The Political Economy of Ethnic Polarization, Natural Resource Curse and Income Inequality

by

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Submitted to Lahore School of Economics in fulfillment of the requirements for the degree of MPhil Economics

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Abstract

This paper analyzes the impact of ethnic polarization in triggering the natural resource curse which consequently results in higher levels of income inequality. We use a dynamic infinite time horizon model in a general equilibrium framework setting. A backward-induction process is used with three essential elements. Firstly, we decide upon the size of the elite through cost-benefit analysis. Secondly, the elite decide whether to indulge in rent-seeking or not by comparing their respective utilities. Lastly, the elite decide upon the optimal level of expropriated rents through a utility maximization problem. We are able to show that it is only in ethnically polarized societies, the economy is stuck in a high-corruption equilibrium by raising the returns from rent-seeking. Conversely, in ethnically homogenous societies, a low-corruption equilibrium will exist conduit lower concentration of political power

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1.0 Introduction

Natural resource abundance has ignited much debate regarding its significance in hindering or inducing growth. However, there is no single unifying framework that explores the casual relationship between the two. In this study, we propose ethnic polarization as the causal link between resource curse and income inequality. Previous studies highlight the role played by resource rents in creating a wedge between income levels across groups. The focus is therefore on the redistributional effects of resource rents. The uniqueness of the study lies in the fact that no theoretical framework has been developed that amalgamates the elements under discussion. As every hypothesis is sparked by empirical regularities, this topic is no different. Economic intuition suggests that natural resource abundance should have a growth-inducing effect on an economy. However, empirical evidence suggests otherwise (Sachs and Warner, 1995; Sala-i-Martin and Subramanian, 2003). Countries that are abundant in natural resources popularly mineral oil, natural gas and land tend to grow slower as compared to resource-rich countries. Furthermore, there is empirical evidence that ethnically diverse economies also tend to grow slower than ethnically homogenous ones (Montalvo and Querol, 2005;Collier , 2006). By taking into account the observed regularities, the study builds a unique political economy framework to explain the resource curse.

The example of Nigeria is often quoted by economists and political scientists to resolve the resource curse puzzle. Nigeria is not only a highly ethnically diverse country but it also polarized consisting of 200 ethnic groups with around 500 indigenous languages (World Bank, 2014). However, compared to the rest of the world, the Sub-Saharan developing countries face a downward trend in the annual GDP growth rate. The country experienced large gains roughly around US$200 million from between 1970 to 1990 from oil exports however that did little to improve the prevalent living standards. Nigeria fares poorly on development indicators with a Gini coefficient of 43% way above the Sub-Saharan average. The increase in oil prices during the 1970-2000 increased the level

of inequality with top 2% population having an income share equivalent to that of the bottom 55%. Thus the dependence on revenues from natural resource reserves proved to be detrimental for the country fostering fiscal mismanagement, corruption and rent-seeking behavior. Norway, another natural resource abundant country is often juxtaposed as an example of the resource-curse fallacy. The Norwegian economy too is rich in natural resources such as natural gas, oil and forests but the resource curse did not exhibit itself. Norway is one of the most egalitarian economies of the world with a Gini coefficient of 27% and sustainable growth rates (World Bank, 2010). Norway is predominantly an ethnically homogenous nation with similar culture, religion and language. Thus, the conundrum regarding the natural resource endowment persists.

The topic for discussion can be broken down into three elements namely ethnic polarization, resource curse and income inequality. To understand this subject, it is quintessential to distinguish between ethnic fractionalization and polarization. Recent studies have recognized the importance of this differentiation. Ethnic fractionalization is given by the probability that two randomly drawn groups belong to a distinct ethnic group. The maximum is reached when theoretically speaking each person belongs to different group. On the other hand, polarization is when the economy consists of two equally sized groups, one more dominant than the other (Alesina, 2002). Interestingly, one of the most prominent studies by Easterly and Levine (1997) implicitly assumed to incorporate polarization as a determinant of growth rather than fractionalization. Ethnic polarization would thus be embedded in the concept of high degree of differences in preferences between groups i.e. a large ethnic majority faces a large ethnic minority. Polarization therefore has the capacity to influence economic policy through rent-seeking activities (Montalvo and Querol, 2005).

The principal short coming of the empirical work on ethnic polarization is the methodology used. The empirical works of Martin and Subramanian (2003), Mauro (1995) and Canning and Fay (1993) use the ethnolinguistic fractionalization (ELF) to measure the degree of ethnic diversity in

an economy. However several concerns have been raised as to the use of this index as a proxy for ethnic polarization. Firstly, ELF Index is inadequately constructed due to certain specification issues i.e. one ethnic group may speak more than one language. Furthermore, it suffers from the problem of endogeneity i.e. the variable might be correlated with other variables of interest such as political, economic and social factors (Montalvo and Querol, 2005). Thus a wide research void exists in this field of economics. The theoretical nature of the paper tends to counter these aforementioned problems with ethnic polarization as an analysis tool.

