Policy Research Working Paper 9880

Taxation, Accountability, and Cash Transfers

Breaking the Resource Curse

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WORLD BANK GROUP
Development Economics
Development Research Group
December 2021

Policy Research Working Paper 9880

Abstract

Why is governance in resource-rich countries so poor? This paper argues that it is because governments in these countries do not rely on taxation, which is an important instrument for citizens to hold their governments accountable. Using a game-theoretic model, the authors show that the combination of low taxes and weak governance can be an equilibrium in an economy with sizeable mineral revenues. As income from natural resources ultimately declines, replacing it with tax revenues may require governments to give control of these proceeds to citizens, in the form of cash transfers say, as a credible commitment to accountability, thereby breaking the country out of its resource curse.

This paper is a product of the Development Research Group, Development Economics. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://www.worldbank.org/prwp. The authors may be contacted at sd294@georgetown.edu and qdo@worldbank.org.

Taxation, Accountability, and Cash Transfers: Breaking the Resource Curse*

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JEL Classification: D73, H27

Keywords: Natural resource curse, taxation, accountability, credible commitment.

*We are grateful to Pierre Bachas, Katy Bergstrom, Anne Brockmeyer, Michael Clemens, Jishnu Das, Marcelo Giugale, Stephen O'Connell, Oyebola Okunogbe, Berk Özler and Martin Ravallion for helpful comments and discussions. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of the World Bank, its Board of Executive Directors, or the governments they represent.

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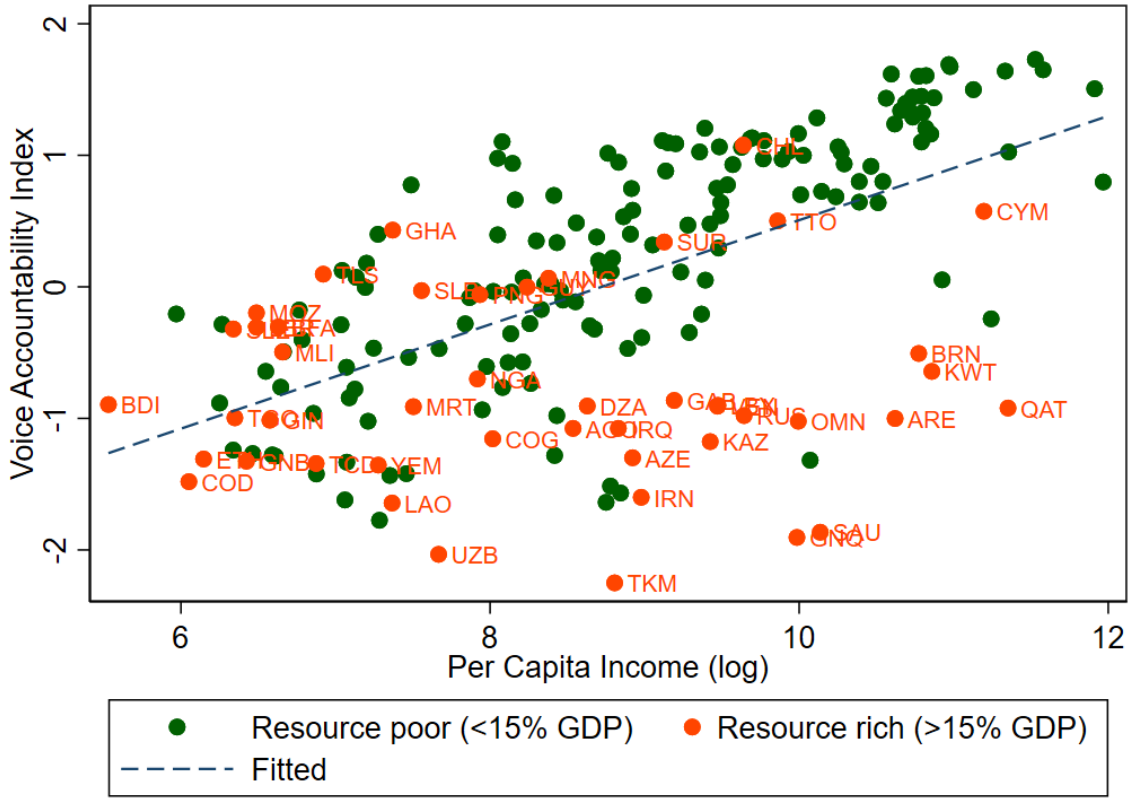
1 Introduction

That a large number of resource-rich developing countries have performed poorly in terms of growth, poverty reduction and macroeconomic stability has given rise to the concept of a "resource curse" (Gelb 1988, Auty 1993), the idea that something intrinsic to natural resources prevents these countries from succeeding. Early studies focused on the effects of a resource boom on the competitiveness of the other tradable sectors, or the Dutch disease (Corden and Neary 1982, Sachs and Warner 2001). Noting that some resource-rich countries have performed well, subsequent researchers have emphasized the quality of institutions, suggesting that the presence of natural resources inhibits the development of high-quality institutions, which in turn undermines economic growth (Isham et al. 2003, Sala-i-Martin and Subramanian 2003). In particular, governance indicators such as voice and accountability are systematically lower in resource-rich countries as shown in Figure 1.

