes, if the burden of taxation becomes too high for citizens, it might be associated with lower scrutiny and less involvement in the political process. Moreover, due to the fact that in oil economies, revenue from taxes are minimal, we can expect that controlling for the impact of taxes, a greater dependency on oil is likely to create less accountability (Ross, 2001). We will test these three ideas by departing from Shah's (2005) specification and controlling for a country's level of development (GDP per capita) and overall policy framework (trade openness ratio). In this second step, we keep the same measure of voice and accountability.

Table 5 presents the results. Controlling for development and policy variables, it appears, throughout the three columns, that oil dependency, measured as the level of oil rent as part of GDP, has a negative association with accountability. This confirms what is alluded to in the literature as the resource curse. Regarding taxation, the two first columns exhibit a positive relationship, significant at 1%, between the level of tax revenue and the extent of voice and accountability in a country.

**Table 5: The Main Determinants of Accountability**

VARIABLES	Voice and accountability		
	(1)	(2)	(3)
Tax Revenue	0.054*** (0.011)	0.059*** (0.012)	0.096** (0.043)
Tax Revenue^2			-0.001 (0.001)
Oil Rent	-0.021** (0.008)	-0.018** (0.009)	-0.017* (0.009)
GDP per capita (log)	-0.0336 (0.058)	-0.0178 (0.061)	-0.0158 (0.061)
Openness		-0.179 (0.154)	-0.174 (0.155)
East Asia and Pacific	-1.597*** (0.529)	-1.470*** (0.546)	-1.465*** (0.546)
Latin America and the Caribbean	-1.044** (0.523)	-1.015* (0.530)	-1.036* (0.531)
Middle East and North Africa	-1.824*** (0.548)	-1.556*** (0.575)	-1.546*** (0.576)
South Asia	-1.684*** (0.549)	-1.665*** (0.567)	-1.628*** (0.569)
Sub-Saharan Africa	-1.625*** (0.508)	-1.516*** (0.523)	-1.465*** (0.526)
Oecd	-0.911* (0.500)	-0.856* (0.511)	-0.881* (0.513)
Constant	0.895 (0.700)	0.784 (0.739)	0.462 (0.822)
# of obs.	94	87	87
R^2	0.493	0.459	0.465
Joint-significance Tax and Tax^2 (p-value)			0.000
Threshold			t=49%

Note: Standard deviation in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

In the third column, we include the squared value of tax revenue to assess the existence of a non-linear relationship between the level of taxation and the extent of voice and accountability. The coefficients of tax revenue and tax revenue squared are jointly significant at the 1% level, the first positive and the second negative. This result confirms the fact that, after a threshold, at too high levels of taxation, the relationship between taxation and the political involvement is inverted. The threshold can be computed and happens for a level of tax revenue of about 49% of GDP. Since the tax-to-GDP ratio in most developing countries is below this level, one can assume that most of them are situated on the rising part of the relationship where increases in the level of taxation are associated with more accountability. It is also worth noting that controlling for all these variables, Africa seems to suffer from a

certain lack of accountability. That is also precisely why a fiscal contract needs to be established in oil-rich African countries.

In sum, the empirical analysis confirms the results highlighted in the theoretical model that higher citizens' scrutiny is associated with better outcomes in terms of public spending and that increased taxation, but not at confiscatory rates, induces citizens to raise their demand for good governance. The proposed scheme of redistributing a share of oil revenues and then taxing citizens might therefore be able to break the vicious circle prevalent in oil-rich economies and lead to better public spending outcomes.

#### **4. Potential Candidates and Implementations Issues**

As this is a new proposal, it is worth investigating how and where it could be implemented. We will focus on Sub-Saharan Africa because in many oil producing countries of this region, there is a real need of increased public goods and indicators reveal a lack of voice and accountability.

There are obviously some difficulties in implementing such schemes and challenges deriving from governance problems need to be taken into consideration as a starting point.

First, political will and stability should be relatively high for the redistribution and taxation scheme to be effective. If a government does not want to implement such a redistribution scheme, external pressure is likely to fail and this mechanism cannot be seriously implemented. Secondly, any government could siphon off some of the redistributed funds. This in line with critics such as Hjort (2006), who maintain that in a low-capacity and corruption-ridden country, there will be even more leakages in the system and corruption with redistribution schemes. Thirdly, having taxation as part of redistribution of oil revenues induces transaction costs. Given these considerations, the proposed 'citizen funds +' should not be implemented in a country with extremely weak governance indicators and virtually non-existent tax systems.

Among Sub-Saharan African oil countries, the three countries with the best performance in the 2009 Corruption Perception index, and that could therefore be potential candidates, are, Gabon, Nigeria and Cameroon. Similarly, according to the two CPIA indicators of the efficiency of revenue mobilization and the quality of public administration, these countries are above the average of African oil countries.