Through our results we are able to show that nexus between natural resource curse and income inequality is through ethnic polarization. High degree of ethnic polarization enables concentration of power much easier. We use the idea of social distance to understand interaction between agents of the society. Greater heterogeneity leads to lack of trust between individuals culminating in higher transaction costs between groups. Thus agents closer to the political centre, facing similar values and culture, are able to build a network of elite. The elite have an insider advantage due to the low transaction costs that they face. These barriers to entry in the bureaucratic process leads to concentration of political power. The elite are now able to redirect natural resource rents from the productive sector of the economy and use it for their own personal benefit. Thus, the economy is stuck in a high-corruption equilibrium. The study shows that there exists a threshold value of ethnic polarization beyond which the economy is stuck in a low-growth equilibrium. The results not only appeal to economic intuition but also satisfy the empirical regularities. The presence of natural resource reserves are not itself the problem but it is infact the way those resources are utilized. Conversely, ethnically homogeneous countries do not face the resource curse since participation in the political processes is less costly. Thus the study offers a promising outlook by building the gap in the literature.

Next, we briefly explain how economic theory in this field has evolved over the years.

Transition of thought: Market view

The resource curse debate was first ignited by Sachs and Warner (1995) in their empirical work where they find a negative relationship between natural resource abundance measured using ratio of natural resource exports to GDP and growth rates as opposed to resource-scare countries. The casual link was established on how resource abundance impacts policy indicators such as trade policy and bureaucratic functioning. The Prebisch-Singer Hypothesis (1948), although now redundant, projected a downward trend in the prices of natural commodities. Since developing countries are predominantly reliant upon the primary sector thus the divide between the developing and developed world would widen over time. However this theory relied upon flawed empirical methodology using composite indices to measure fluctuations in commodity prices.

The collapse of the former hypothesis leads to an alternate explanation i.e. the Dutch Disease Hypothesis. Natural resource abundance is associated with resource booms leading to an appreciation of the exchange rate. The exchange rate appreciation leads to reallocation of productive resources from the manufacturing (tradable) to the natural resource sector. Since manufacturing sector is often associated with higher productivity subject to increasing returns to scale compared to the natural resource sector thus growth rates are more likely to stagnate due to allocative inefficiencies in the economy. However, like the Prebisch-Singer thesis, the Dutch-disease phenomenon was abandoned due to lack of empirical support (Bulte et al., 2005). Other market-based theories also borrowed the idea of "crowding-out" effect explaining the resource-curse effect. Resource booms divert resources from productive activities such as learning by doing, accumulation of human capital and entrepreneurial talent into the rent-seeking sector. Similarly, natural resource abundance cushion inefficiencies by allocating investment from the formal to the informal sector often termed as the "voracity-effect" (Gylfason, 2001; Lane and Tornell, 1999; Torvik, 2002).

Political economy models: Role of institution

The theoretical framework of the market theories could not be corroborated by empirical evidence, leaving room for further analysis. This marked the beginning of the political-economy based models. Politics and economics are intertwined since time immemorial however it is only recently that the interdependence between the two has been realized. One of the major breakthroughs in the political economy models has been the inclusion of institutional quality. Three schools of thoughts emerge. Firstly, resource abundance is translated into a curse due to institutional decay synonymously deterioration of bureaucratic quality. Presence of natural resources in an economy lead to poor governance and use of state institutions for expropriating resource rents (Ross, 2001).

Secondly, institutions can be viewed as benign as argued by Sachs and Warner (1995) where resource abundance is in itself sufficient to trigger the curse. The causal effect of institutions is primarily through geography i.e. climate, resource reserves and terrain determine the types of institutions set up in an economy. However, this view has been undermined thanks to the extensive work of Acemoglu, Johnson and Robinson (2002). These proponents of the institutional view argue that there has been a reversal of fortune in the modern world. Countries that were previously poor are now rich and vice versa. The change in the relative income levels of the world economies can be explained by the planting of inclusive institutions in the previously poor economies by the European colonizers. Example of Canada and USA are sufficient to corroborate the hypothesis. If geography was the decisive factor then this reversal of fortune couldn't have been made possible.

