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Natural Resources, Conflict and Democratization

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Abstract

This paper explores the effect of natural resource abundance on political stability. We extend the work of Acemoglu and Robinson (2006) and Morrison (2007) to analyze how natural resource abundance affects the threat of revolution and democratization. The model is able to reproduce the stylized facts associated with the political resource curse. Natural resource abundance is explicitly considered into the constraint faced by the elite and the poor when they take strategies to maximize their own welfare. Unlike Morrison (2007), we do not support the claim that natural resource abundance always helps non-democratic regimes to prevent democratization or revolution. In the case of democracy, natural resource rents have to be high enough to prevent revolution. Moreover, we find that inefficiencies and repression are necessary for the elite to maintain the control of political power. Under threat of revolution, the elite will democratize only if the level of natural resource rent is high enough to avoid revolution once democracy is implemented.

1 Introduction

Democratization has been a subject of recent interest for development economists. The increasing importance of institutions on economic growth has brought a new wave of multidisciplinary research about how

political institutions can be harmful or beneficial to the economic growth (Acemoglu and Robinson, 2001). Democratic societies are associated with higher levels of income per-capita and faster economic growth than non-democratic ones (La Porta el al., 1999; Minier, 1999). Other literature has stressed the impact of economic development on democratization through the stabilization of democratic regimes or the timing of democratization, especially in Western Economies (Przeworski et al., 2000; Boix and Stokes, 2003). Developing economies exhibit a more persistent combination of non-democratic regimes, low economic growth, and natural resource abundance. The idea of an economic or political "resource curse" has been largely debated, with little consensus about whether natural resources are a blessing or a curse for the economic development of an economy (Sachs and Warner, 1995; Ross, 2001; Smith, 2004; Bunnschweiler and Bulte, 2008; Alexeev and Conrad, 2009).

In the one hand, the economic "resource curse" has been seen as a paradox in the development economics literature. It is supposed that revenues from minerals should be a gift from nature since its supply is fixed and its revenue could lessen the taxation on income and on consumption, reducing the distortions associated with taxation. Additionally, natural resource revenues can be spent on capital and public goods needed for the economic growth. However, early works by Auty (1990) has stressed the negative incentives that natural resource revenues have on corruption, investment and human capital, among other factors that condition the economic growth of an economy. Sach and Warner (1995) find that natural resource endowment, measured as the proportion of natural resource exports over GDP, has a significant and negative effect on the rate of growth. Recent empirical literature is not so conclusive about the existence of a curse (Alexeev and Conrad, 2009; Van der Ploeg and Ploehekke, 2010). Behind most of the recent discussion is the idea that natural resources affect economic performance either directly or indirectly through institutions.

On the other hand, natural resource abundance has also been linked to the persistence of non-democratic regimes, particularly in oil based countries (Ross, 2001; Collier, 2003; Morrison, 2007; Tsui 2009). In a different approach, it has been also argued that oil revenues may encourage political instability because it leads rebels and secessionist to fight against the government for the oil ownership, specially when the opportunity cost of

rebellion is low (Collier and Hoeffler, 2004). The political science literature has defined as Rentier States (RS) to those countries whose government funding depends on external rents and are less likely to be democratic than those that are tax-reliant. In countries where oil revenues increase to the point at which they dominate a government's revenue sources, the government evolves from an extractive state into a distributive one. Oil-based countries avoid going through the process of extracting taxes from the population in exchange of political support without any economic cost for the citizens. Ross (2001, p. 329) citing to Bebalwi defines a RS as "... one where the rents are paid by foreign actors, where they accrue directly to the state, and where only a few are engaged in the generation of this rent, the majority being only involved in the distribution or utilization of it ...".

The purpose of this paper is to provide a theoretical framework to explain how and when natural resource abundance will affect negatively the political stability or the possibility of democratization of a non-democratic regime. The motivation arises from the need of economic models that analyze the effects of natural resource abundance over political regimes. To our knowledge, Morrison (2007) has been the only author that has studied theoretically the link between natural resource abundance and persistence of non-democratic regimes. We build a model that persistence of inefficient actions taken by non-democratic rulers based on Acemoglu and Robinson (2006) and Morrison (2007). Unlike Morrison (2007), we find that natural resource abundance will not always help non-democratic regimes to prevent democratization or revolution. Repression is also needed to maintain the control of the political power by the elite.

The paper is organized as follows. The section 2 provides a review of the literature and empirical findings about the role of natural resources in preventing the rise of democracy. In Section 3, we present the main characteristics of the theoretical model. In Section 4, we introduce the main developments and results of the effect of natural resources on political stability and democratization. Finally, section 5 presents the main conclusions of the paper.

2 Literature Review

Models in the recent political economy tradition (Acemoglu and Robinson, 2001; Acemoglu and Robinson, 2006; Morrison, 2007) see political regimes as an allocation mechanism of resources in a society. In this context, conflicts emerge when groups disagree with the kind and level of redistribution imposed by who governs. Non-democratic political regimes might face the threat from the majority when the absolute and/or relative differences in the redistribution of resources encourage the poor to revolt. Democracy emerges through the enfranchisement of the poor and an improvement in treatment of that social group.