A particular focus could then be given to the new oil producers, namely Ghana and Mauritania, because the recent discovery of oil leaves room for the implementation of new mechanisms since there are no pre-existing ones. In addition, Ghana has a reasonably well-performing tax system.

Having identified potential candidates, the feasibility and complexity of such schemes need to be addressed<sup>10</sup>. On the logistical/technical side, it is obvious that many questions need to be answered<sup>11</sup> such as the existing capacity of revenue administration and the tax culture in a country or which tax instruments (e.g., direct personal income tax, property taxes or some types of indirect taxes, such as the VAT, and user fees) should be used<sup>12,13</sup>? Who should be eligible for these schemes<sup>14</sup> and would it be done to identify the beneficiaries without creating too much geographical/ethnic tension<sup>15</sup>? How is it possible to reach citizens in remote regions<sup>16</sup>?

## 5. Concluding remarks and areas for future research

This paper demonstrates that without shaping a fiscal social contract through taxation of citizens in oil-rich economies, citizens' scrutiny over public spending will probably remain low. In turn, the efficiency of public spending would not be enhanced despite increased external pressure for transparency. The line of argument, based on theoretical and empirical analysis, is straightforward: citizens are more likely to monitor their governments when they pay taxes because they are certain and know that the income they lost through taxes is part of government revenue and should be spent on public goods. By contrast, they are uncertain, or at least there is a cost to obtaining the information, over the level of oil revenue which is accruing directly to the government; monitoring is therefore more costly or its return more uncertain. When there is increased scrutiny due to taxation, the diversion of government revenue for uses other than the efficient provision of public goods will become more difficult. Alternatively, government's incentives to design and implement policies that improve the welfare of the population will rise.

In light of the theoretical and empirical evidence (not to mention common sense), a proposal to redistribute oil revenues and tax citizens should at least be piloted. Despite its complexity, this experiment should be launched because after decades of external pressure, it

---

<sup>10</sup> It is worth noting that large oil per capita expected revenues can possibly change the tax base and therefore have a higher expected impact. Therefore, the extent of oil per capita revenues should also be an important criterion for country selection.

<sup>11</sup> We leave aside the question of what should be the share to redistribute since it is essentially an issue of consensus to be reached by the citizenry.

<sup>12</sup> For instance, instead of explicitly taxing them, a smaller dividend could be given but explicitly showing (on a card for instance) the amount they would be getting if there were no taxes.

<sup>13</sup> From a political economy perspective, three elements need to be satisfied: ensuring transparency; building in functional mechanisms to overcome institutional constraints; and building consensus around oil revenue management.

<sup>14</sup> Ross (2007) also explains that this would not address regional grievances, since those who live closer to the mineral's source would continue to ask for a larger share of revenues, which cannot be satisfied.

<sup>15</sup> While there are still some major gaps, ID registration is improving in poor countries with the development of biometric techniques in developing countries (Gelb and Decker 2011).

<sup>16</sup> Redistribution of revenues could use the pilot information technology tools used by conditional cash transfers schemes in some countries in SSA.

is probably time to acknowledge that donors' pressure in these countries is not as effective as expected. Most citizens in oil-rich economies do not have any link with their government. Even though not perfect (especially at the beginning), this experiment could help create a link between citizens and their government.

The proposal should be piloted because it is not easy to implement. But in the field of oil-rich economies, most initiatives, such as EITI (Extractive Industries and Transparency Initiative) or the National Resource Charter<sup>17</sup>, are difficult to implement and they all depend on elites' willingness to adhere to the process. An important advantage of this proposal (over the other initiatives) would be that it is aligned with some politicians' incentives. Indeed, this proposal could, in the short term, benefit a politician since citizens will have their incomes raised by the direct redistribution.

In order to address the pertinent questions related to this proposal, country case studies could be undertaken to test the feasibility of redistributive and tax mechanisms as presented. The recent discovery of oil reserves in some African countries opens up new opportunities as well as challenges for public engagement, public discussion and interventions in institutional arrangements for the entire value chain, including resource collection and management.

---

<sup>17</sup> <http://www.naturalresourcecharter.org/>.