Thirdly, resource abundance interacts with institutional quality to determine the development path of an economy. Proponents of this view argue that institutional quality can experience changes in the presence of resource abundance. Inclusive or "producer-friendly" institutions such as those that ensure property rights and rule of law in an economy can turn resource abundance into a blessing. On the other hand, extractive or "grabber-friendly" institutions can divert productive resources into rent-seeking activities (Mehlum, Torvik and Moene, 2005). Corruption and

concentration of bureaucratic power are possible side-effects of resource abundance nurtured in poor-quality institutions. Leite and Weidmann (1999) argued how natural resource abundance determines the level of corruption in an economy using a theoretical framework. Three aspects verify the level of corruption in an economy namely natural resource abundance, government policies and concentration of political power. The paper also emphasizes the importance of initial conditions i.e. it helps in explaining the non-monotonic relationship between resource abundance and growth. The state of development in the economy will play an important role if the curse exhibits itself. The study relies upon the basic setup established by the aforementioned authors elaborating it further by adding the component of ethnic polarization and income inequality which will be discussed later.

Political institutions and concentration of power amongst the elite

The basis of the political economy models are nested in the concentration of political power. In societies where political power is diluted, the incumbent party needs to win majority support through the provision of public good. The economies of scale associated with the provision of public good ensure the support of the masses is captured. However, in cases where political power is concentrated then making targeted transfers to the interest groups can serve the purpose. This is the underlying framework as to why ethnic polarization (associated with concentration of political power) can deter growth-inducing policies. The availability of easily expropriated rents only facilitates the process. Theoretical political models in this field can be classified into two categories i.e. one where the role of political institutions is explicitly incorporated and the other in which government policy emerges as the equilibrium outcome of rent-seeking activities. Powerful groups transfer expropriated wealth to themselves. The behavior of the interest groups is constrained by the transfer of other groups and the non-negativity constraints (Deacon, 2011).

The study takes a similar approach by taking the role of government as implicit.

Ethnic Polarization

The role of conflict

As stated earlier, there is a dearth of a unifying framework to incorporate ethnicity, natural resource curse and inequality. Recent work done in this field focuses on how ethnic polarization triggers civil conflict and thus hampers growth. Querol and Montalvo (2005) focus on how ethnic polarization instead of fractionalization can lead to potential conflicts in society thus ensuing political instability and lower levels of investment in the economy. However, they are careful in drawing conclusions and predict a non-monotonic relationship between ethnic polarization and conflict. At low levels of polarization, conflict is less likely to occur for obvious reasons. At high levels of polarization i.e. where the number of small ethnic groups is large the lobbying power is diluted and thus translates into a lower probability of civil conflict. Other conflict based models include the works of Collier (2006) and Caselli (2006). Caselli (2006) develops a theoretical framework as to how natural resource abundance generates power struggles within an economy raising the discount rate of the ruling party. Resource rents raise the discount rate of the governing elite and thus lower investment in public goods. The power struggles emerge between the challenger and the incumbent. If the incumbent makes sufficient investment in productive capital then it is feasible for the challenger to not stage a coup and generate profits as an entrepreneur.

Collier (2006) empirically explores the possible causes of civil conflict by testing two strands of theories namely the feasibility hypothesis and the motivation hypothesis. The former hypothesis presumes that civil conflict will occur whenever it is feasible where feasibility is defined as military strength and financial gains. The motivation hypothesis can be further subdivided into greed and grievance where greed originates from a desire to capture rents while the latter comes from the

marginalization of certain groups in a society. The study concludes that the feasibility hypothesis gains precedence over the motivation hypothesis and can thus help in explaining conflicts emerging from financial gains i.e. resource curse. For any theoretical framework to be satisfactory it is important to satisfy the empirical regularities. However the conflict-based theories are often downplayed due to lack of empirical support. Not all ethnically polarized economies rich in natural resources face civil conflict. That leaves room for a different transmission mechanism and that is exactly what this study does.

Corruption, Rents and Inequality

The other strand of literature focuses on how expropriated rents foster corruption mainly through the use of bribes to win political support. Such a strategy is possible where political power is concentrated and the share in rents is substantial enough to ensure coalition. Corruption imposes certain costs to the society namely lowered investment, diversion of productive resources from growth-inducer sectors to rent-seeking activities and uncertainties associated with corruption contracts. Mauro (1998) empirically tested the idea of how the education spending is the first to bear the brunt of increased corruption in an economy. Similarly, Romer (1994) suggested that how corruption acts as a tax on the ex-post profits thereby reducing reinvestment into more innovative processes. Other channels through which corruption can deter growth is through reduced foreign direct investment and public spending (Tanzi, 1998). The balanced-growth model of Ehrlich and Lui (1999) discusses how elite are faced with a decision to either invest in political or human capital. The study specifically focuses on political corruption where government intervention creates a deviation between market and shadow prices. The gap between the two has been termed as bribes or rents. The incentive to invest in political capital deters investment in human capital that has been regarded as the engine of growth in modern economics. Thus the economy can experience

multiple equilibria depending upon the level of investment in political capital (Wadho, 2014).