In general, the economic literature (Acemoglu and Robinson, 2001 and 2006 for example) has mostly studied how taxation affects political regime stability and the transition from autocracies to democracies in the absence of natural resources. Autocratic elites are forced to grant representation to the citizens in exchange for taxes. Acemoglu and Robinson (2001) present a model of political transition that is useful in highlighting the main characteristics of the political economy of democratization. An initial distribution of human capital determines the income level of the elite and the poor. A taxation system allows make transfers of income between the groups that help to sustain a particular political regime: oligarchic autocracy, revolution or democracy. Transition from a political regime to another occurs in bad times, when a negative economic shock reduces the average productivity, i.e the income level for everyone. In a democratic regime, the elite night want to undertake a coup to impose an elite rule. On the other hand, the poor attempts a revolution to overthrow the oligarchic regime. Transition between regimes is costly and imposes a one period loss of the income for the society. Hence, a group who is deciding to take the power evaluates the cost of the political change to some threshold level as result of comparing rationally the present value of its welfare under the two political regimes. These thresholds are defined by the particular conditions of the economy and the level of asset distribution in the society. Agents want to prevent the transition to other regime through a change in the net transfers between groups. This means that the elite may increase the tax rate to avoid revolution and

the poor may reduce the tax rate to prevent the coup by the elite. The elite also have three additional options when faces the possibility of revolution. In the one hand, if revolution is inevitable then the elite may want to extend the franchise and transits to a democratic regime. On the other hand, the oligarchic regime may survive if the elite make a redistribution of assets that reduces the appealing of the revolution. Finally, the elite can also use repression to prevent a revolution by hiring an army.

Democratization can be the deliberate decision of elites facing political and economic constraints. Elites have to democratize because there are revolutionary threats from the rest of the population due to redistributive reasons. In this case, democratization is coming "from below": it comes from the citizens who demand a better redistribution of income. On the other hand, elites may implement democratization if they prefer sharing with the citizens the burden of productivity enhancing investment on public goods. Then, democratization is from above: it is implemented by the elite without pressure from the citizens. Cervellati, Fortunato and Sunde (2006) have modeled the timing of democratization in an overlapping generation model where democratization may emerge from below and from above. Agents live for two periods and bequeath part of its income in the form of investment on capital. Production takes place with constant return to scale and productivity enhancing public good production function. The government is managed by the elite who spend its tax revenues in financing the public good and redistributing income toward the poor. The elite is the owner of the land and capital, and cannot tax the subordinated group, so they face the whole tax burden to finance public spending. The authors find that the provision of the public good is efficient in democracy but inefficient in an oligarchic regime. Faster technological change tends to accelerate democratization as the poor accumulates more capital and gets more power to threat the elite from below.

There are few theoretical models in the political economy literature that try to explain how the existence of natural resource rents helps the survival of autocratic regimes. Morrison (2007) extends the models developed by Acemoglu and Robinson to the context of a government that also receives non-tax revenue, oil revenues for example. The author shows that non-tax revenue should lead to greater regime stability in dictatorships.

Non-tax revenue increases the availability of more resources with which to appease citizens, and thereby prevent a revolution or transition to democracy. The link between oil shocks and regime stability in RS is, (1) during booms politicians are likely to flood the domestic economy with revenues, spending unwisely and spurring destabilizing inflation and, (2) bust periods make it impossible to continue patronage and the weakness of state institutions makes it impossible to extract revenues from domestic sources. Dictatorships are threatened by the citizens, who are unhappy about the amount of transfers they are receiving. The Saudis found themselves in a difficult economic situation as oil prices dropped throughout the 1990s. By the mid 1990s, sixty five percent of state expenditures went to paying government salaries and to paying down the debt.

The RS theory has several causal mechanisms (Ross, 2001). First, high resource rents preclude governments from taxing their populations, so citizens will be less likely to demand accountability and representation from the government. Second, high resource rents leads to greater spending in patronage and in home enterprise that prevents development and future attempts of democratization. In most RS, the majority of government revenue generated from oil comes not through taxes but rather through State-owned companies. Ross (2001) suggests that state ownership of oil companies may be a factor associating oil wealth with poor economic performance and regime stability. Oil revenues also allow governments to invest in repression. Finally, government may prevent the population to move into economic sectors where workers are more able to push for democracy.

In a very influential paper, Collier and Hoeffler (2004) state that natural resources provide both motive and opportunity for creating indirect institutional and economic causes of instability. According to that paper, the natural resource endowment of a country should promote conflict, especially in non-democratic countries. On the other hand, we have stressed the possibility of the Rentier State hypothesis. It seems interesting that the empirical literature has been moving slowly toward support the idea of a Rentier State with repression.

Ross (2001) tests the RS model using a pooled time-series cross-national data set for the period 1971-1997. His research provides interesting findings. First, oil impedes democracy with a stronger effect the poorer a

country is. Second, there is empirical evidence for a link between oil and democracy through three mechanisms: large-scale redistribution, repression, and lack of modernization. Smith (2004) revisits the evidence linking oil and democracy focusing on the regime survival in less-developing countries. He analyzes data from 107 developing countries for the period 1960-1999 to estimate the effects of oil wealth on regime failure and conflict. He finds that oil wealth is robustly associated with more durable regimes and significantly related to lower levels of conflict. Moreover, oil wealth affects negatively the intensity of civil war which contradicts the Collier and Hoeffler's hypothesis. In addition, this econometric model also supports the hypothesis that repression decreases significantly the risk of regime failure. He explains that the absence of revolutions and democratization in oil-rich non-democracies during the period of low oil prices (1986-1997) may have been due the existence of social cohesion, political measures and repression.