Another distinctive feature of resource-rich countries is their low levels of taxation (Figure 2). Bornhorst et al. (2009) showed in a sample of 30 oil-producing countries that one percentage point increase in hydorcarbon revenues is associated with a 0.2 percentage points decrease in non-hydrocarbon revenues. Thomas and Trevino (2013) confirm the finding for a sample of 20 African countries. Africa and the Middle East, the two most resource-dependent regions, have the lowest tax-to-GDP ratios which, until recently, were declining. Nigeria's oil rents are orders of magnitude greater than Ghana's and its tax-to-GDP ratio is one-tenth that of Ghana (Baryeh and Ezeka 2018).

Van der Ploeg (2011) and Moore (2015) raise the possibility that, since these non-tax revenues do not come from citizens, governments are not accountable to citizens for their spending. On one hand, governments have no incentive to raise taxes because they will then have to answer to citizens. On the other hand, citizens have little incentive to pay taxes if they cannot be sure that the government will spend the revenues in a way that benefits them. In short, the government lacks the legitimacy to raise taxes, which results in it not being accountable. In this paper, we show that, not only can this situation persist for a long time, but when resource revenues begin to decline, governments may not be able to replace

Figure 1: Voice Accountability Index and per capita GDP

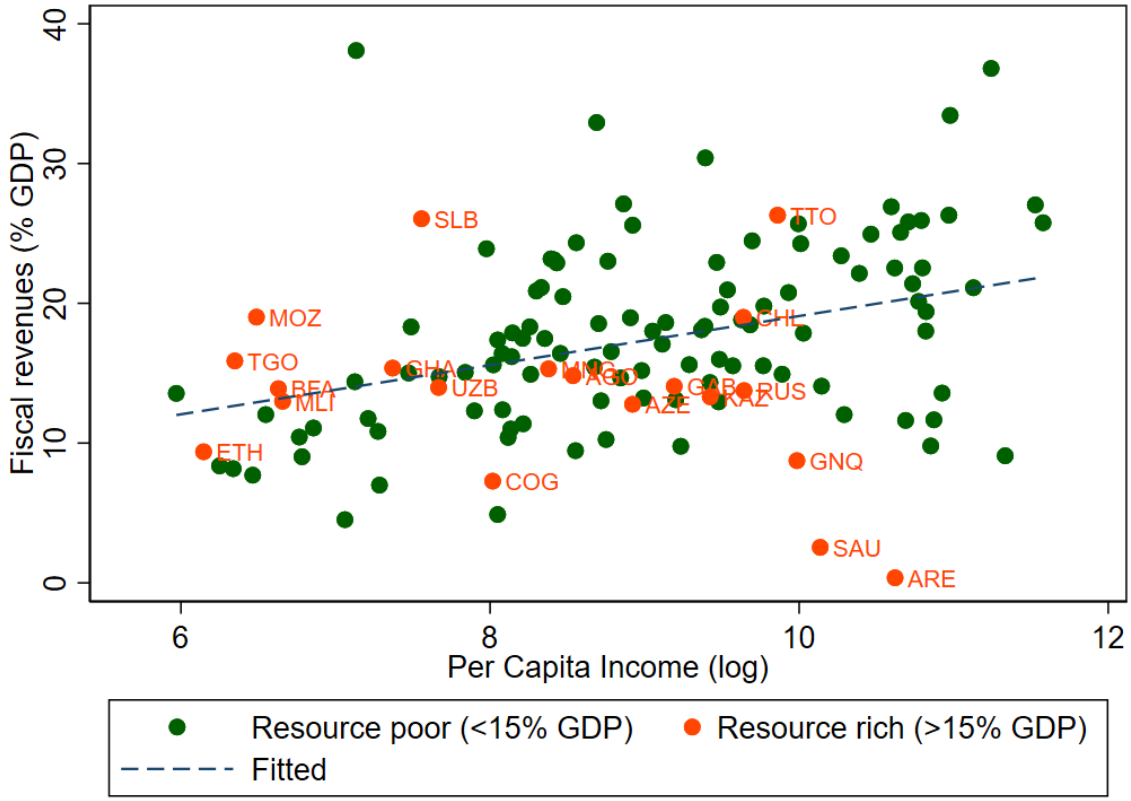


Notes: Voice Accountability Index, per capita GDP, and Natural resource revenues are measured in 2012 and obtained from the World Governance Indicators and World Development Indicators databases (accessed October 20, 2021).

them with tax revenues because they cannot credibly commit to being accountable for public spending. We also offer a solution to this problem: cash transfers to citizens ahead of their tax payments, which then give an incentive for the government to be accountable, and for citizens to pay their taxes.

The connection between the ability of a government to raise taxes and the quality of public goods, often referred to as the "tax bargain", is widely accepted in principle (Moore 2015). Since the English Revolution of the 17th Century, when Parliament gained authority over taxes as a way of constraining the monarch's spending, taxation has been a means for citizens to hold leaders accountable. More recently, Brautigam (2008) explained how Mauritius used sugar export taxes to mobilize private actors, which contributed to state building. Other

Figure 2: Fiscal revenues vs. Resource revenues



Notes: Data on resource revenues, fiscal revenues as fraction of GDP and per capita income are measured in 2012 and obtained from the World Development Indicator database (accessed October 20, 2021). Observation for Timor-Leste was dropped (outlier).

examples include Somaliland, where the introduction of local taxes prompted citizens to demand inclusive and representative institutions (Eubank 2008). Weigel (2020) shows that a property tax in a large city in the Democratic Republic of Congo induced greater political participation by citizens that, in turn, improved governance. Gadenne (2017) finds that in Brazilian municipalities an increase in local taxes, unlike grants, improved both the quantity and quality of education infrastructure. Likewise, Martinez (2019) finds that property taxes had a bigger effect than oil royalties on local public goods in Colombia. An analysis of 45 African countries over 35 years yields a positive association between tax revenues and accountability (Dom 2018).

