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Working Paper

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GLO Discussion Paper, No. 611

Provided in Cooperation with:
Global Labor Organization (GLO)

Suggested Citation: Wadho, Waqar; Hussain, Sadia (2020) : Ethnic Diversity, Concentration of Political Power and the Curse of Natural Resources, GLO Discussion Paper, No. 611, Global Labor Organization (GLO), Essen

This Version is available at:
<http://hdl.handle.net/10419/222447>

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Ethnic Diversity, Concentration of Political Power and the Curse of Natural Resources*

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July 19, 2020

Abstract

The empirical evidence suggests that the resource rich countries tend to have poor economic performance and higher rent seeking. In this paper, we develop a general equilibrium model explaining why natural resources turn out to be a curse in an economy divided into two classes: elite and workers. Our model explains the resource curse in a setup in which governing elite expropriate rents from natural resources which reduces the productive use of these resources. The expected costs and benefits of such rent seeking activities depend on the degree of ethnic polarization which affects the concentration of political power, and on the quality of institutions which constraints rent seeking. The model predicts that in the presence of natural resources and rent seeking, ethnic diversity increases concentration of political power, reduces income per capita and increases income inequality. Moreover, the impact will be higher in economies that depend more on natural resources.

JEL classification: Q32; D72; O11; O13

Key words: Rent seeking; Political power; Natural resource curse; Ethnic diversity

*We would like to thank Thomas Seegmuller, Azam Chaudhry, Naved Hamid, Theresa Chaudhry, and the participants of 2019 International Conference on Public Economic Theory, Strasbourg France for their useful comments and suggestions.

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1 Introduction

Ever since Sachs and Warner (1995), the notion of ‘natural resource curse’ has attracted considerable attention in the scholarship and policy making. Countries rich in natural resources such as fossil fuels and minerals are shown to perform poorly in terms of their economic growth and development. The notion is supported by both— the country case studies and the cross country empirical evidence. Nigeria is often cited as a classic case study of a country who has enjoyed considerable oil windfalls since the late 1960s but has failed to achieve any economic success: Oil revenues per capita in Nigeria increased from US\$33 in 1965 to US\$325 in 2000 but its per capita GDP in 2000 is lower than it was in 1970 (van der Ploeg, 2011; Sala-i-Martin and Subramanian, 2003; Bevan et al., 1999) and is among the lowest in the world. In a cross country study, Gylfason (2001) reports that for the OPEC countries, GNP per capita decreased by 1.3 percent per year on average during 1965-98 compared with 2.2 percent average per capita growth in all lower- and middle-income countries.

However, Nigeria is not the only country who experienced resource booms in the last century. Countries like Saudi Arabia, Norway, Canada, Botswana and other smaller states such as Qatar are all rich in natural resources and had experienced resource windfalls but unlike Nigeria they were able to raise their living standards and some of them are among the wealthiest nations in the world. Or take an example of two diamond rich African neighbors; Angola and Botswana. While Angola is plagued by the civil wars, the Botswana has been the success story of Africa (see Acemoglu et al., 2003) and has achieved the living standards that are many times better than that of Angola. In this paper, we attempt to unravel such resource curse puzzle. We build a theoretical model to explain the resource curse in a setup in which governing elite expropriate rents from natural resources which reduces the productive use of these resources resulting in lower per capita income and higher income inequality. The expected costs and benefits of such rent seeking activities depend on the degree of ethnic polarization which affects the concentration of political power, and the quality of institutions which constraints rent seeking.

This paper contributes to at least three broad strands of economic literature: First, it contributes to natural resource curse literature in explaining why natural resources could be a curse. The last couple of decades has witnessed a growing evidence that countries rich in natural resources perform poorly (Auty, 2001; Birdsall et al., 2001; Gylfason, 2001; Gylfason et al., 1999; Mehlum et al., 2006; Sachs and Warner, 1995, 1999, 2001). The abundance of natural resources in these studies is shown to be associated with slower economic growth, lower education attainment, and more corruption and rent seeking. Theoretically, the ‘resource curse’ has mainly been explained either through the lens of market-based or political economy based theories. Market-based explanations rely on the ‘Dutch disease’ mechanism, where a resource boom

is linked to a crowding out of manufacturing exports and/or misallocation of resources resulting in lower learning by doing and spillover effects (Bravo-Ortega and De Gregorio, 2005; Torvik, 2001; Gylfason et al., 1999). The political economy based strand of literature, on the other hand proposes that the natural resources generate rents, which results in unproductive rent seeking activity and corruption, especially when institutions are weak (Zhan, 2017; Wadho, 2014; Mehlum et al., 2006; Robinson et al., 2006; Torvik, 2002; Auty, 2001; Baland and Francois 2000; Lane and Tornell, 1996). Our proposed mechanism broadly lies within the political economy explanation of the resource curse and we add to this literature by offering a plausible mechanism which could explain the cross-country evidence.