In a similar fashion, Acemoglu, Robinson and Verdier (2004) argue that in the presence of weak institutions, divide-and-rule strategies are easier to implement. Cooperation between the possible challengers is deterred through the use of redistribution of wealth in the form of bribes from those who resist to those who submit. Consequently the kleptrocrat through redistributive strategies is able to transfer wealth between the two groups. Weak institutions facilitate the process by ensuring no accountability of actions of the politicians. In this study the decisive mechanism as to how expropriated rents leads to redistribution of wealth across ethnic groups is through increase in rent-seeking activities.

Income Inequality matters

The discussion would be incomplete without reviewing the work on income inequality. Why should inequality be a problem? Previously, inequality has been considered to trigger growth or as benign in economic literature. The trickle-down effect was soon abandoned in favor of equal distribution of income. Inequality has sparked much interest as the relationship between growth and inequality is reinforced by recent studies. Alesina and Rodrik (1994) through detailed model explained the impact on inequality on redistribution policies and consequently growth. The study found that greater inequality enables the government to set up a higher tax rate to encourage transfers from the rich to the poor. The median voter in an unequal society is more likely to decide upon a high tax rate to benefit from the increased transfers. In such a fashion, initial distribution of income determines the growth patterns of an economy. Thus the non-monotonic relationship between income inequality and growth exists in a cross-sectional setting. The idea is based on the assumption that human capital is the engine of growth thus greater investment in human capital translates into higher steady-state levels. Thus, in rich economy, the ability to invest by

the lower income bracket will determine the growth patterns. A more egalitarian setting will be more conducive to growth. In a poor economy, the opposite holds true (Perotti, 1993). Thus high levels of inequality are associated with growth-retarding policies.

Another study by Glaeser (2005) integrates the political economy elements of inequality. The study hypothesizes a two-way relationship between income inequality and redistribution by taking into account the role of ethnic heterogeneity and political institutions. Higher redistribution is associated with lower levels of income inequality while high levels of inequality are associated with lower redistribution. The collective action problem is a prominent feature of ethnically diverse societies therefore using the median voter theorem it can be seen that redistributive policies are less likely in much a setup. The problem is much worse under a majortarian rule as compared to a proportional electoral system. Thus a strong relationship between inequality, growth and redistribution policies can be established.

An attempt to amalgamate polarization with politics using inequality-growth relationship was taken by Keefer and Knack (2000). The study empirically tests the idea that social polarization weakens property rights and hence reduces growth. Previous studies establishing a link between growth and inequality focus on four channels. Firstly, increased inequality reduces access to credit market thus invigorating a vicious cycle. Secondly, the incentive to invest in economies of scale by the manufacturers from catering to the middle group is reduced. Thirdly, greater inequality increases demand for redistribution policies and consequently exhibit itself as a burden on the government budget. Furthermore, empirically higher levels of inequality are associated with greater social unrest. Keefer and Knack however focus on a completely different channel i.e. how polarization impacts political decision-making. Again two strands of literature have been juxtaposed with this view. The first strand argues that in order to bring about a political change consensus of the two groups is required. The collective action problem leads to a delay in policy change and thus

adds to the uncertainty element. In a majoritarian system, greater polarization between parties implies that the decisive party will make decisions unpleasant to the losing party. Thus increased polarization leads to deterioration of property rights with redistributive policies posing themselves as a burden on government resources. Therefore, inequality can have far-reaching effects not just on the growth aspects but also on the development trajectory of the economy.

The ethnically dominant group is able to concentrate political capital which acts as a stepping stone to accumulate income in the form of resource rents. The reallocation of productive investment into rent-seeking activities not only reduces growth but increase the inherent inequalities between the ethnic groups. Exclusivity in terms of access to political power comes from the degree of polarization in the economy which is contingent upon their social distance from the centre.

Sociological studies have emphasized the importance of using social distance from the centre (centrality) to determine the importance of mutual affiliation between members of a society. There are several measures of social distance that have been used namely affectivity, normative distance, interactive distance and lastly, cultural and habitual distance (Karakayali, 2009). Briefly explaining these terminologies; affectivity, can be defined as individual's motivation to associate with another agent with an expectation that the other party would reciprocate as well (Magee and Smith, 2013). Normative distance comes from "consciously expressed norms" that members from a group collectively recognize. Ethnic ties can be classified in this category such that a distinct group of "insiders" and "outsiders" which in this case are the minority groups exist. Interactive distance is a quantitative measure determining as to how often two groups interact. Lastly, cultural and habitual distance depends upon the degree of imitation between two groups.