This paper links natural resource endowments, accountability, and fiscal capacity by provid-

ing a game-theoretic model that formalizes the intuition by which governments of resource-rich countries do not have an incentive to be accountable to their citizens and therefore citizens do not have an incentive to pay taxes. In our model, public investments are financed by the government's own funds from resource revenues and by taxes levied on citizens. The government chooses to be corrupt or accountable and this determines the quality of public goods produced. A corrupt government obtains kick-backs from public investments but as a result, these projects are less likely to be successful. Citizens can choose whether or not to comply with their tax obligations. Their choice is a function of whether or not they think the government will be accountable. Depending on the parameter values, the equilibrium of this economy can be one of the following four regimes:

- *Resource curse:* The government has such high levels of non-tax revenues that it does not need taxes to finance public investments. Knowing this, citizens choose not to pay taxes and "free ride" on the government's own resources. Hence, the government has weak incentives to choose to be accountable. The result is poor governance and low levels of tax revenues.

- *Credibility trap*: Resource-rich countries are facing on the one hand declining revenues as a result of shifts away from fossil fuels, and on the other hand increased expenditure needs as populations grow and age. When its own revenues are not sufficient to cover the required public investments, the government needs tax revenues. However, for an accountable government to be an equilibrium, the threat of future loss of tax revenues needs to be strong enough to deter corruption. Otherwise, the economy is in a credibility trap; the equilibrium is characterized by corruption and low tax/low public investment, even though the government would have preferred to be accountable so as to obtain tax compliance and finance public investments.

- *Restoring credibility with transfers:* To escape a credibility trap, the government needs to make tax evasion costly enough. One instrument to do so is to transfer resources to citizens; such policy increases the tax base and with it the cost to the government of being corrupt. As a result, when transfers are sufficiently large, commitment to accountability is a credible strategy for the government. The economy then moves to

a high tax revenue/high quality of public investment equilibrium. Given the alternative, such transfers are incentive-compatible as far as the government's objectives are concerned.

- *Poverty trap:* When stuck in a credibility trap and without sufficient resources to effectively deter itself from being corrupt, the government is then caught in a poverty trap, whereby no taxes are paid and no project gets funded.

Our findings hinge on two assumptions: (i) the government is unable to enforce full tax compliance and (ii) citizens are not atomistic when it comes to the payment of taxes. The first assumption finds ample empirical support (see, e.g., Bachas and Soto 2020, Lobel et al. 2021, and Londono-Velez and Avila-Mehecha 2021 for recent evidence on tax evasion). The non-atomicity assumption is necessary to avoid free-riding so that citizens pay taxes in the first place. It finds some support with evidence on "tax morale", whereby citizens pay taxes based on social norms of compliance. Luttmer and Singhal (2014) provide examples from laboratory studies, natural experiments, and randomized control trials that suggest that tax morale, as opposed to tax enforcement, plays an important role in compliance decisions. Besley, Jensen, and Persson (2019) formalize this tension between extrinsic and intrinsic incentives to pay taxes. To be sure, tax compliance is also influenced by the availability of third-party information and investments in tax capacity (Pomeranz 2015) but these are under-supplied in resource-rich countries. Finally, in our model, the taxpayers or citizens need not be a set of non-atomistic individuals. Instead of cash transfers made to atomistic citizens, we could consider giving budgetary authority to the parliament (as in 17th Century England) or transferring resource revenues to an independent sovereign wealth fund. These institutions would play the role of the representative citizen to hold the government accountable by threatening to withhold resources. The independence of such institutions from the government is however not a given (as we have seen in the case of sovereign wealth funds [Frynas 2017]), so the choice of accountability-enforcing institution is not clear-cut.

Our paper relates to the literature on state capacity, in particular the capacity to raise taxes. Closest to our paper is Besley (2020) who links state capacity to social norms (or "civic culture") and highlights reciprocity, whereby citizens' moral obligation to pay taxes is

intimately related to the government's provision of public goods. While we do not focus on social norms in our model, reciprocity is at the heart of the strategic interaction between the government and representative citizen. This quid-pro-quo has been documented in various settings such as Uganda (Cohen 2020) or Haiti (Krause 2020).

Our model is tailored to address issues specific to resource-rich countries and therefore deals with overcoming the so-called resource curse. One prominent suggestion is to earmark and ring-fence resource revenues, possibly in a sovereign wealth fund. The experience with sovereign wealth funds has been mixed (Alsweiler and Rietwell 2018). A program to earmark 85 percent of Chad's oil revenues for poverty-related expenditures was terminated prematurely because the Chadian government wanted to use the resources for security expenditures (Mitchell 2010). The common feature of these solutions is that the government surrenders control of oil resources to an external agent. Inasmuch as there is no ideal external agent, these schemes are likely to have limited impact. Our proposal, alongside those of Moss et al. (2015), Sala-i-Martin and Subramanian (2003), and Giugale and Nguyen (2012), is that the control be given to the citizens, since the purpose of the exercise is to promote the interests of the citizens. Some of these proposals suggest that public-expenditure efficiency can be improved by combining cash transfers with taxation of citizens (Devarajan et al. 2011, Devarajan 2019). The essence of these policy proposals is the transfer of control rights over public finances to the people, who might well be the only independent institution. However, as suggested above, citizens, while independent, have to solve the collective-action problem of avoiding free-riding. In sum, there is a tradeoff between independence and collective action in choosing institutional arrangements to overcome the resource curse.