Second, our paper contributes to a growing body of literature on the effects of ethnic diversity on economic performance (see Alesina and La Ferrara, 2004 for an overview). This strand of literature looks at the effects of ethnic diversity on economic performance, separately and in connection to natural resources. Easterly and Levine (1998) found that at the aggregate level ethnic diversity reduces economic growth and proposed it be the reason behind the sluggish performance of ethnically diverse Africa. One explanation for the negative association between the ethnic diversity and sluggish economic growth is that the ethnic diversity may lead to increased civil strife (Worldbank, 1997), however, Collier (1998) showed that such belief could be wrong. In a subsequent research, Collier distinguishes between ‘dominance’, in which one group constitutes a majority, and ‘fractionalization’, in which there are many small groups and show that it’s the case of the former in which ethnic diversity is associated with poor economic performance (Collier, 2001). Whereas, Easterly (2001) claims that the negative effect of ethnic diversity is weaker when institutional quality is higher. In an attempt to connect ethnic diversity and natural resource curse, Hodler (2006) shows that ethnic fractionalization and resource abundance have a negative impact on property rights and that the income effect of natural resources is positive in homogenous countries, but becomes increasingly negative as ethnic fractionalization increases. We add to this literature by proposing a mechanism in which ethnic diversity determines the concentration of political power, which adversely affects per capita income and income inequality.

Third our paper sheds some new light on the relationship between rent seeking/corruption and institutional quality (Wadho, 2014; Mehlum et al., 2006; and Ehrlich and Lui, 1999) and contributes to this literature by designing a rent expropriation mechanism in the presence of natural resources as the source of rents.

We model a two class economy comprising the elite and non-elite as in Wadho (2014), however, the size of elite in our model is endogenously determined. The group formation mechanism crucially depends on three factors: flow of natural resources, institutional constraints, and the degree of ethnic diversity. Natural

resources and institutional constraints determine the extent of rent expropriation which in turn affects the reward for being elite. The size of elite is determined by transaction costs that depend on one's distance to the political center and the concentration of elite group which depends on the degree of ethnic diversity. We show that there will be greater concentration of political power in more ethnically diversified societies and in economies with low quality institutions that constraint rent seeking, which further leads to lower income per capita and higher income inequality.

The paper is structured as follows. Section two sets-up the model and technologies. Section three presents the elite decision problem. Section four presents the optimal solutions, the steady state solutions and discusses the findings. Section five concludes.

2 Model Assumptions

We consider a closed economy with an infinite time horizon within a general equilibrium setting. The economy's initial endowments include a stock of natural resources, S_0 , and a total population, L_t which is further divided into the elite, sL_t and the non-elite, $(1-s)L_t$, where $s \in (0, 1)$. The two classes are heterogenous in terms of their differential access to political capital. The size of the elite is determined endogenously and we assume no population growth.

2.1 Households

Agents within each group are identical, they maximize their utility, represented as the weighted sum of future discount flows

$$U = \int_0^{\infty} u(c_t) e^{-\rho t} dt \quad (1)$$

where $\rho > 0$ denotes the rate of time preferences. c_t is the lifetime consumption of a household. $U(c_t)$ has the usual properties of constant inter-temporal elasticity of substitution and it satisfies the Innada conditions.

All households are endowed with a certain level of income, y_t , that earn a rate of return, r_t , and they supply their labor which earns them a competitive wage, w_t . Each unit of labor is supplied inelastically at the prevalent market wage. The elite households, however, have an additional source of income acquired through rent expropriation from the natural resources. The elite are identical with respect to access to political power, hence, they also receive equal amount of rents. We assume that the political power that the elite possess enables them to extract rents from natural resources whose intensity is determined through an optimization problem.