Basedau and Lay (2010) study empirically if and how oil revenues affect conflict. They deal with the first question by extending the framework proposed by Collier and Hoeffler (2004) and find an inverted U-shaped relationship between revenues from oil wealth per capita and conflict. More important, highly dependent oil exporters are almost completely spared from violent conflict. They suggest that the governments in oil-rich countries avoid conflict by a combination of distribution, high spending on repression and better state capacity.

Tsui (2009) uses information from oil discoveries and reserves provided by the Association for the Study of Peak Oil (ASAP) to solve the endogeneity problem presented by oil abundance measures in most of studies in the literature. He finds that discovering 100 billion barrels pushes a country's democracy level almost 20 percentage points below the existing trend after three decades of the discoveries. This effect is higher for high-quality and low-cost oilfields such as those found in Middle East countries. The reduced form of the econometric model does not allow differentiate between large-scale redistribution, lack of taxation and repression. However, Cotet and Tsui (2008) empirically find that conflict is avoided in oil rich non-democratic regimes through large military spending.

3 A Static Model of Taxation and Distribution

In this section, we introduce a static model of taxation and distribution in an economy endowed with natural resources. The model is built upon Morrison (2007) but it is modified to allow a richer structure and new results. We assume the presence of two groups, the elite and the poor, defined by the subscripts, $i = e$ (elite) and p (poor). The total population is normalized to 1 and a fraction $1 - \lambda$ of the population is member of the elite. An individual in group i consumes a private good, c_i,which is equal to the value of the disposable non-resource income, $(1-\tau_i)y_i$. Here, τ_i is the tax rate on non-resource income and y_i is the income per capita of group i. The poor get a fraction θ of the non-resource income of the economy. Then, the non-resource income per-capita for each representative agent is given by

$$y_p = \frac{\theta \overline{y}}{\lambda} \qquad \text{and} \qquad y_e = \frac{(1-\theta)\overline{y}}{1-\lambda}$$

It is assumed that such that $\theta < \lambda$, the elite receives more non-resource income-per capita than the poor such that

$$y_p < \overline{y} < y_e$$

Individual also have access to a public good, S_i. We assume that the elite are able to consume the whole public good whereas the rest of the population only enjoys a proportion $(1 - \beta)$ of the public good. This is consistent with the approach of Bjorvitn (2006) who consider the effects of polarization on the provision of public goods for different groups, and also reflects the fact that elite may built infrastructure and social programs that benefit them more than the rest of the population. A lower value of β implies a better provision of public goods for the general population, less polarization or inequality in the provision of the public good.

This parameter could represent the impurity of the public good. On the other hand, the provision of public goods per-capita is financed by tax revenues, τy^i, and resource rents, μ. The income tax rate,τ, is fixed and that level of resources rents are exogenously given. Since the political economy model we are going to present is static, then the exogeneity of the level of resource rents has to be interpreted as a production capacity constraint that is fixed and given in the short-run. Therefore,that an economy has more resource rents could represent ex-ante decisions about investment in natural resource production capacity made by the rulers.

Redistribution is only made through the provision of the public good. There are not direct monetary transfers between groups [1]. Therefore, the level of per-capita public good is defined by

$$(1) \qquad S_e = \tau[(1-\lambda)y_e + \lambda y_p] + \mu = \tau\overline{y} + \mu$$

$$(2) \qquad S_p = (1-\beta)[\tau[(1-\lambda)y_e + \lambda y_p] + \mu\} = (1-\beta)(\tau\overline{y} + \mu)$$

For simplicity, we assume that the welfare of a representative individual in group i is defined by an additive separable utility function, linear in the consumption of the private good. The contribution of the public good to the individual welfare is given by αS_i^{ϕ}, the utility of the consumption of a public good. The function $K(S_i) = S_i^{\phi}$ is a concave production function of the public good that satisfy the usual properties, $K' > 0, K'' < 0$, therefore the parameter ϕ must be smaller than 1. Concavity of the utility associated to the public good captures diminishing returns to government size due to economic distortions. On the other hand, the parameter α represents the value of the public good. A public good with high valuation across the population of a country is usually called a "common interest public good" in the literature (Besley and Persson, 2009; 2010)

[1] Acemoglu and Robinson (2001; 2006) consider redistribution through direct transfers, where all agents receive the same amount of transfers but the richer group pays more than the other one. Although we state that direct monetary transfers are not part of the model, it is not difficult to adapt the view of the model toward one with redistribution through direct transfers where the function $K(\bullet)$ refers to the deadweight loss associated with the inefficiency or corruption of the government.