After a careful consideration of the work done by previous studies in this field, the study provides a promising outlook by using a unique transmission mechanism whilst bridging the gap between the theoretical and empirical studies. By using a balanced-growth model, we are able to show

that rent expropriation leads to greater extraction of natural resources arriving at a sub-optimal growth equilibrium. In a ethnically polarized setting, the process is faciliated by developing a network of elite. Resource rents are therefore utilized in reinforcing income inequality across the elite and those outside the elite networks. The rest of the paper is organized in the following order: The next section describes the basic setup of the economy comprising of two distinct type of households and the final production sector. The mechanism through which the size of the elite and the optimal rents are determined will be described thereon. Next, we solve the elite utility maximization problem to determine the optimal values of the variables of interest which will determine the type of equilibrium the economy ends up in. Lastly, we show the impact of rent-seeking on income inequality between the two ethnic groups prevalent in the society.

2.0 Conceptual Framework

This section summarizes the basic setup of the economy to determine the combined effect of ethnic polarization and resource abundance on income inequality levels using a general equilibrium framework. Using an infinite time horizon growth model, the economy is endowed with a total population of N_t and stock of natural reserves denoted by S_0. The aggregate population can be subdivided into two distinct ethnic groups' mainly one ethnic majority and other ethnic minorities. There is no population growth such that N is constant over time.

The degree of polarization in the society is denoted by θ such that a higher value of θ corresponds to greater degree of ethnic polarization between groups. Agents in each group have differentiated access to political capital. The term political capital can be defined as access to political power contingent upon their social distance from the centre. Let the total number of elite in the economy be s. The mechanism through which the value of s is determined has been explained in the later section. The minority group has limited access to political power. The total number of private

workers is represented by $(1-s)N$. The study shows that only members from the dominant group will find it feasible to become elite. The minorities will be absorbed in the private sector due to their respective higher transaction costs. The ratio of elite to private sector agents is fixed and represented by $\frac{s}{1-s}$ where s lies within the range of 0 to 1. The fraction can also be synonymously interpreted as the inverse of concentration of political power.

2.1 Households

There are two types of individual in the economy namely the elite household and the private-sector households (non-elite). Agents within each group are homogenous and have identical preferences. The household-head maximizes the family utility by incorporating the welfare of the future generation. The household head is the member with the highest income. The preceding argument has important implications since the elite, if present, in the household will always be the decision maker due to the significant contribution made to the household income.

Households maximize overall utility, U, depicted as the weighted sum of future discounted utility flows i.e. $u(c)$. Utility is derived through consumption of good; c_t. Income that is not consumed is saved. The utility function assumes the usual properties satisfying the Innada conditions.

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

ρ is the rate of time preferences such that $\rho > 0$ as per standard economic assumption.

Sources of income to each type of household would differ mainly due to their ability to expropriate rents from the natural resource reserves thus dividing households' into two distinct groups. The elite households have three sources of revenue mainly resource rents, interest income (r) and wages (w). On the other hand, households affiliated with private sector workers as the head will have different sources of income i.e. wages, interest income and transfer payments. Each household

is endowed with accumulated assets (a) on which they can earn an interest (r). All agents are competitive earning, their marginal product taking w and r as given. Each unit of labor is supplied in-elastically at the prevalent wage rate. The optimal level of expropriated rents from the natural resource reserves are decided upon through the utility maximization problem of the elite. All elite are homogenous in terms of their access to political power (quantified through their social distance from the centre) therefore all elite receive an equal share in the pool of rents.

Thus the main distinction between the utility maximization problem of the elite and private sector households are the constraint functions. The elite household determine the optimal level of consumption (c^*) and rent extraction (σ^*) using an optimization problem.