The rest of the paper is organized as follows. Section 2 of the paper contains the formal presentation of the model and results. Section 3 concludes.

2 A Model of Taxation, Resources and Accountability

We consider a three-period model, $t \in \{0, 1, 2\}$, involving a government that is solely responsible for providing public goods to its citizens. In each period $t \in \{1, 2\}$, one project can

be undertaken and doing so requires investment I and yields a stochastic return $\tilde{R}$, which is equal to R with some probability μ and 0 with probability $1-\mu$; μ can take two values, $\mu \in \{\mu_H, \mu_L\}$ with $\mu_L < \mu_H$.

Accountability choice In the first period, $t = 0$, the government takes a governance decision γ; it can choose whether to be accountable, $\gamma = A$, or corrupt, $\gamma = C$. This decision has two implications. First, it determines the project's prospects: $p_\gamma \in [0, 1]$ with $p_A > p_C$. which determines the probability of success in each period so that $\mu = \mu_H$ with probability p_γ and $\mu = \mu_L$ with probability $1 - p_\gamma$. In words, public good projects are more likely to have good prospects if the government chooses to be accountable. Secondly, the governance decision drives the private benefits B_γ, with $B_A < B_C$, that the government receives in each period the public good project gets funded, irrespective of the project's outcome. The inequalities $p_A > p_C$ and $B_A < B_C$ give rise to the tension faced by the government: while a corrupt government enjoys a higher private benefit when a project is funded, it is less likely to produce a successful project and hence loses fiscal revenues to finance projects in the future.

Government endowment, taxes, and citizen compliance At the beginning of time, i.e. $t = 0$, the government has a fixed endowment G_0 from resource revenues. The endowment is either used to finance the public goods or stored costlessly. We denote by g_t the amount spent in period t. In addition, the government can tax citizens. In each period $t \geq 1$, citizens have income T that the government can tax. However, for administrative and political reasons, the government has limited ability to monitor and enforce tax policy (Besley and Persson 2014). We denote $\chi \in \{0, 1\}$, the citizens' tax compliance decision. That is, if $\chi = 1$, citizens comply with their tax obligations and tax revenues are $\tau(1) = T$. If citizens evade taxes, $\chi = 0$, the government can only collect some residual $\tau(0) = \lambda T$. As a result, tax revenues can be written $\tau(\chi) = [\chi + (1 - \chi)\lambda]T$.

Preferences A critical feature of this model is the mismatch between citizens' preferences and the government's objective. We assume that the government cares about the quality of

public goods but also puts a premium on its own private benefits when the project is funded. Citizens only value the public good. The government's payoff is thus given by

$$U_t(g_t, \chi_t|\gamma) = \begin{cases} \alpha B_\gamma + (1-\alpha)\pi_t R - g_t & \text{if} \quad g_t + \tau(\chi_t) \geq I \\ \tau(\chi_t) & \text{otherwise} \end{cases} \tag{1}$$

where α is the weight the government puts on its private benefit as opposed to the outcome of the public good.

The citizens' instantaneous payoffs are given by the expected returns on the project minus tax payments if the project is financed or by the tax payments otherwise:

$$V_t(g_t, \chi_t|\gamma) = \begin{cases} \pi_t R - \tau(\chi_t) & \text{if} \quad g_t + \tau(\chi_t) \geq I \\ -\tau(\chi_t) & \text{otherwise} \end{cases} \tag{2}$$

where $\pi_t \equiv p_t\mu_H + (1-p_t)\mu_L$ is the probability the project is successful at time t; p_t is the period-t prior that the public project has prospects $\mu = \mu_H$. Both government and citizens discount the future by a factor δ.

Finally, we make the following parameter restrictions:

$$\mu_L R < I < \mu_H R \quad \text{and} \quad I < (1-\alpha)\mu_L R + \alpha B_A. \tag{3}$$

which reflect the facts that citizens will prefer to invest if and only if the project has high prospects μ_H, while the government is always willing to do so, given the private benefits it can derive from a project.

Bayesian updating After the government has made its accountability decision, citizens learn about the prospects of public goods. We write $R_1 = .$ if no project in period $t = 1$ was undertaken. We can then write posterior beliefs (or period-2 priors) as

$$p_2(\tilde{R}_1|\gamma) = \begin{cases} p_1 & \text{if} \quad R_1 = . \\ \frac{(1-\mu_H)p_\gamma}{(1-\mu_H)p_\gamma + \mu_H(1-p_\gamma)} & \text{if} \quad R_1 = 0 \\ \frac{\mu_H p_\gamma}{\mu_H p_\gamma + (1-\mu_H)(1-p_\gamma)} & \text{if} \quad R_1 = R \end{cases} \tag{4}$$

As a result, the posterior increases after a successful project and decreases after a failed one. If the project is not financed, then beliefs do not change.

The timing of the economy is as follows:

- In period $t = 0$: The government chooses a governance regime $\gamma \in \{A, C\}$, which noisily determines the ex-ante success probabilities $\mu \in \{\mu_H, \mu_L\}$. At the same time, the governance regime determines the government's private benefits B_γ, to be paid in every period that public good projects are funded.