2.2 Technologies

There is a unique final good produced by firms operating in a perfect competition environment employing labor, L , capital, K_t , and the flows from natural resources, N_t .¹ N_t represents the use of stock of natural resources, S_0 , defined as

$$\dot{S} = S_0 - \int_0^t N_t \quad (2)$$

K_t represents the use of capital stock, K_0 , adjusting for the rate of depreciation, δ , is defined as

$$\dot{K} = K_0 - \delta \int_0^t K_t \quad (3)$$

From the flow of natural resources N_t , the elite expropriate a proportion, $\sigma_t \in (0, 1)$ such that $(1 - \sigma_t)$ is left to be used in productive activities. Output is produced with a constant returns technology of a Cobb-Douglas production function form

$$Y_t = A(K_t)^{1-\alpha-\beta} ((1 - \sigma_t)N_t)^\beta (L)^\alpha$$

where A represent the overall efficiency. Per capita representation of the production function is given by

$$y_t = A k_t^{1-\alpha-\beta} ((1 - \sigma_t)n_t)^\beta \quad (4)$$

where $y_t = \frac{Y_t}{L}$, $n_t = \frac{N_t}{L}$ and $k_t = \frac{K_t}{L}$.

All markets are competitive, the profit maximization by firms results in all factors of production being paid their marginal product.

$$MPK = \frac{(1 - \alpha - \beta)y_t}{k_t} = r_t \quad (5)$$

$$MPN = \frac{\beta y_t}{n_t} \quad (6)$$

$$MPL = \alpha y_t = w_t \quad (7)$$

¹Since there is no population growth, we do not use time subscript with labor, L for the sack of brevity.

3 The elite decision problem

3.1 Expected costs and benefits from being elite

We assume that all the elite extract rents, thus, the decision to be an elite is essentially identical to a decision of being a rent-seeker. An individual's decision to be a rent-seeker or not depends on the benefits that it receives in terms of rent extraction and the costs it incurs of being a rent-seeker. We model two distinct types of costs that an elite rent-seeker faces: first, there is a transaction cost that it incurs in establishing the elite network, and second, the rent expropriation activity is considered as an illegal act and there are penalty costs that an individual pays if caught being rent-seeker. The two types of costs differ in terms of their nature as well as the timing. Transaction costs are incurred ex-ante and are determined by the cultural and normative attributes of an individual. Broadly speaking, the transaction costs are defined as the cost of persuading, coordinating and negotiating others (Langlois, 1992). The extent of such costs could be linked with family ties and extended kinship that facilitate interaction among individuals, hence, lowering down the transaction costs. In economics, these costs are conceptualized as 'cost of administering, directing, negotiating and monitoring of the joint productive activities', particularly in the context of contract law theories (Landa, 1981; Alchian and Woodward, 1988). Two important elements of these costs involve cost of coordination and contract-enforcement between agents and both these costs are positive function of the size of the network.

At an individual level, these costs depend on one's position in the network space. The existing literature models the concept of social distance as a stable social space inherited by individuals in a society. This inherited social distance plays a decisive role in formation of subgroups in the population with similar culture and beliefs (Akerlof, 1997). Ethnicity, religion and social demographics are considered as antecedents of social distance. In many societies, religion and ethnicity are able to sustain their social salience and remain stable over time (Smith et. al., 2014). In line with this literature, we envisage a political landscape where an agent, i , is located at a variable distance from the political centre. The presence of a distinct social distance from the centre implies a unique transaction cost for each individual.

More precisely, we assume a uniformly distributed population against social distance, z_i . Social distance is a random variable ranging from 0 to \bar{Z} . \bar{Z} is some maximum level of social distance in a given society. We model this upper bound of the social distance as a function of ethnic diversity. Precisely, $\bar{Z} = \theta$, where θ is a fixed parameter representing the degree of ethnic polarization in a society. Higher values of θ correspond

to greater ethnic divide within the population.² Given this, the transaction costs are modeled as

$$T_i = z_i \quad (8)$$

where T_i is the transaction cost that an individual with a distance z_i , incurs.

Penalty costs on the other hand are ex-post and depend on the probability of being detected as rent seeker and the monetary costs associated with it. Assuming that a bigger expropriation of natural resources would imply bigger offense, we model penalty costs as an increasing function of the extent of the offense (i.e. rent expropriation)

$$F_t = \sigma_t f \quad (9)$$

where F_t is the total cost and f is a fixed penalty imposed on each fraction of rents expropriated.