2.2 Technologies

On the production side, the economy consists of one final production sector producing one final consumption good. The production sector uses three main inputs namely labour (L), capital (K_t) and flow of natural resource sector (R_t) from the total reserves available (S_0). R represents the depletion of the natural resource stock (S_0) which can be defined by the following function

$$\dot{S} = S_0 - \int_0^t R_t \tag{2}$$

Output is produced using a Cobb-Douglas production function subject to constant returns to scale i.e. twice differentiable and concave in nature. Each factor of production receives its marginal product therefore all markets are competitive. A is the productivity parameter exogenously determined by the level of technologies available to the economy.

$$F_t(K_t, R_t, L) = AK_t^{\alpha} R_t^{\beta} L^{1-\alpha-\beta} \tag{3}$$

Rents are imposed on the natural resource sector such that only $(1-\sigma_t)R_t$ makes it to the final output sector. Expressing the final output production function in per-capita terms and accounting for the rent leakages, the following equation emerges

$$\frac{Y}{L} = \frac{AK_t^{\alpha}[(1-\sigma_t)R_t]^{\beta}L^{1-\alpha-\beta}}{L} \tag{3.1}$$

$$y_t = Ak_t^{\alpha}[(1-\sigma_t)\widetilde{R}_t]^{\beta} \tag{3.2}$$

Equation (3.2) defines the production function in per-capita terms. Such that share of each input after normalizing L becomes

$$MPK = \alpha Ak_t^{(\alpha-1)}[(1-\sigma_t)\widetilde{R}_t]^{\beta} = \frac{\alpha y}{k_t} = r \tag{3.3}$$

$$MPR = \beta Ak_t^{\alpha}(1-\sigma_t)^{\beta}\widetilde{R} = \frac{\beta y}{\widetilde{R_t}} \tag{3.4}$$

$$MPL = y_t - \beta y_t - \alpha y_t = w \tag{3.5}$$

Thus the share of K_t, R_t and L becomes αy_t, βy_t, $(1-\alpha-\beta)y_t$ respectively. Note that the term y_t accounts for rent expropriation. σ_t reduces the share of each factor of input and is treated as a leakage in the production process.

2.3 The Degree of Rent Expropriation

The mechanism through which elite are able to extract rents is dependent upon their social distance from the centre which has been explained in the next section. In a ethnically polarized economy, members belonging to the same ethnic background will find it more cost-effective to interact with each other. Conversely, members belonging to the elite networks faces lower transaction cost hence a smaller social distance as compared to the outsiders. Let the proportion of rents

extracted be σ which will determine the degree of rent extraction in the economy. The thesis of the argument is that in ethnically polarized societies the institutions, quantified using probability of getting caught, p; make rent expropriation much easier due to lack of accountability of the elite at the expense of the society (Leite and Weidmann, 1999). The total rents available to the elite household will be determined through an optimization problem. Since all elite are homogenous i.e. facing the same marginal costs namely transaction costs and marginal benefits namely expropriated rents. The idea is similar to the one used by Mehlum, Moene and Torvik (2006) where all grabbers (those involved in rent-seeking) share the rents equally amongst themselves.

2.4 Social distance, transaction costs and concentration of political power

This section explains the mechanism through which the value of s and σ^* are endogenously determined. Agents farther away from the centre, will not have access to the *"elite networks"* based on their cultural and other normative differences. The distance from the centre is termed as social distance. Members with similar culture, beliefs and status would be closer to each other on the social distance scale. Alternatively, agents closer to the centre can penetrate the elite networks due to the insider advantage quantified through *transaction costs*.The concept of transaction costs have been used in previous studies to understand inter and intra firm dealings. These costs can be viewed as the cost of persuading, coordinating and negotiating and teaching others (Langlois, 1992). In this study, we view transaction costs as the cost of coordinating and communicating between members of the society. Therefore, these costs have a more political element to it. The study takes a multidimensional approach by incorporating the interaction of two types of social distances i.e. normative and cultural and habitual distance. Hence, there is a distinct presence of members closer to the centre defined as the *"insiders"* and a periphery consisting of members relatively further away termed as the "*outsiders*".

The elite households have the ability to impose rents which are shared equally amongst the elite members. The expropriated rents can be viewed as the additional benefit from becoming an elite. On the costs side, agents are faced with two types of costs namely *penalty costs* and *transaction costs*. Penalty costs can be viewed from both monetary and non-pecuniary aspects. In monetary terms, penalty costs would be the fine the rent-seeker pays, if caught. The non-pecuniary costs, if caught, would include the loss of reputation in the society or imprisonment sentence. The penalty costs are dependent upon the probability that the corrupt official is caught in rent-seeking depicted by p which is a function of σ and the monitoring efficiency (m) available to the economy i.e. $p(m, \sigma)$ (Leite and Weidmann,1999). The higher the level of rent expropriation, the greater the probability of getting caught i.e. $\frac{dp}{d\sigma} > 0$. The underlying positive relationship can be attributed to the fact that an increase in rent-seeking activities would increase corruption which would make the likelihood of getting caught (detection) much easier. Efficient monitoring quality also culminates in greater chances of getting caught; in notational form that simply means $\frac{dp}{dm} > 0$. Monitoring efficiency indirectly captures the effect of institutional quality. An efficient monitoring system leads to greater transparency which is conducive to more inclusive institutions.