- In periods $t = 1, 2$, citizens make a tax compliance decision $\chi_t \in \{0, 1\}$ and pay tax $\tau(\chi_t)$. Meanwhile, the government makes an investment decision g_t. The project takes place if and only if there are enough resources to cover the cost of the project, that is, $\tau(\chi_t) + g_t \geq I$. The project's return is determined by μ_γ. Instantaneous payoffs are given by (1) and (2). Posteriors q_{t+1} are determined by Bayes' rule (4) and the government's endowment evolves according to $G_{t+1} = G_t - g_t$.

Equilibrium concept An equilibrium of the economy is a Perfect Bayesian Equilibrium (PBE) whereby agents' strategies maximize payoffs subject to beliefs and beliefs are updated using Bayes' rule.

We look at the equilibrium of the economy for different levels of the government's endowment G_0 relative to the size of the project I.

2.1 Resource curse equilibrium

In the first scenario, the initial endowment is so large , i.e. $G_0 \geq 2(I - \lambda T)$, that the government can finance the public good in the two periods even if citizens evade their tax obligations. As a result, we have the following proposition (all proofs are henceforth collected in the appendix):

Proposition 1: Resource curse equilibrium If $G_0 + 2\lambda T \geq 2I$, the unique equilibrium is one where the government chooses to be corrupt, $\gamma = C$, and citizens do not comply with their tax obligations, $\chi_1 = \chi_2 = 0$.■

There are two aspects to this resource curse equilibrium. Large initial endowments of resource revenues imply that the government does not need to rely on citizens' tax compliance to build the project in both periods. By the same token, citizens do not comply with tax laws because, if they did, it would not affect the government's accountability decision. Citizens get to "free ride" on the government and benefit from the utility flow from public goods without tax compliance. As a result, the government chooses the corrupt governance regime ($\gamma = C$); and the economy experiences lower expected returns on public good investments. In short, the resource windfall severs the accountability mechanism between taxation and public spending with its implication for the quality of governance. This equilibrium describes the situation in many resource-rich countries where the quality of public expenditures has been found to be especially low (Devarajan and Singh 2012, Devarajan 2019). Various studies have pointed to the low productivity of public investment in developing countries in general and Africa, which has a large number of resource-rich countries, in particular (Pritchett 2000, Devarajan et al. 2003). An index of public investment efficiency (Dabla-Norris et al. 2012) finds Sub-Saharan Africa and the Middle East and North Africa, the two most mineral-rich continents, as the lowest-scoring regions.

2.2 From resource curse to credibility trap

We now turn to the case where the government's endowment alone is not sufficient to finance public goods projects in both periods if citizens evade their taxes. Many resource-rich governments will find themselves in this situation as demand for fossil fuels decline as the world tries to mitigate climate change on the one hand, and public expenditure needs increase as populations grow and age on the other. We first make the following assumption:

Assumption A0: We assume that $G_0 + (1+\lambda)T < 2I$ and $G_0 + \lambda T > I$.■

Assumption A0 means that while the government can finance one project out of its own resources, doing so will prevent a second project to be financed, even with citizen tax compliance. This assumption describes the transition phase that many previously resource-rich countries find themselves in. Resource revenues have declined (due to declining prices or reserves) and expenditure needs have increased (sometimes due to a flagship project such as a new capital city) by so much that if the government continues to rely on resource revenues for financing public investments, it will not be able to finance any projects in the future even if there is full tax compliance. We now examine the Perfect Bayesian Equilibrium in this case. Other cases are analyzed in the Appendix.

Period $t = 2$ outcomes

First, we note that any node reached in period $t = 2$ is characterized by some public good investment having taken place in period $t = 1$: if only one project were to be funded, both government and citizens strictly prefer for that project to be funded in period $t = 1$ as their discount factor $\delta < 1$. This subgame is thus characterized by priors $p_2(R_1|\gamma)$ about the project's prospects and government endowment G_1, which depend on the outcome of the project in period $t = 1$.

Given Assumption A0 and investment having taken place in period $t = 1$, the subgame is characterized by a government endowment level G_1, which is either insufficient to undertake

a second project in $t = 2$, i.e. $G_1 + T < I$, or sufficient if and only if citizens pay their taxes: $G_1 + \lambda T < I < G_1 + T$. In the former case, citizens do not comply with their tax requirements: $\chi_2 = 0$. In the latter, there is tax compliance ($\chi_2 = 1$) if and only if

$$\pi_2(R_1|\gamma)R - (1-\lambda)T \geq 0, \tag{5}$$

where $\pi_2(R_1|\gamma) = p_2(R_1|\gamma)\mu_H + [1 - p_2(R_1|\gamma)]\mu_L$ is the probability of success of the project in period $t = 2$. We thus define $\bar{p}_2$, the probability cutoff that satisfies (5) with equality.

Assumption A1: Period $t = 2$ posteriors $p_2(R1|\gamma)$ are such that $p_2(0|A) < \bar{p}_2 < p_2(R|C)$.■

Assumption A1 implies that citizen compliance in period $t = 2$ will occur if and only if the project outcome in period $t = 1$ is R, i.e. the project is successful. Such a strategy is independent of the government's initial choice of governance regime.