and may represent national security or welfare-state depending on the country being considered. Therefore, an individual in group i maximizes the utility function:

$$(3) \qquad U_i = c_i + \alpha S_i^{\phi}$$

Replacing (1) and (2) in (3), we obtain the indirect utility functions for individuals in each of the groups:

$$(4) \qquad V_e = (1-\tau_i)y_i + \alpha[\tau\overline{y} + \mu]^{\phi}$$

$$(5) \qquad V_p = (1-\tau_p)y_i + \alpha[(1-\beta)(\tau\overline{y} + \mu)]^{\phi}$$

Equation (4) and (5) represents the indirect utility functions for the elite and the poor, respectively. Replacing the income functions into the indirect utility functions, we get our last expression for the indirect utility:

$$(6) \qquad V_e = (1-\tau)\frac{(1-\theta)\overline{y}}{1-\lambda} + \alpha[\tau\overline{y} + \mu]^{\phi}$$

$$(7) \qquad V_p = (1-\tau)\frac{\theta\overline{y}}{\lambda} + \alpha[(1-\beta)(\tau\overline{y} + \mu)]^{\phi}$$

The RHS of (6) and (7) are the same only under exceptional circumstances, as we analyze below, and evidently greater income and public good inequality will increase the indirect utility gap, $V^e - V^p$. This gap can be expressed as:

$$(8) \qquad V_e - V_p = (1-\tau)\frac{\overline{y}}{1-\lambda}\frac{(\lambda-\theta)}{\lambda} + \alpha([\tau\overline{y}+\mu]^{\phi} - [(1-\beta)(\tau\overline{y}+\mu)]^{\phi})$$

From equation (8) is clear that the gap increases as the non-resource income of the poor (θ) decreases and increases with the level of impurity of the public good (β). Non-resource income equality, $\lambda = \theta$, does not guarantee that $V_e = V_p$, as long as $\beta > 0$, so strict equality in non-resource income and consumption of public good is an necessary condition for equality in utility. Moreover, the gap could be eliminated with unbalanced provision of private and public goods for each groups, such that high non-resource income inequality but disproportionally provision of public good for the poor could make $V_e = V_p$, and vice versa.

We want to know what is the most preferred tax of each group in democracy. The equations (6) and (7) define our benchmark under a non-democratic regime. To find the most preferred tax rate in democracy, we will assume that the poor will want a level of provision of the public good similar to that one of the elite. This implies $\beta = 0$, so maximizing equations (6) and (7) with respect to the tax rate povide us the optimal tax rates for each group in he society:

$$(9) \qquad \tau_e = (\frac{1}{\overline{y}})([\frac{(1-\theta)}{\alpha\phi(1-\lambda)}]^{\frac{1}{\phi-1}} - \mu]$$

$$(10) \qquad \tau_p = (\frac{1}{\overline{y}})([\frac{\theta}{\alpha\phi\lambda}]^{\frac{1}{\phi-1}} - \mu)$$

Given equation (9) and (10), we can establish the first proposition related to the most preferred tax rates by each group in the society,

Proposition 1. ***(Tax rate preferences) .*** *In a democracy, the most preferred tax rate of the elite decreases as (i) inequality increases (lower value of θ/λ), (ii) level of natural resources rents increases (higher value of*

μ), (iii) the valuation of the public good decreases (lower value of α) and (iv) the average per-capita income increases (higher value of $\overline{y}$). On the other hand, the most preferred tax rate of the poor decreases as (i) inequality decreases (higher value of θ/λ), (ii) level of resources rents increases (higher value of μ), (iii) the valuation of the public good decreases (lower value of α), and (v) the average per-capita income increases (higher value of $\overline{y}$)

Proof. See the appendix

The characterization of the tax rates in the model with resources rents differs from Morrison (2007) because even with symmetric players the tax rate may not be zero, so the rentier effect would be absent. This happens if the valuation of the public good α is high like in the case of Norway. Consider also the effect of ϕ (the concavity of $K(\cdot)$. This parameter can be conceived as the state capacity level of the economy following to Bourguignon and Verdier (2010). A lower value of ϕ affects negatively the most prefreed tax rate of both agents. The more the state capacity, the higher is the most preferred tax rate of the agents (Besley and Persson, 2010). The Rentier Stater Effect can be obtaining directly from the analysis of the equation (10).

Corollary 2. ***(Rentier State Effect).*** *In a democracy, if the level of natural resource rents is high enough, the most preferred tax rate of the median voter equal to zero.*

Proof. In equation (8), if we establish the condition $\tau_p = 0$, then by definition of τ_p, so $\frac{1}{\overline{y}}[\frac{\theta}{\alpha\phi\lambda}]^{\frac{1}{\phi-1}} - \frac{\mu}{\overline{y}} = 0$. Therefore, there exists a value

$$\mu^* = [\frac{\lambda}{\theta}\alpha\phi]^{\frac{1}{1-\phi}}$$

such that for any $\mu > \mu^*$, $\tau_p = 0$ (a corner solution).

Since μ^* is an increasing function of (λ/θ), more unequal democratic societies can be sustained without taxation if the natural resource rents are high enough. Besides, a high valuation of the public good (high value of α) also increases μ^*, so the "common interest effect" more than compensate the "rentier effect"; tax rates may be positive. It also follow from above that lower state capacity (lower value of ϕ) implies lower taxation, an effect also consistent with Bourguignon and Verdier (2010).