Thus the functional form assigned is as follows

$$p(m, \sigma) = m\sigma \tag{4}$$

Monitoring technology is exogenously determined however p and σ are jointly determined in this model. Thus total penalty costs if the corrupt official is caught is probability times the fine (Q)

$$\text{Total penalty cost } = p(\sigma, m)Q = m\sigma Q \tag{4.1}$$

The preceding equation embodies the importance of quality of institutions in determining the functioning of the society. The effect of magnitude of the penalty costs is contingent upon p. Until inclusive institutions are not present to enforce those costs, the effect is rendered ineffective. Therefore, institutional quality (monitoring efficiency) plays an essential role in activating the natural resource curse (Mehlum, Torvik and Moene, 2005; Leite and Weidmann, 1999)

2.4.1 Transaction costs

The second aspect of the costs side is the transaction costs faced by the members of the society. Sociological studies emphasize the importance of family ties and extended kinship in facilitating interaction between individuals by lowering down the transaction costs. In a more economic setting, transaction costs have been used to understand the behavior of firms. Alchian and Woodward (1988) classify transaction costs into two distinct categories namely the *measurement-cost view* and the *asset-specificity view*. The former takes into account the costs of "administering, directing, negotiating, and monitoring of the joint productive teamwork". On the other hand, the latter encompasses "quality or performance of contractual agreements".

In this study, we categorize transaction cost as *coordination costs* and *contract enforcement costs*. Coordination costs increase as the size of the social network increases since it is more cost-effective for two independent agents to interact as opposed to coordination costs of two pairs of agents connected through a network. (Landa, 1981). These costs are similar to the measurement-cost view of Alchian and Woodward (1988). On the other hand, contract enforcement costs emanate from the concept of social contract theory. A social contract is a voluntary agreement between members of the society backed by moral or political obligation. The element of trust plays a vital role in contract enforcement. In the presence of uncertainty, contract enforcement is costly and thus creates friction in markets (Bohnet, Frey and Huck, 2001). In our setup, contract-enforcement

costs are transplanted to a political economy context. Agents take into account these costs such that interaction with those outside their respective ethnic groups are deterred.

We use the concept of social distance as a decisive mechanism to determine the power assumed by an individual in the society. The premise is based upon the assumption that the head of the ethnic group lies at the centre (Ahlerup and Olsson, 2012). The distribution is taken from a von Thunen series of concentric circles to allow for differences based on particular characteristics (Landa, 1981). Thus the farther away from the centre the individual lies, the greater the coordination costs. On the other hand, the contract enforcement cost embodies the concept of cultural distance. Members within the same ethnic group have a set of shared beliefs and moral code. Thus further away from the centre the agent is the weaker the ethnic tie and greater the transaction costs.

Note that penalty costs would be the same for all members of the society. However, transaction costs would be the decisive factor in determining who participates in the political process. Let zi denote the distance of an agent from the centre. Transactions costs are thus a function of zi. The functional form for the transaction costs per elite takes the following form

$$T_i = \theta z_i \tag{5}$$

θ is a fixed parameter denoting the magnitude of the transaction costs. Intuitively, θ denotes the degree of ethnic polarization in the society. Thus more polarized the society is in terms of culture, norms and values; the greater the value of θ. Members belonging to the ethnic minorities face the highest transaction costs thus ending up at the periphery in this setup. The threshold value for z_1 is endogenously determined through a cost-benefit analysis approach. Since members within each group are homogenous therefore the transaction costs for each member is the same.

The elite decision problem is three-dimensional in nature. Firstly, agents have to decide to become elite. This is determined through marginal cost-benefit mechanism which will subsequently determine the size of the elite. The second tier of the decision problem is whether to be a rent-seeker or not by weighing the respective utilities. If the utility from being corrupt (rent-seeker) is greater than the utility from being honest, then the elite will decide to be corrupt. Since all agents are homogenous within groups, then all elite will be corrupt. Such a situation can be termed as a high-corruption (low-growth) equilibrium. The converse holds true for low-corruption (high-growth) equilibrium. Once the elite decide to become rent-seekers, the third tier of the decision is to decide upon the optimal level of rents, σ, from the elite utility maximization problem. The model is solved by using backward-induction.

By equating the marginal costs (transaction costs) and marginal benefit (expropriated rents), the values of z_1 and consequently s is determined endogenously.