Period $t = 1$ tax compliance

In a subgame characterized by government's choice of governance γ, citizens have priors p_γ about the projects' prospects and the government has endowment G_0. Assumption A0 holds. For citizens, tax compliance implies the possibility of a second project being undertaken. Given their period $t = 2$ strategies, their payoffs are

$$V_1(0) = \pi_1(\gamma)R - (1+\delta)\lambda T,$$

if they evade, and

$$V_1(1) \;\; = \;\; \pi_1(\gamma)R - (1-\delta\lambda)T + \delta[\mu_H p_\gamma R - \pi_1(\gamma)(1-\lambda)T]$$

if they comply, where $\pi_1(\gamma) = p_\gamma\mu_H + (1-p_\gamma)\mu_L$ is the probability of success of a project given accountability choice γ. Tax evasion implies that the government will finance the first project, but a second project will not take place. If citizens comply with their tax obligations,

a second project can be financed out of their taxes if the first-period project turns out to be successful. The compliance decision is thus given by

$$\frac{\delta p_\gamma \mu_H}{1+\delta[p_\gamma \mu_H + (1-p_\gamma)\mu_L]} R \geq (1-\lambda)T. \tag{6}$$

The fraction in (6) is increasing in q_1, so we define $\bar{p}_1$ as the prior such that (6) holds with equality.

Assumption A2: Period $t=1$ prospect probabilities are such that $p_C < \bar{p} < p_A$.■

Assumption A2 implies that tax compliance occurs if and only if the government has chosen accountability over corruption: $\chi_1(A)=1$ and $\chi_1(C)=0$.

Period $t=0$ governance choice

In period $t=0$, the government makes its governance decision. Under Assumption A0, the tradeoff the government faces is between higher private benefits and a higher likelihood that public goods will be financed in the second period. Namely, if the government chooses accountability, then

$$\begin{aligned} U_0(A) &= \alpha B_A + (1-\alpha)\pi_1(A)R - I + T \\ &+ \delta\{\pi_1(A)[\alpha B_A + (1-\alpha)\pi_1(A)R - I + T] + (1-\pi_1(A))\lambda T\}, \end{aligned} \tag{7}$$

which consists of the period-1 expected payoffs where citizens comply with their tax obligations and period-2 payoffs, which depend on whether the $t=1$ project was successful or not; success happens with probability $\pi_1(A)$.

If the government chooses corruption instead, then no project takes place in period $t=2$, i.e.

$$U_0(C) = \alpha B_C + (1-\alpha)\pi_1(C)R - I + \lambda T + \delta\lambda T. \tag{8}$$

For the government to choose accountability over corruption, it must be the case that

$U_0(A) \geq U_0(C)$ or

$$\alpha\Delta B - (1-\alpha)\Delta\pi_1 R - (1-\lambda)T \leq \delta\pi_1(A)[\alpha B_A + (1-\alpha)\pi_1(A)R - I + (1-\lambda)T], \quad (9)$$

where $\Delta B = B_C - B_A$ and $\Delta\pi_1 = \pi_1(A) - \pi_1(C)$. The government prefers an accountable over a corrupt governance environment if the short-term benefits of corruption (left-hand side) are outweighed by the gains from having a project financed in the second period (right-hand side).

However, is an accountable government an equilibrium outcome? To see this, consider the government's incentives to deviate from $\gamma = A$. A deviation considers that citizens believe that the government chose accountability at $t = 0$ so that they comply with taxes in the first period and

$$\begin{aligned} \tilde{U}_0(C) &= \alpha B_C + (1-\alpha)\pi_1(C)R - I + T \\ &+ \delta\{\pi_1(C)[\alpha B_C + (1-\alpha)\pi_1(C)R] - I + T] + (1-\pi_1(C))\lambda T\}. \end{aligned} \quad (10)$$

The condition for accountability to be an equilibrium is thus $\tilde{U}_0(C) \leq U_0(A)$ or

$$\alpha\Delta B - (1-\alpha)\Delta\pi_1 R \leq \frac{\delta\Delta\pi_1}{1-\delta\pi_1(C)}[\alpha B_A + (1-\alpha)\pi_1(A)R - I + (1-\lambda)T]. \quad (11)$$

We can thus summarize the credibility trap below:

Proposition 2: Credibility trap With endowment levels given by Assumption A0 and parameter conditions A1-A2, the only equilibrium is one characterized by corruption if inequality (11) fails to hold. Otherwise, an equilibrium characterized by accountability exists if and only if (9) holds.■

Proposition 2 captures the issues facing governments when their endowments are too low to ensure self-financing of public projects. If (11) holds, the threat of citizen tax evasion (in the second period) leads the government to choose accountability over corruption and hence not deviate from an accountability equilibrium path. However, if (11) fails to hold,

the government suffers from a credibility gap: it cannot commit not to be corrupt even when being accountable would generate higher private payoffs and public benefits. In this case, the perfect Bayesian equilibrium is sub-optimal. We call this the credibility trap.

2.3 Escaping the credibility trap with cash transfers

The government's credibility gap is captured by inequality (11) failing to hold. The loss to the government in case of project failure is not large enough to make the commitment to being accountable credible. This issue is particularly relevant when $G_0 + (1 + \lambda)T < 2I$, i.e. the government strictly prefers an outcome where it chooses $\gamma = A$; and citizens comply with taxes in the first period and in the second pending a successful first-period project.