The elite rent seeker faces a probability, p_t , of being caught which we model as an endogenous function as well and depends on the extent of rent-seeking offense and the monitoring effort. Assuming that a bigger extraction of rents would imply a more visible rent-seeking, the probability of being caught is an increasing function of the extent of rent-seeking, σ_t . Further, the chances of being caught also depend on the intensity of monitoring effort or its efficiency. Combining these two, we model probability of being caught as

$$p_t(\sigma_t, m) = \sigma_t m \quad (10)$$

where m is the monitoring efficiency, which represents the quality of institutions. A higher value of m would imply better quality institution and a higher probability of being detected as rent-seeker.

Given the technologies for penalty costs and the probability of being caught, the expected penalty cost (EP) of being rent-seeking elite is

$$EP = p_t F_t = \sigma_t^2 f m \quad (11)$$

The gains from being a rent-seeking elite come from the rents extracted from natural resources. The optimal level of rent extraction, σ_t , is determined through a utility maximization problem explained in the subsequent section. The elite are able to extract $\sigma_t N_t$ of natural resources that they divide equally among themselves. With a probability $(1 - p_t)$, a rent-seeking elite is successful in retaining the extracted rents.³ Given this, the expected benefits of being rent-seeker are

$$EB = \frac{(1 - p_t) \sigma_t N_t}{sL} \quad (12)$$

²We could also include other cultural cleavages to determine the upper bound of the social distance. This, however, will not alter our qualitative results as long as the upper bound is an increasing function of θ .

³With the opposite probability p_t , rents are confiscated. We assume that these rents are a part of penalty F_t that is imposed on the rent seekers such that the penalty costs always exceed the captured rents.

One immediate implication of the equation (12) is that the expected benefits of an individual rent-seeker decrease with the size of rent-seeking elite, *ceteris paribus*.

4 Optimal Solutions

4.1 Elite decision problem

The elite decision problem is two-dimensional: In the first, they decide to be a rent-seeker (elite) or not by weighing in the expected costs and benefits as explained in the previous section. An agent opts to be a rent-seeker if the net rewards of being rent-seeker exceeds to that of being honest. In the second, elite rent-seekers choose the optimal level of rent expropriation that maximizes their utility. The degree of rent expropriation will in turn determine the amount of productive natural resources that are diverted away from the production sector. The model is solved through backward induction in which agents first choose optimal level of rent expropriation.

4.1.1 Utility maximization problem of the elite

The elite derive utility from the consumption of a single good, c_t . The optimization involves choosing consumption c_t and the extent of rent expropriation, σ_t . The elite maximize utility function in equation (1) subject to an income constraint defined as

$$\dot{y} = w_t + r_t y_t + EB - EP - c_t \quad (13)$$

where w_t is the wage income earned from the final output sector and $r_t y_t$ is the return on productive capital, EB and EP is the expected benefits and penalty costs of being rent-seeker as given in equation (11) and (10), respectively. After substituting in for p_t , EB and EP in the income constraint, the corresponding Hamiltonian problem is

$$H = u(c_t)e^{-\rho t}.dt + \lambda_t(w_t + r_t y_t + \frac{(1 - \sigma_t m)\sigma_t N_t}{sL} - \sigma_t^2 f m - c_t)$$

The first-order conditions yield

$$\frac{dH}{dc_t} = u'(c_t)e^{-\rho t}.dt = \lambda_t \quad (a)$$

$$\frac{dH}{d\sigma_t} = \frac{N_t}{sL} - \frac{2\sigma_t m N_t}{sL} - 2\sigma_t m f = 0 \quad (b)$$

$$\frac{dH}{dy_t} = \dot{\lambda} = -\lambda_t r_t \quad (c)$$

From the first order condition in (b), the optimal level of rent expropriation for a given level of natural resource flows would depend on the size of the elite, sL , the rate of penalty, f , and the efficiency of monitoring technology, m

$$\sigma_t = \frac{N_t}{2mN_t + 2mfsL} \quad (14)$$

The size of rent expropriation increases with the flow of natural resources and decreases with the size of elite, effectiveness of monitoring technology, and the rate of penalty.