We have provided a wide characterization of the taxation system in a democratic society with natural resources. In the next section, we study the conditions under which the non-democratic rulers, the elite, may democratize or not depending on the level of resource rents.

4 Democratization and Natural Resources

In the game we consider three political regimes: democracy (D), non-democratic oligarchy (ND) and revolution (R). There are some assumption on the parameters to ensure that there is no coup during normal times in democracy and no redistribution in normal times in oligarchy.

In democracy, the median voter should prefer higher redistribution than the elite to provide incentives for the elite to try to avoid democratization. This happens when the elite face higher taxes in democracy than under a non-democratic. A democratic Rentier State never will have higher taxation than a non-democratic regime if the equation (10) implies a non-positive tax rate. Following to Morrison (2007), the following assumption guarantee that the poor will prefer democratization to a non-democratic regime.

$$\mu < [\frac{\theta}{\alpha\phi\lambda}]^{\frac{1}{\phi-1}}$$

Notice that if the assumption 1 is not satisfied, the poor is indifferent between democracy and non-

democracy. Then, a non-democratic regime can persist as soon the RHS of the assumption does not decrease.

We assume that the collective action problem of the poor to produce a revolution is solved when bad times arise in the society (Acemoglu and Robinson, 2001; Morrison, 2007). Under these events, the state of mobilization is assumed to be high (H). Otherwise, the state of mobilization is assumed to be low (L). On the other hand, if the elite democratize, the tax rate is that preferred by the poor. If the elite do not democratize, they still have the opportunity to redistribute some of their wealth through taxation or other measures that reduce the incentives of the poor to revolt.

The timing of the game in a static setting where there is interaction between the agents for one period. Initially, there is a nondemocratic country governed by the elite.

1) Nature chooses a state of mobilization of the poor, ψ^j, such that $j = L$ or H.

2) The elite respond to the poor's mobilization taking measures either to democratize (D) or maintain a non-democracy (ND).

3) After the elite's move (in either a democracy or a non-democracy), the poor decide whether to stage a revolution (R) or not.

The payoffs for the elite and the poor are state dependant payoffs because they depend on the state variable of the political regime ($P = D, ND, R$) and state of mobilization of the poor (ψ^j with $j = L$ or H). Let us define the payoff of the individual in group i under the political regime P when the state of mobilization of the poor is L by the expression $V_i(P, \psi^j)$.This variable may be related to the Nature's decision about whether mobilization is high or not at the beginning of the game. If ψ^s is low, the returns to the poor from a revolution are low, so the state of mobilization of the poor is low. If ψ^j is high, the state of mobilization of the poor is high.

The strategy of the poor depends on net gains between revolution and the other political regime, what

is affected by assumption about the level of redistribution after the revolution. We want to emphasize this point because the effects of natural resources rents on democratization depend on this "revolution constraint'. In Morrison (2007), the negative relationship between resources rents and democratization is driven by the assumption about the payoff for the poor in a revolutionary regime: the revolution distributes evenly the economy's income ($\psi^j \overline{y}$) among the poor and the elite are left with nothing. Thus, the elite will always prefer democratization to revolution. Notice also that Morrison (2007) considers the following payoff for the poor under a revolutionary regime:

$$V_p(R, \psi^j) = \frac{\psi^j \overline{y}}{\lambda} \tag{11}$$

Let us provide some critical comment about condition (11). First, the provision of public good dissapears completely in (11). One could argue that a socialist revolution eliminates the need of redistribution so there is not need of redistribution through public good provision. However, the resource rents are also eliminated of the revolution's payoffs. Since the presence of resource rents is the main subject of the analysis, they are necessarily to be included in the revolution's payoff. A more consistent way of including the resource rents is through the public good provision. Besides, we also assume that the level of natural resource rents after revolution is diminished in some proportion e. This would be consistent with the fact that a revolution would incentive to flee the most educated part of the population, engineers, geologists and technician working in the natural resource sector. Additionally, this also could reflect the fact that the revolutionary group could license to foreign companies to exploit the oil fields in exchange of a higher premium[2]. The payoff for the representative poor under a revolutionary regime is:

$$V_p(R, \psi^j) = \frac{\psi^j \overline{y}}{\lambda} + \alpha[(1-e)\frac{\mu}{\lambda})]^{\phi} \tag{12}$$

[2]For example, Chinese oil companies have inferior technological capabilities to exploit off-shore oil fields than the western international oil companies (IOCs). Ploeg and Rohner (2010) provides an analysis where a government licensing extraction rights must offer higher premium to the IOCs

Let us analyze the game using backward induction. Given the assumption 1, the tax rate will never be set above the most preferred tax rate of the poor, τ^p. However, it may be possible that the tax rate in democracy is not enough to prevent revolution. In term of payoffs, this happens when $V_p(R, \psi^j) > V_p(D)$ or

$$\frac{\psi^j \overline{y}}{\lambda} + \alpha[(1-e)\frac{\mu}{\lambda}]^\phi > (1-\tau)\frac{\theta\overline{y}}{\lambda} + \alpha[\tau\overline{y} + \mu]^\phi \tag{13}$$