Many governments can find themselves in this situation. They may have started out with high endowments from resource revenues but with mismanagement of those revenues or falling resource prices, their endowment has shrunk to the point where they need to collect taxes to finance public projects. However, because of the legacy of mismanagement or corruption, the government cannot credibly commit to using tax revenues productively, making citizens reluctant to comply with tax laws. What is to be done? We now show that credibility can be established by the government transferring cash to citizens in period 0 and thereby signaling that it will have to choose accountability as its governance regime to fund the project. Citizens will then choose to comply with taxes and the public project gets built.

Suppose in period $t = 0$, in addition to its governance decision γ, the government can transfer out of its resource endowment a lump-sum amount D to citizens in period $t = 2$ in the form of a cash transfer. D gets added to citizens' taxable income, which then becomes $T + D$. The government faces the budget constraint $D \leq G_0$.

For the government's incentive compatibility constraint to hold, the cash transfer must be large enough, i.e. $D \geq \bar{D}$, where (11) holds with equality for $D = \bar{D}$. The cost to the government of transferring $\bar{D}$ is the loss of tax revenues in the second period in case the project fails in $t = 1$. The cost is thus equal to $\delta(1 - \pi_1(A))(1 - \lambda)\bar{D}$.

Proposition 3: Accountability with cash transfers If $G_0 \geq \bar{D}$, the optimal level of transfer from the government to citizens in period $t = 2$ is equal to $\bar{D}$ if $U_0(A) \geq U_0(C) + \delta(1 - \pi_1(A))(1 - \lambda)\bar{D}$ and equal to 0 otherwise.■

When the government is better off being accountable rather than corrupt, transferring $\bar{D}$ increases the government's loss if citizens fail to pay their taxes, so the government will not deviate from an accountable strategy. Knowing this, citizens pay their taxes and the high-quality public project gets built.

2.4 A poverty trap

If $G_0 < \bar{D}$, then there is no transfer that can break the credibility trap. The level of resources has fallen to such depths that the government does not have enough money to transfer to meet its incentive-compatibility constraint. Since the quality of public expenditures remains low, the economy will not by itself improve, which is characteristic of a poverty trap. In short, resource-rich governments that are trying to raise taxes but lack a credible commitment to accountability have a window of opportunity in which to implement the cash transfer scheme described above. If they miss this opportunity, it may be too late.

3 Conclusion

This paper tries to explain why the resource curse persists and identify ways of breaking it. The key is the role of taxation in resource-rich countries. The tax bargain, whereby citizens pay taxes and governments provide public goods, is weak or nonexistent in countries where a large share of government resources come from non-tax sources, such as mineral revenues or foreign aid. We show that the resulting low tax/low accountability situation is an equilibrium in the sense that neither citizens nor government have an incentive to deviate from it.

The recognition that the lack of taxation is central to the resource curse also provides a clue to a solution. If, because of declining mineral revenues or rising expenditure needs, a government needs tax revenues, then perhaps the tax bargain can be restored. But if they are to pay taxes, citizens must be convinced that the government will change its ways and be accountable. Governments that have a track record of corruption and economic mismanagement may not be able to credibly commit to changing their ways. We show that there is a way out of this dilemma: if the government transfers a portion of its mineral revenues as cash to citizens beforehand, then the cost to government of remaining corrupt becomes very high. Knowing this, citizens will agree to pay their taxes and a high tax/high accountability equilibrium is achieved. If the government does not undertake the cash transfers, the low-accountability regime will continue, with poor-quality public expenditures undermining economic performance. The situation could get to a point when the government does not have enough resources to transfer and the economy is caught in a poverty trap.

The problem of governance in developing countries in general, and in resource-rich countries in particular, has vexed the policy community for years. While there seems to be a consensus on the severity of the problem, possible solutions are few and far between. Some of the solutions, such as creating sovereign wealth funds or earmarking expenditures for poverty reduction, have been difficult to implement. Others, such as technical assistance on public expenditure management or resource mobilization, do not seem to have significant impact. Still others, such as distributing oil revenues as cash transfers, have been economically sound but politically difficult. This paper suggests a way forward that is both economically and politically feasible.

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A Proofs

Proof of Proposition 1 In any subgame in either period $t = 1$ or $t = 2$, government investment is $g_t = I - \tau(\chi_t)$. Condition $G_0 + 2\lambda T > 2I$, implies that such a strategy is feasible. In words, the government will use its own funds to invest in both periods, irrespective of citizen compliance. In the previous stage, citizens thus choose $\chi_t = 0$ as compliance does not increase investment. In turn, since $\chi_t = 0$ irrespective of γ, it is dominant strategy for the government to choose $\gamma = C$.■

Proof of Proposition 2 First, we show that $\gamma = C$ and $\chi_1 = \chi_2(.) = 0$ is an equilibrium. To see that, if the government plays C, then assumption A2 implies that $\chi_1 = 0$ is optimal for citizens. The government then finances out of its own resources, i.e. $g_1 = I - \lambda T$. Assumption A0 then implies that no resources are left to finance public investments in period $t = 2$, so that $\chi_2(R) = \chi_2(0) = 0$ is optimal. Reciprocally, unconditional tax evasion $\chi_1 = \chi_2(.) = 0$ implies that government action in time $t = 0$ has no influence on citizen tax compliance. $\gamma = C$ is thus optimal for the government.