4.2 Production Sector

Firms operate in a competitive environment taking the extent of rent expropriation by the elite and the overall efficiency, A as given. The profit function can be defined as the net proceeds from sales after wages and rent of capital.

$$\pi_{it} = AK_{it}^{1-\alpha-\beta}((1-\sigma_t)N_{it})^\beta L_i^\alpha - wL_i - r_t K_{it} \quad (15)$$

Firms maximize the present value of profit by allocating the optimal level of capital, K_{it} , and the use of natural resources, N_{it} . A representative firm maximizes the present value of profits in (14) subject to the aggregate stock of productive capital, K_t and the stock of natural resource, S_o . The firm's optimization problem can be modeled using a Hamiltonian function as⁴

$$H = [AK_{it}^{1-\alpha-\beta}((1-\sigma_t)N_{it})^\beta L_i^\alpha - wL_i - r_t K_{it}] e^{-rt} + \mu_0(N_t) - \mu_{1t}(N_t) + \lambda_{1t}(K_0 - \delta K_t)$$

The first-order conditions yield

$$\frac{dH}{dK_{it}} = [(1-\alpha-\beta)A(K_{it})^{-\alpha-\beta}((1-\sigma_t)N_{it})^\beta L_i^\alpha - r_t] e^{-rt} = 0 \quad (d)$$

$$\dot{\lambda}_{1t} = -\frac{dH}{dK_0} = -\lambda_{1t} \quad (e)$$

$$\frac{dH}{dN_{it}} = [(\beta-1)AK_{it}^{1-\alpha-\beta}(1-\sigma_t)^\beta N_{it}^{\beta-1} L_i^\alpha] e^{-rt} = 0 \quad (f)$$

$$\dot{\mu} = -\frac{dH}{dS_0} = 0 \quad (g)$$

⁴ μ_0 is a nonnegativity constraint on the natural resource flows. We use the Kuhn-Tucker conditions of complementary slackness to solve the model such that $\mu_0 N_t = 0$

Equation (g) from the first-order condition yields the Hotelling-rule. In our model, there are no extraction costs of natural resources.

4.3 The steady-state solutions

In this section, we look at the steady-state solution of the elite and firm's maximization problem. A joint determination of the optimal level natural resources use and the optimal size of rent expropriation in the steady state are given by⁵

$$n^* = \frac{(\sqrt{1-2m} - (1-2m)) fs}{1-2m} \quad (16)$$

$$\sigma^* = \frac{\sqrt{1-2m} - (1-2m)}{2m\sqrt{1-2m}} \quad (17)$$

A firm's decision to use natural resources crucially depends on the size of the elite network, penalty costs associated with rent seeking, and the efficiency of monitoring technology⁶. There is a negative association between higher concentration of political power (smaller size of the elite, s) and the productive use of natural resources implying that the flow of natural resources into production decreases with the concentration of political power. A higher concentration of political power would imply a bigger share of natural resources expropriated by the elite which reduces firms' profit in (equation 14). The flow of natural resources, however, increases with the penalty rate, f and the monitoring efficiency, m as both of them increase the ex-post cost of rent-seeking, which in turn decreases the level of rent expropriation. Whereas, the steady state level of rent expropriation is solely determined by the efficiency of monitoring technology. As monitoring efficiency increases (denoted by higher values of m), the degree of rent expropriation declines in the steady-state. A higher efficiency of monitoring would imply a higher probability of being detected, hence a higher ex-post cost of being rent-seeker, which reduces the size of rent expropriation. Assuming that the efficiency in monitoring the corrupt behavior depends positively on the quality of institutions. This finding implies that the level of rent expropriation would be lower with better quality institutions that detect and punish rent-seeking more efficiently.