## Bibliography

- Alesina, A., Baqir, R. and Easterly W. (1999), "Public Goods and Ethnic Divisions", *The Quarterly Journal of Economics*, 114(4), pp. 1243-1284.
- Anderson, J. (2002), "The Alaska Permanent Fund: Politics and Trust", *Public Budgeting and Finance*, pp.57-68.
- Arrow, KJ. (1971), *Essays in the Theory of Risk Bearing*, Amsterdam, North Holland.
- Auty, R. M. ed. (2001), *Resource Abundance and Economic Development*, UNU/WIDER Studies in Development Economics, Oxford and New York.
- Barro, R.J. (1973), "The Control of Politicians: an Economic Model", *Public Choice*, 14, pp.19-42.
- Bates, R.H. and Lien Da-Hsiang D (1985), A Note on Taxation, Development and Representative Government, *Politics and Society* 14 (1).
- Bernanke, B. and Gertler, M. (1989), "Agency Costs, Net Worth, and Business Fluctuations", *The American Economic Review*, 79(1), pp. 14-31.
- Besley, T. (2006), "Principled agents? The political Economy of Good Government", Oxford University Press.
- Bird, R., Martinez-Vasquez, J. and Torgler, B. (2008), "Tax Effort in Developing Countries and High Income Countries: The Impact of Corruption, Voice and Accountability", *Economic Analysis and Policy*, 38(1).
- Birdsall, N. and Subramanian, A. (2004), Saving Iraq from Its Oil, *Foreign Affairs*, 83(4), pp.77-89.
- Bornhorst, F., Gupta, S. and Thornton, J. (2009), "Natural Resource Endowments, Governance, and the Domestic Revenue Effort: Evidence from a Panel of Countries", *European Journal of Political Economy*, 25(4), pp.439-446.
- Brautigam, D., Fjeldstad, O. and Moore, M. (2008), "Taxation and State-Building in Developing Countries: Capacity and Consent", Cambridge University Press.
- Collier, P. (2006), "Is Aid Oil? An Analysis of Whether Africa Can Absorb More Aid", *World Development*, 34(9), pp.1482-1497.
- Collier, P., Van der Ploeg, R., Spence, M. and Venables, A.J. (2010), "Managing Resource Revenues in Developing Economies", *IMF Staff Papers*, 57(1).
- Ehrhart, H. (2009), "Assessing the Relationship between Democracy and Domestic Taxes in Developing Countries", CERDI Working Paper 200930.
- Gelb, A. and Grasmann, S. (2010), "How Should Oil Exporters Spend Their Rents?", Center for Global Development Working Paper 221.
- Gelb, A. and Decker, C. (2011), "Cash at Your Fingertips: Biometric Technology for Transfers in Resource-Rich Countries", Center for Global Development Working Paper 253.
- Gylfason, T., Herbertsson, T. and Zoega, G. (1999), "A Mixed Blessing: Natural Resources and Economic Growth," *Macroeconomic Dynamics* 3, 204-225.
- Gylfason, T. (2001), "Natural Resources, Education, and Economic Development", *European Economic Review*, 45, pp. 847-859.

- Henry, C. and Springborg, R. (2001), *Globalization and the Politics of Development in the Middle East*, Cambridge: Cambridge University Press.
- Heuty, A. and Carlitz, R. (2009), “Resource Dependence and Budget Transparency”, available at <http://www.revenuewatch.org/news/020109a.php>.
- Hjort, J. (2006), “Citizen Funds and Dutch Disease in Developing Countries”, *Resources Policy* 31, pp.183-191.
- Humphreys, M. and Sandbu, M. (2007), “The Political Economy of Natural Resource Funds” in *Escaping the Resource Curse*, Eds. Humphreys, M., Sachs, J. and Stiglitz, J., New York: Colombia University Press.
- Karl, T.L. (2007), “Ensuring Fairness: The Case for a Transparent Fiscal Social Contract” in *Escaping the Resource Curse*, Eds. Humphreys, M., Sachs, J. and Stiglitz, J., New York: Colombia University Press.
- Knack, S. (2009). “Sovereign Rents and the Quality of Tax Policy and Administration”, *Journal of Comparative Economics*, 37, pp.359–371.
- Lederman, D., Loyaza, N. and Soares, R. (2005), “Accountability and Corruption”, *Economics and Politics*, 17(1), pp. 1-35.
- Lederman, D. and Maloney, W. (eds.) (2007), *Natural Resources, Neither Curse Nor Destiny*, Washington DC: World Bank and Stanford University Press.
- Leite, C. A. and Weidmann, J. (1999). “Does Mother Nature Corrupt? Natural Resources, Corruption, and Economic Growth,” *IMF Working Paper 99/85*.
- Levi. M. (1988), *Of Rules and Revenue*, Berkeley, Los Angeles and London: University of California Press.
- McGuirk, Eoin (2010), “The Illusory Leader: Natural Resources, Taxation and Accountability”, The Institute for International Integration Studies Discussion Paper Series 327, IIS.
- Moore, M. (2007), “How Does Taxation Affect the Quality of Governance?”, *IDS Working Paper 280*.
- Najman, B., Pomfret, R. and Raballand, G. (2007), *The Economics and Politics of Oil in the Caspian Basin*, London: Routledge.
- Newbery, D. and Stern, N. (eds.), (1987), *The Theory of Taxation for Developing Countries*, Washington: World Bank.
- OECD, (2008), *Governance, Taxation and Accountability*, OCED: Paris. <http://www.oecd.org/dataoecd/52/35/40210055.pdf>.
- Persson, T. and Tabellini, G. (2000), “*Political Economics: Explaining Economic Policy*”, The MIT Press, Cambridge.
- Pratt, J. (1964), “Risk Aversion in the Small and in the Large”, *Econometrica*, 32(1-2), pp.122-36.
- Rajkumar, A. and Swaroop, V. (2008). “Public Spending and Outcomes: Does Governance Matter?”, *Journal of Development Economics*, 86, pp. 96-111.
- Ross, M. (2001), “Does Oil Hinder Democracy?” *World Politics*, 53, pp.325-361
- Ross, M. (2007), “How Mineral-Rich States Can Reduce Inequality” in *Escaping the Resource Curse*, Eds. Humphreys, M., Sachs, J. and Stiglitz, J., New York: Colombia University Press.