Second, we consider whether a strategy profile such that $\gamma = A$, $\chi_1 = 1$, and $\chi_2(R_1) = 1$ and $\chi_2(0) = 0$ is an equilibrium. Assumption A1 implies that $\chi_2(.)$ is optimal from citizens' viewpoint in period $t = 2$. Furthermore, Assumption A2 implies that $\chi_1 = 1$ is best response to the government choosing $\gamma = A$. We now examine whether the government has an incentive to deviate from $\gamma = A$, given citizens' strategy profile. Utility $\tilde{U}_0(C)$ is the government's utility from a deviation while $U_0(A)$ is the equilibrium payoff. Inequality (11) thus is the condition for a deviation to make the government worse off. If (11) fails to hold, a credibility trap ensues and the corruption equilibrium is the only equilibrium.■

Proof of Proposition 3 Suppose that (11) fails to hold. Note that the right-hand side of (11) is increasing in T. There exists a level $\bar{D}$ such that the inequality holds with equality for taxable income equal to $T + \bar{D}$, so that a transfer $\bar{D}$ to citizens implies that taxable income becomes $T + \bar{D}$. With such taxable income, equation (11) holds so that $\gamma = A$ is an equilibrium.

We next need to verify that it is in the government's interest to make such transfer. With a strictly smaller transfer, tax compliance does not occur so the government's payoffs are:

$$V(D|D < \bar{D}) = \alpha B_C + (1-\alpha)\pi_1(C)R - I + \lambda T + \delta[\lambda T - (1-\lambda)D]$$

It is thus optimal for the government to choose $D = 0$, so that

$$V(0) = \alpha B_C + (1-\alpha)\pi_1(C)R - I + \lambda T + \delta[\lambda T - (1-\lambda)D]. \tag{12}$$

On the other hand, with transfers above $\bar{D}$, the government's payoffs become

$$\begin{aligned} V(D|D \geq \bar{D}) &= \alpha B_A + (1-\alpha)\pi_1(A)R - I + T \\ &+ \delta\{\pi_1(A)[\alpha B_A + (1-\alpha)\pi_1(A)R - I + T] + (1-\pi_1(A))[\lambda T - (1-\lambda)D]\}, \end{aligned}$$

As payoffs decrease with D, it is optimal for the government to choose $D = \bar{D}$, so that

$$\begin{aligned} V(\bar{D}) &= \alpha B_A + (1-\alpha)\pi_1(A)R - I + T \\ &+ \delta\{\pi_1(A)[\alpha B_A + (1-\alpha)\pi_1(A)R - I + T] + (1-\pi_1(A))[\lambda T - (1-\lambda)\bar{D}]\}, \end{aligned} \tag{13}$$

The ex-ante cost to the government is thus $\delta(1-\pi_1(A))(1-\lambda)\bar{D}$ which is worth undertaking if and only if $U_0(A) \geq U_0(C) + \delta(1-\pi_1(A))(1-\lambda)\bar{D}$. ■

B Equilibrium characterization

In this section, we characterize all possible equilibrium outcomes as functions of parameter values. We focus on the "credibility trap" equilibria, since the resource curse equilibrium was treated in Proposition 1. We address the remaining cases in turn. In particular, we distinguish three cases: Case 1 refers to the situation where the government can finance one project out of its own funds and requires tax compliance to be able to finance a second one; case 2 occurs when the endowment falls even more so that the government needs tax compliance in both periods in order to be able to have projects financed; we finish with case

3 where tax compliance allows at most one project to be financed. We review these in turn.

Case 1: $G_0 + 2\lambda T < 2I \leq G_0 + (1+\lambda)T$

Since the government can finance one project out of its funds, any equilibrium will have the government do so in the first period. Citizens thus evade taxes in period 1, $\chi_1 = 0$, and under Assumption A1, will pay taxes only if the $t = 1$ project is successful. The tradeoff for the government is thus between higher private benefits and higher probability of success in the first period, i.e.

$$\begin{aligned} U_0^1(A) &= \alpha B_A + (1-\alpha)\pi_1(A)R - I + \lambda T \\ &+ \delta\{\pi_1(A)[\alpha B_A + (1-\alpha)\pi_1(A)R - I + T] + (1-\pi_1(A))\lambda T\}, \end{aligned} \tag{14}$$

while

$$\begin{aligned} U_0^1(C) &= \alpha B_C + (1-\alpha)\pi_1(C)R - I + \lambda T \\ &+ \delta\{\pi_1(C)[\alpha B_C + (1-\alpha)\pi_1(C)R - I + T] + (1-\pi_1(C))\lambda T\}, \end{aligned} \tag{15}$$

The inequality driving the governance choice of the government is thus identical to (11): in equilibrium, the government chooses accountability in period $t = 0$ if and only if (11) holds.

Case 2: $G_0 + (1+\lambda)T < 2I \leq G_0 + 2T$

The case analyzed in Proposition 2 covers the parameter condition $G_0 + \lambda T \geq I$. If however $G_0 + \lambda T < I$, the government needs tax compliance in both periods for projects to be financed. Since no project gets financed in an equilibrium where the government chooses $\gamma = C$, the condition for $\gamma = A$ to be an equilibrium outcome is identical to the case in Proposition 2, i.e. it is necessary and sufficient that (11) holds.

Case 3: $G_0 + 2T < 2I$

In this case, the problem becomes a static case where no project is funded in period 2, irrespective of period 1 outcome. As a result, the absence of a second project to act as an incentive for the government to choose A, the only equilibrium is one where $\gamma = C$ and tax evasion happens in both periods: $\chi_1 = \chi_2 = 0$. In the first period, whether the project gets financed depends on whether or not $G_0 + \lambda T \geq I$.