4.4 The decision to be rent seeker and the size of the elite network

The elite's decision to be a rent-seeker or not eventually determines the size of the elite. The decision to be a rent seeker is determined through a cost-benefit analysis in which agents compare their expected benefits of being a rent-seeking elite with its expected costs. All the elite face similar ex-post penalty costs and receive same rewards from being the rent seeker, however, transaction costs depend on one's distance to the political

⁵See Appendix A for the derivations

⁶We assume $1-2m > 0$. This would imply monitoring effort $m < \frac{1}{2}$, which is more likely the case in many developing countries.

centre which will eventually determine the size of the elite. The elite population is uniformly distributed along social distance of an agent from the political centre implying that the size of the elite is given by

$$\frac{1}{\bar{Z}(\theta)} * z_i = sL \quad (18)$$

Given this, there exists a threshold level of social distance, z_1 , such that costs of being rent seeker equals its benefits. Beyond the social distance of z_1 , costs would exceed the benefits. Combining equation (17) with the transaction costs in equation (7), the transaction costs at the threshold z_1 are given by

$$T_1 = sL\theta$$

Given the transaction costs above, the total costs (including both penalty and transaction costs) of being rent seeker are given by

$$TC = \sigma_t^2 f m + sL\theta \quad (19)$$

An agent compares the total costs in (18) with the benefits of being a rent-seeker in (11). From this comparison, the steady-state size of the elite is given by

$$s^*L = \frac{(\sqrt{1-2m} - (1-2m))(1 - \sqrt{1-2m})f}{4m(1-2m)\theta} \quad (20)$$

The steady-state size of the elite is a function of degree of ethnic polarization, θ , monitoring efficiency, m , and the penalty costs, f . There is a negative relationship between the size of the elite and ethnic polarization, θ . A higher θ would imply a lower size of the elite or a greater concentration of political power. Linking this finding with the earlier steady-state solution of natural resources flow shows that in more polarized societies (higher θ), there will be greater rent expropriation from natural resources and lower profits for firms. On the other hand, there is a positive relationship between the steady-state size of the elite and monitoring efficiency as well as the penalty costs, suggesting that improved monitoring and higher fines would dilute the concentration of political power. Assuming that with better quality institutions there will be more efficient monitoring, the preceding observation would imply that societies with better quality institutions that improve monitoring and penalize the rent seeking behavior will have lower concentration of political power.

4.5 Income per capita and income inequality

4.5.1 Income per capita

From the household maximization problem, the standard Euler equation gives the optimal consumption path as

$$\frac{\dot{c}}{c} = \frac{MPK - \rho}{\varphi}$$

By using the marginal product of capital in (4), the optimal rate of growth in consumption is given by

$$\frac{\dot{c}}{c} = \frac{(1 - \alpha - \beta)k_t^{-\alpha-\beta}[(1 - \sigma)n_t]^\beta - \rho}{\varphi} \quad (21)$$

Equation (20) implies that k converges to a steady-state value of k^* defined by

$$k^* = [(1 - \alpha - \beta)A\rho^{-1}]^{\frac{1}{\alpha+\beta}} [(1 - \sigma^*)n^*]^{\frac{\beta}{\alpha+\beta}}$$

By substituting in for n^* and σ^* from equation (15) and (16) respectively, the steady-state of k^* is given by

$$k^* = [(1 - \alpha - \beta)A\rho^{-1}]^{\frac{1}{\alpha+\beta}} \left[\frac{\left(1 - x^{\frac{1}{2}}\right)^2 f s^*}{(1 - x)x^{\frac{1}{2}}} \right]^{\frac{\beta}{\alpha+\beta}}$$

where $x = 1 - 2m$.

One of the immediate implications of the above equation is that the steady-state capital per worker decreases with the concentration of political power. Further, the negative impact of the concentration increases with the share of natural resources in total output, β . The later implies that the economies that rely more on natural resources experience bigger negative impact of the concentration of political power.

By substituting in for the steady-state size of the elite in (19), the steady-state of k^* is given by

$$k^* = [(1 - \alpha - \beta)A\rho^{-1}]^{\frac{1}{\alpha+\beta}} \left[\frac{\left(1 - x^{\frac{1}{2}}\right)^4 f^2}{2\theta L(1 - x)^2 x^{\frac{1}{2}}} \right]^{\frac{\beta}{\alpha+\beta}} \quad (22)$$

The steady-state capital per worker is related negatively to the degree of ethnic polarization, θ and positively to the quality of institutions. A higher value of θ would imply greater ethnic polarization, which according to equation (21) results in lower steady-state capital per worker.