Considering the most preferred tax of the poor (10), we can obtain the following constraint,

$$\psi^j > (1 - [\frac{1}{\overline{y}}[\frac{\theta}{\alpha\phi\lambda}]^{\frac{1}{\phi-1}} - \frac{\mu}{\overline{y}}])\theta + \frac{\alpha\lambda}{\overline{y}}([(\frac{\theta}{\alpha\phi\lambda})^{\frac{1}{\phi-1}}]^\phi - [(1-e)\frac{\mu}{\lambda}]^\phi) \tag{14}$$

If (14) holds, democratization cannot prevent a revolution. There will be a revolutionary regime in equilibrium but revolution is more likely to be avoided the higher is the value of the RHS of the equation (14). Define the RHS of equation (14) as ψ^*. The next proposition links the level of resource rents to the possibility of revolution under democracy

Proposition 3. ***(Revolution under democracy)***. *In democracy, there is a resource rents threshold above which higher levels of natural resource rents discourage revolutions and below which higher levels of natural resource rents encourage revolutions.*

Proof. Take (14) and calculate $\frac{\partial\psi^*}{\partial\mu} = \frac{\theta}{\overline{y}}[1 - \frac{\alpha\phi}{\theta}(1-e)(\frac{\lambda}{\mu(1-e)})^{1-\phi}]$. Therefore $\frac{\partial\psi^*}{\partial\mu} > 0$ if and only if $\mu > \lambda(1-e)^{\frac{\phi}{1-\phi}}(\frac{\alpha\phi}{\theta})^{\frac{1}{1-\phi}}$, otherwise $\frac{\partial\psi^*}{\partial\mu} < 0$.

Notice that keeping the other variables constant, lower inequality (higher value of θ or lower value of λ), lower valuation of public good (lower value of α) or greater efficiency loss of managing rents under revolutionary

regime (higher value of e) reduces the level of natural resource rents necessary to sustain a democratic regime. The relative gains from revolution are reduced by a more equal distribution of assets and lower valuation of the public good. Besides, the effect of the relative size of the poor λ on revolution is negative: the greater the λ, the lower the per capita gains from revolution. The impact of these resources will be greater with lower inequality and lower average income.

This result is remarkable since it contrasts with Morrison's (2007). He finds that higher rents always make more difficult the occurrence of a revolution in democracy. One could wonder how all this is compatible with the empirical or casual evidence. Should Norway be in a continuous process of revolution because the value of α is high among its population? The RHS of (14) might provide different equilibriums. The higher value of α in Norway may be entirely compensated by the lower inequality of its society. In the other extreme, democratic societies with high inequality (lower value of θ/λ) and low valuation of public goods (low value of α) may be more prone to develop revolutionary revolts like in the case of some countries in South America (Bolivia and Ecuador) and Africa (Nigeria and Angola).

We also imposed a second assumption that makes that revolution is only a threat to democracy when Nature chooses a state of high mobilization, ψ^H (Acemoglu and Robinson, 2006; Morrison, 2007). Therefore, the low state of mobilization, ψ^L, must be not enough to encourage revolution in a nondemocracy (even if $\tau = 0$) or,

$$\psi^L < \theta + \frac{\alpha\lambda}{\overline{y}}([(1-\beta)\mu]^\phi - [(1-e)\frac{\mu}{\lambda}]^\phi)$$

By making this assumption, if Nature moves "L", the outcome of the game will be a nondemocracy in which the elite set the tax rate to zero (Morrison, 2007).

We now analyze the conditions under which a non-democratic regime may face a revolution depending on the level of resource rents. Replacing a zero tax rate into Equation (13) above, and imposing the condition

that the payoffs of the poor from revolution are lower than those from non-democratic regime ($V^c(R, \mu^S) < V^c(ND)$), revolution is avoided if

$$(15) \qquad \frac{\psi^H \overline{y}}{\lambda} + \alpha[(1-e)\frac{\mu}{\lambda}]^\phi < \frac{\theta \overline{y}}{\lambda} + \alpha[(1-\beta)\mu]^\phi$$

Equation (15) implies

$$(16) \qquad \psi^H < \theta + \frac{\alpha\lambda}{\overline{y}}([(1-\beta)\mu]^\phi - [(1-e)\frac{\mu}{\lambda}]^\phi)$$

Define the RHS of (18) as ψ^{**}. The next proposition links the resource rents to the possibility of revolution under a non-democratic regime.

Proposition 4. ***(Revolution under non-democratic regime)****. A higher level of natural resources rents reduces the chances of revolution in non-democratic regimes only if* $1-\beta > \frac{1-e}{\lambda}$*, otherwise higher resource rents increase the prospect of revolution.*

Proof. Take (16) and calculate $\frac{\partial \psi^{**}}{\partial \mu} = \frac{\alpha\lambda\phi}{\overline{y}}\mu^{\phi-1}[(1-\beta)^{\phi-1} - (\frac{1-e}{\lambda})^{\phi-1}]$ which is positive if and only if $1-\beta > \frac{1-e}{\lambda}$.