- Rothschild, M. and Stiglitz, J.E. (1971), "Increasing Risk II: Its Economic Consequences", *Journal of Economic Theory*, 3(1), pp.66-84.
- Sala-i-Martin, X. and Subramanian, A. (2003), "Addressing the Natural Resource Curse: an Illustration from Nigeria", *IMF Working Paper 03/139*.
- Sachs, J. D. and Warner, A.M. (1995). "Natural Resource Abundance and Economic Growth," *NBER Working Paper 5398*.
- Sachs, J. D. and Warner, A.M. (2001). "The Curse of Natural Resources," *European Economic Review* 45, pp. 827-838.
- Sandbu, M. (2006). "Natural Wealth Accounts: A Proposal for Alleviating the Natural Resource Curse", *World Development*, 34(7), pp.1153-1170.
- Segal, P., (2011). "Resource Rents, Redistribution, and Halving Global Poverty: The Resource Dividend", *World Development*, forthcoming.
- Shah, A. (2005), "Fiscal Decentralization and Fiscal Performance", *World Bank Policy Research Working Paper 3786*.
- Treisman, D. (2007), "*The Architecture of Government: Rethinking Political Decentralization*", Cambridge University Press.

## Annex 1: Variables definition and sources

### Education variables:

- **Gross secondary education enrollment ratio.** Ratio of total secondary school enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Source: World Bank WDI.
- **Public secondary education spending.** Share of public expenditure for secondary education is the percentage of public education expenditure for secondary education. Source: World Bank WDI.
- **Secondary pupil teacher ratio.** Number of pupils enrolled in secondary school divided by the number of secondary school teachers. Source: World Bank WDI.

### Governance indicators:

- **Government effectiveness.** Quality of public services, quality of the civil service and degree of its independence from political pressures, quality of policy formulation and implementation, and credibility of the government's commitment to such policies. Source: Kaufman governance indicators.
- **Control of corruption.** Extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Source: Kaufman governance indicators.
- **Voice and accountability.** Measures the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and free media. Source: Kaufman governance indicators.
- **Corruption perception index.** Corruption perception index (1995-2006). Source: [http://www.transparency.org/policy\\_research/surveys\\_indices/cpi/2008](http://www.transparency.org/policy_research/surveys_indices/cpi/2008)

### Government Investment and Taxes

- **General Government final Consumption Expenditure per Capita.** (current US\$) (average 2002-2006). Source: World Bank. WDI.
- **Tax Revenue.** (as a share of GDP) Sum of taxes on international trade, taxes on goods and services and taxes on income and profits. Source: World Bank. WDI.

### Oil export measures and reserves:

- **Crude oil exports.** Crude oil exports (number of thousand barrels per day) (2005). Source: Energy Information Administration, International Energy Annual 2006.
- **Oil exports.** Exports (mineral fuels, oils, distillation products, etc.) as a share of total exports (2006). Source: International Trade Center.
- **Crude oil reserves.** Proved reserves (number of billions of barrels) (2008). Source: Energy Information Administration, International Energy Annual 2006.
- **Oil Rent** (as a share of GDP). Rent calculated as a difference between the price of oil and its production cost. World Bank (Adjusted Net Savings Projects).

### Control variables

- **Urban population.** Source: World Bank WDI.
- **GDP per capita.** Based on purchasing power parity in constant 2005 international dollars. Variable in logarithms. Source: World Bank WDI.
- **Openness.** Imports of goods and services (BoP, current US\$) plus exports of goods and services (BoP, current US\$) as a share of GDP (current US\$). Source: WDI.