Given the steady-state level of capital per worker in (21), the per capita steady-state level of income in (3) is given by

$$y^* = A [(1 - \alpha - \beta)A\rho^{-1}]^{\frac{1-\alpha-\beta}{\alpha+\beta}} \left[\frac{\left(1 - x^{\frac{1}{2}}\right)^4 f^2}{2\theta L(1 - x)^2 x^{\frac{1}{2}}} \right]^{\frac{\beta}{\alpha+\beta}} \quad (23)$$

From equation (22), economies will have a lower steady-state income per capita with higher degree of ethnic polarization, θ and with lower quality of institutions. Ethnic polarization leads to higher concentration of political power, which results in a greater rent expropriation from natural resources and lower profits for firms. Lower firm profits in turn reduce the productive use of natural resources hence the marginal product of physical capital. Furthermore, the negative impact of ethnic polarization will be higher in economies that are more dependent on natural resources (a higher β). On the contrary, better quality institutions impose higher restrictions on rent-seeking by increasing the expected costs of being rent-seeker, which lowers the concentration of political power and results in lesser rent expropriation from natural resources.

4.5.2 Income inequality

Heterogeneity across agents in terms of their access to political power implies that income levels will differ between the elite and the non-elite. The non-elite agents generate income through wages and returns on capital, however, the elite agents have an additional source of income coming from the rent expropriation. A convenient measure of income inequality is the ratio of the income of the elite to that of the non-elite. In the steady-state, this is given by

$$\begin{aligned} IE &= \frac{w^* + y^*r^* + (EB - EP)}{w^* + y^*r^*} \\ &= \frac{\alpha y^* + y\rho + (EB - EP)}{\alpha y^* + y\rho} \end{aligned}$$

By substituting in for the expected costs EP in (10) and the expected benefits EB in (11), and by using the steady-state condition, income inequality is given by

$$IE = \frac{\alpha y^* + y^*\rho + \left(1 - x^{\frac{1}{2}}\right)^2 f\left(2(1 - x)x^{\frac{1}{2}}\right)^{-1}}{\alpha y^* + y^*\rho} \quad (24)$$

In equation (23), $IE > 1$ which implies that in the steady-state, the elite agents earn higher income than the non-elite. Furthermore, income inequality increases with the degree of ethnic polarization.⁷ The positive impact of ethnic polarization on income inequality results from its negative impact on wages. Higher ethnic polarization results in more concentration of political power, which in turn increases rent expropriation and decreases productive use of natural resources and hence wages. The elite agents, like the non-elite will also have lower wages with higher degree of ethnic polarization, however, part of their income loss is compensated by net benefits from rent expropriation.

⁷Note $\frac{\partial IE}{\partial \theta} = \frac{\partial IE}{\partial y^*} \cdot \frac{\partial y^*}{\partial \theta} > 0$

5 Conclusion

Recent empirical evidence suggests that the resource rich countries tend to have poor economic performance and higher rent seeking. In this article, we build a theoretical model explaining this evidence where abundance of natural resources affects rent seeking, which in turn determines the level of income per capita and income inequality. We model an economy divided into two classes: the elite and workers. The former is a privileged class who has access to political power and could expropriate rents from natural resources. The size of the elite is endogenously determined and depends on natural resources that is the source of rents, ethnic diversity which determines the transaction costs, and institutional quality which constraints rent seeking.

We find that there is a negative relationship between the size of the elite and ethnic polarization. A higher ethnic polarization would imply a greater concentration of political power and greater rent expropriation from natural resources. On the other hand, there will be a lower concentration of political power with better monitoring and higher penalty on rent seeking implying that better quality institutions would dilute the concentration of political power. Our main results show that income per capita decreases with ethnic polarization and increases with the quality of institutions, and this impact will be more pronounced in economies that depend more on natural resources. Furthermore, ethnic polarization also results in income inequality and a higher ethnic polarization would imply a higher income inequality between the elite and non-elite.

Our main thesis in this paper provides some important policy lessons for countries that are rich in natural resources and are home to diversified ethnicities. Concentration of political power determines the direction of the impact of natural resources on economic wellbeing. Any policy reform that dilutes this concentration such as broadening the access to political power (reducing cost of participation) and the policy reforms constraining rent seeking would reduce rent expropriation and improve income per capita and income equality.