Higher levels of productive inefficiency (e) in the oil sector in the revolutionary regime will reduce the gains of revolution and reduce the possibility of a transition to a revolutionary regime. This may explain why generally countries rich in natural resources, especially minerals, tend to have lower levels of technical

education. Most educated people belong to the elite or have been supported by the elite through patronage. For example, in Saudi Arabia only a minor part of students in the university system studies engineering or other scientific professional degree. Another interpretation of the parameter e would be the use of military repression to reduce the level of mobilization of the poor or a policy of destroying oil production capacity!. In addition, the condition $1-\beta > (1-e)/\lambda$ is more likely to be satisfied the better the provision of the public good to the poor (lower β) and the larger the proportion of the poor in the total population (higher λ). Putting all together, we can draw a picture of a country with a large poor and uneducated population supported by the provision of public goods.

The transition between different political regimes may also be such that revolution is neither inevitable with any level of taxation nor avoidable with no taxation, a combination of the negation of conditions (14) and (16):

$$(17) \qquad \theta + \frac{\alpha\lambda}{\overline{y}}([(1-\beta)\mu]^{\phi} - [(1-e)\frac{\mu}{\lambda}]^{\phi}) < \psi^{H}$$

$$\text{and} \qquad \psi^{H} < (1 - [\frac{1}{\overline{y}}[\frac{\theta}{\alpha\phi\lambda}]^{\phi-1} - \frac{\mu}{\overline{y}}])\theta + \frac{\alpha\lambda}{\overline{y}}([(\frac{\theta}{\alpha\phi\lambda})^{\phi-1}]^{\phi} - [(1-e)\frac{\mu}{\lambda}]^{\phi})$$

In this situation, the possibility for democratization exists. The elite may promise a positive tax rate in order to prevent revolution. However, the poor know that there exists a commitment problem: the elite may deny on their promise later. Following the political economy literature, it is assumed that with a probability q the elite do not honor its promise. The possibility of revolution is increasing on lower values of q because the poor know the promise will be difficult to be fulfilled by the elite. In this case, the only option for the elite is to democratize to avoid revolution. The elite will set the tax rate so that the poor are indifferent between revolution and non-democracy. That tax rate is the one that meets the following condition:

$$\psi^H = q\{(1-\tau)\frac{\theta\overline{y}}{\lambda} + \alpha[(1-\beta)(\tau\overline{y}+\mu)]^\phi\} + (1-q)\{\theta + \frac{\alpha\lambda}{\overline{y}}([(1-\beta)\mu]^\phi - [(1-e)\frac{\mu}{\lambda}]^\phi\}$$

or after plugging (10) and $V_p(R, \psi^H)$:

$$\psi^H = q\{(1-[\frac{1}{\overline{y}}[\frac{\theta}{\alpha\phi\lambda}]^{\frac{1}{\phi-1}} - \frac{\mu}{\overline{y}}])\theta + \frac{\alpha\lambda}{\overline{y}}([(\frac{\theta}{\alpha\phi\lambda})^{\frac{1}{\phi-1}}]^\phi - [(1-e)\frac{\mu}{\lambda}]^\phi)\} + (1-q)\{\theta + \frac{\alpha\lambda}{\overline{y}}([(1-\beta)\mu]^\phi - [(1-e)\frac{\mu}{\lambda}]^\phi\} \tag{18}$$

comparing this to $V_p(R, \psi^H)$, we can solve for an important value of q^*,

$$q^* = \frac{\psi^H - \theta - \frac{\alpha\lambda}{\overline{y}}([(1-\beta)\mu]^\phi - [(1-e)\frac{\mu}{\lambda}]^\phi}{\frac{\theta}{\overline{y}}[\mu - [\frac{\theta}{\alpha\phi\lambda}]^{\frac{1}{\phi-1}} + \frac{\alpha\lambda}{\overline{y}}[(\frac{\theta}{\alpha\phi\lambda})^{\frac{\phi}{\phi-1}} - ((1-\beta)\mu)^\phi]} \tag{19}$$

What is the effect of μ on q^*? The Proposition 5 establishes this link:

Proposition 5. *Natural resources helps to prevent democratization through additional redistribution if there is a level of the natural resource rents μ is sufficiently high, such that $\frac{\partial q^*}{\partial \mu} < 0$ and Proposition 4 holds.*

Proof. See Appendix.

At q^*, the payoffs in a non-democratic and revolutionary regime are the same for the poor. If $q < q^*$, democratization emerges because the redistribution through higher taxes transfered from the elite to the poor is not credible enough to avoid revolution. In the opposite case, if $q \geqslant q^*$, that kind of redistribution is credible. This means that the higher is the value of q^*, the more likely is democratization. Proposition 5 says

that only at high levels of natural resource rents it might be sure the case that as μ rises, q^* falls. Notice that it is possible to have numerous additional equilibria (see the appendix).

5 Conclusion

In this paper, we have proposed a model of the effects of natural resources on political stability and democratization. In the political economy literature, the political resource curse has been the name given to the institutional mechanisms through which the abundance of natural resource may avoid the democratization of non-democracies. We have set up a model that allow us analyze the role of natural resource abundance (rents) in the political process. Our model, though simple, highlights some of the most common characteristics of non-democratic countries with abundance of natural resources.

We do not support the claim that natural resource abundance always helps non-democratic regimes prevent democratization or revolution. In the case of democracy, resources rents have to be high enough to prevent revolution. Moreover, we find that inefficiencies and repression are necessary for the elite to maintain the control of political power. Under the threat of revolution, the elite will be able to democratize only if the level of natural resource rents are high enough to avoid revolution once democracy is implemented.

Since the model is simple, a number of possible extensions are possible. First, we have not considered the possibility of elite competition. As has been stressed by some authors, non-democratic political regimes usually face internal conflict between different groups of the elite: rentiers versus entrepreneurs, conservatives versus liberals, and so on. Competition between groups of the elite will probably increase the welfare of the poor because more redistribution and a weaker elite. Second, it would be nice to incorporate some productive public good in the model, in the spirit of the models of democratization from above. Considering two types of redistribution, there will be a trade-off between efficiency and control of political power, so it will be interesting

to analyze the incentives faced by the elite in the choice of policies.

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6 Appendix

A.1) Proposition 1.

Define $G(x)$ as the inverse of $K'(\cdot) = \phi S_i^{\phi-1}$. Recall $G'(x) < 0$ because the concavity of $K(x)$.

$$\frac{\partial \tau^e}{\partial \theta} = -\frac{1}{\alpha(1-\lambda)\overline{y}} G'(\frac{(1-\theta)}{\alpha(1-\lambda)}) > 0;$$

$$\frac{\partial \tau^e}{\partial \lambda} = \frac{1-\theta}{\alpha(1-\lambda)^2\overline{y}} G'(\frac{(1-\theta)}{\alpha(1-\lambda)}) < 0$$

$$\frac{\partial \tau^e}{\partial \mu} = -\frac{1}{\overline{y}} < 0; \qquad \frac{\partial \tau^e}{\partial \alpha} = -\frac{1-\theta}{\alpha^2(1-\lambda)\overline{y}} G'(\frac{(1-\theta)}{\alpha(1-\lambda)}) > 0$$

$$\frac{\partial \tau^e}{\partial \overline{y}} = -\frac{1}{\overline{y}^2}[G(\frac{(1-\theta)}{\alpha(1-\lambda)}) - \mu] < 0$$

$$\frac{\partial \tau^c}{\partial \theta} = \frac{1}{\alpha\lambda\overline{y}}[G'(\frac{\theta}{\alpha\lambda}) - \mu] < 0; \qquad \frac{\partial \tau^c}{\partial \lambda} = -\frac{\theta}{\alpha\lambda^2\overline{y}} G'(\frac{\theta}{\alpha\lambda}) > 0$$

$$\frac{\partial \tau^c}{\partial \mu} = -\frac{1}{\overline{y}} < 0; \qquad \frac{\partial \tau^e}{\partial \alpha} = -\frac{\theta}{\alpha^2\lambda\overline{y}} G'(\frac{\theta}{\alpha\lambda}) > 0$$

$$\frac{\partial \tau^e}{\partial \overline{y}} = -\frac{1}{\overline{y}^2}[G(\frac{\theta}{\alpha\lambda}) - \mu] > 0 \text{ if } \mu > G(\frac{\theta}{\alpha\lambda})$$

$$\frac{\partial \tau^e}{\partial \overline{y}} = -\frac{1}{\overline{y}^2}[G(\frac{\theta}{\alpha\lambda}) - \mu] < 0 \text{ if } \mu < G(\frac{\theta}{\alpha\lambda})$$

A.2) Proposition 4

Rewrite (19) as $\psi^H = qA + (1-q)B$, where

$$A = 1 - [\frac{1}{\overline{y}}[\frac{\theta}{\alpha\phi\lambda}]^{\frac{1}{\phi-1}} - \frac{\mu}{\overline{y}}])\theta + \frac{\alpha\lambda}{\overline{y}}([(\frac{\theta}{\alpha\phi\lambda})^{\frac{1}{\phi-1}}]^{\phi} - [(1-e)\frac{\mu}{\lambda}]^{\phi}$$

$$B = \theta + \frac{\alpha\lambda}{\overline{y}}([(1-\beta)\mu]^{\phi} - [(1-e)\frac{\mu}{\lambda}]^{\phi}$$

Then $q = \dfrac{\psi^H - B}{A - B}$. Therefore, $\dfrac{\partial q}{\partial \mu} = \dfrac{-\dfrac{\partial \psi^{**}}{\partial \mu}(A-B) - (\dfrac{\partial \psi^{*}}{\partial \mu} - \dfrac{\partial \psi^{**}}{\partial \mu})(\psi^H - B)}{(A-B)^2} = \dfrac{\dfrac{\partial \psi^{**}}{\partial \mu}(B - \psi^H) + \dfrac{\partial \psi^{**}}{\partial \mu}(\psi^H - A)}{(A-B)^2}$

Recall that $A > \psi^H > B$. The signs of the terms $(B - \psi^H)$ and $(\psi^H - A)$ are negative.

$\dfrac{\partial q}{\partial \mu} < 0$ if $\dfrac{\partial \psi^{**}}{\partial \mu}$ and $\dfrac{\partial \psi^{**}}{\partial \mu}$ are both positive, so Propositions 3 and 4 hold. Moreover, there will be other equilibria as soon as the term $\dfrac{\partial \psi^{**}}{\partial \mu}(B - \psi^H) + \dfrac{\partial \psi^{**}}{\partial \mu}(\psi^H - A)$ is negative.