6 References

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Appendix A

The elite's maximization problem:

The optimal consumption and rent-seeking path of the elite through a utility maximization is given by the following Hamiltonian

$$H = u(c_t)e^{-\rho t}.dt + \lambda_t(w_t + r_ty_t + \frac{(1 - \sigma_tm)\sigma_t N_t}{sL} - \sigma_t^2 fm - c_t)$$

The first order conditions yield

$$\begin{aligned}\frac{dH}{dc_t} &= u'(c_t)e^{-\rho t}.dt = \lambda_t \\ \frac{dH}{d\sigma_t} &= \frac{N_t}{sL} - \frac{2\sigma_tmN_t}{sL} - 2\sigma_tm f = 0 \\ \frac{dH}{dy_t} &= \dot{\lambda} = -\lambda_tr\end{aligned}$$

Taking logs and time derivatives of $\frac{dH}{d\sigma_t}$ yields

$$N_t - 2\sigma_tmN_t - 2\sigma_tm f sL = 0$$

$$\begin{aligned}\sigma_t &= \frac{N_t}{2mN_t + 2mfsL} \\ 1 - \sigma_t &= \frac{2mN_t + 2mfsL - N_t}{2mN_t + 2mfsL}\end{aligned}\tag{A-1}$$

The firm's optimization problem:

A firm's profit-maximization problem can be expressed as

$$H = [AK_{it}^{1-\alpha-\beta}((1 - \sigma_t)N_{it})^\beta L_i^\alpha - wL_i - r_tK_{it}]e^{-rt} + \mu_0(N_t) - \mu_{1t}(N_t) + \lambda_{1t}(K_0 - \delta K_t)$$

The first-order conditions yield

$$\frac{dH}{dK_{it}} = [(1 - \alpha - \beta)A(K_{it})^{-\alpha-\beta}((1 - \sigma_t)N_{it})^\beta L_i^\alpha - r_t]e^{-rt} = 0\tag{d}$$

$$\dot{\lambda}_{1t} = -\frac{dH}{dK_0} = -\lambda_{1t}\tag{e}$$

$$\frac{dH}{dN_{it}} = \left[(\beta - 1)AK_{it}^{1-\alpha-\beta}(1 - \sigma_t)^\beta N_{it}^{\beta-1} L_i^\alpha \right] e^{-rt} = 0 \quad (\text{f})$$

$$\dot{\mu} = -\frac{dH}{dS_0} = 0 \quad (\text{g})$$

Taking log and time derivatives of equation (d)

$$\log(1 - \alpha - \beta) + \log A - (\alpha + \beta) \log K_{it} + \beta \log(1 - \sigma_t) + \beta \log N_{it} + \alpha \log L_i = \log r$$

In the steady-state using $\frac{\dot{K}}{K_t} = 0$, yields the following dynamic equation

$$-\beta \frac{\dot{\sigma}}{1 - \sigma} = -\beta \frac{\dot{N}}{N_t}$$

Taking log and time derivatives of equation (f) yields

$$\frac{\dot{K}}{K_t} = \beta \frac{\dot{\sigma}}{1 - \sigma} + r + (1 - \beta) \frac{\dot{N}}{N_t}$$

In the steady-state $\frac{\dot{K}}{K_t} = 0$, and we get the following dynamic equation

$$\frac{\dot{\sigma}}{1 - \sigma} = \frac{\dot{N}}{N_t} = -r \quad (\text{A-2})$$

Using the steady-steady condition from the firm profit-maximization problem and combining it with the elite maximization in (A-1) to solve for N^* and σ^* , we get

$$\begin{aligned} \frac{1}{N_t} &= \frac{2m}{2mN_t + 2mfsL} - \frac{2m - 1}{2mN_t + 2mfsL} \frac{1}{N_t} \\ (4m^2 - 2m)N^2 + (4m^2fsL - 2mfsL)N + (mfsL)^2 &= 0 \end{aligned}$$

From the above quadratic equation only one root is positive (given that $m < \frac{1}{2}$)

$$\begin{aligned} N^* &= \frac{-mfsL + 2m^2fsL + mfsL\sqrt{1 - 2m}}{2m(1 - 2m)} > 0 \\ N^* &= \frac{(2m + \sqrt{1 - 2m} - 1)fsL}{2m(1 - 2m)} \end{aligned} \quad (25)$$

Given this the optimal level of rent expropriation in the steady state is given by

$$\sigma^* = \frac{\sqrt{1 - 2m} - (1 - 2m)}{2m\sqrt{1 - 2m}}$$