3.0 Elite Household Maximization Problem

The elite household maximizes their utility over time subject to an income constraint. The utility function (2) is subject to the following income constraint in per-capita terms.

$$\dot{a} = w + ra + \frac{(1 - p(\sigma, m)\sigma\widetilde{R}}{sN} - p(\sigma, m)Q - c_t$$

w denotes the wages earned in the final output sector, ra denotes the return on savings, $\frac{(1-p(\sigma,m)\sigma\widetilde{R}}{sN}$ denotes the rents expropriated per elite subject to probability of not getting caught. In case the rent-seeker is caught with a probability of p, we deduce (in accordance with literature) that those rents are dissipated as monitoring costs. It can be viewed as a deadweight loss i.e. the amount spent on maintaining checks and balances on the elite. Therefore, we only take into account the

benefits accrued to the rent-seeker with a certain probability; $1-p(\sigma, m)$[1] There are certain benefits for the elite to not indulge in rent-seeking. They receive an equal share in the non-expropriated rents denoted as $(1-\sigma^*)$. As a result there will be a threshold value of $\underline{R}$ beyond which the resource curse exhibits itself. $p(\sigma, m)Q$ denotes the penalty costs as discussed above. c_t denotes consumption over time.

A Hamiltonian problem is set up using σ_t and c_t as the choice variables and a and λ as the state and co-state variables respectively.

$$H = u(c_t).e^{-\rho t}\partial t + \lambda(w + ra + \frac{(1-p(\sigma, m)\sigma\widetilde{R}}{sN} - p(\sigma, m)Q - c_t) \tag{6}$$

Taking First-order conditions

$$\frac{\partial H}{\partial c_t} = \acute{u}(c_t).e^{-\rho t}dt = \lambda \tag{6.1}$$

$$\frac{\partial H}{\partial \sigma_t} = \frac{\widetilde{R}_t}{sN} - \frac{2\sigma\widetilde{R}_t m}{sN} - mQ = 0 \tag{6.2}$$

Solving for the optimal value of σ_t

$$\sigma_t^* = \frac{\widetilde{R} - mQsN}{2m\widetilde{R}} \tag{7}$$

σ^* maximizes the utility of the elite household subject to the income constraint. $\sigma^*$is inversely related to the probability of getting caught, penalty costs and the size of the elite population and directly related to $\widetilde{R}_t$. The relationships appeal to the intuitive sense. The probability of getting caught internalizes the concept of institutional quality. More grabber-friendly the institutions, the corrupt elite will face a lower probability of getting caught or synonymously make rent-seeking less costly. Greater degree of resource extraction will facilitate rent expropriation by increasing

[1] In case the elite are caught, the captured rents are distributed again as transfer payments which would be shared equally amongst the non-corrupt agents of the society.

the size of the pie. The negative effect comes from the size of the elite population (sN) i.e. lower concentration of political power. A higher value of sN will reduce the share of rents per elite.

To determine the behavior of rent expropriation and consumption over time[2], time derivatives are taken yielding the following results

$$\frac{\dot{\sigma}}{\sigma} = \frac{sNmQ}{\widetilde{R}^2 - \widetilde{R}sNmQ}\dot{R} \tag{8}$$

$$\frac{\dot{c}}{c} = \frac{r-\rho}{\theta} \tag{9}$$

Rent-expropriation path of the elite is a non-monotonic function of resource extraction. It is evident that there is a trade-off for the elite to decide whether to extract more rents today or in the future. Extracting more rents in the present from the natural resource reserves would eventually eat up the future rental income. The size of the elite has an interesting relationship with the rental flows. There are two complementaries associated with sN. The first negative complementarity can be seen from σ^* where the sN negatively affects the optimal level of rents. The positive complementarity can be viewed in $eq.8$ where a larger value of sN translates into more corrupt elite making it easier to redirect rents from the productive sector. Thus a positive relationship with the growth in resource rents is reinforced.

The consumption path of the elite (assuming a standard constant relative risk aversion function) is typical to that of a dynamic utility maximization problem.

3.1 Utility maximization problem of the non-elite

Non-elite households differ from that of elite's in terms of their sources of income. A present

[2] [1]we use a standard constant risk aversion utility function to find the comsumption time path

value Hamiltonian problem can be set-up using only c_t as a choice variable. The constraint faced by the non-elite is given by the following equation. We first consider the case where the corrupt elite is caught and the expropriated rents are used up in monitoring the elite. Thus the non-elite households have three sources of income namely wages, interest income and the income generated from the natural resource flows after the elite have taken away σ_t^*.

The other scenario is when the corrupt elite is caught and the expropriated rents are further redistributed amongst the non-corrupt agents of the society which have been discussed later.

A present-value Hamiltonian problem can be set up for the non-elite

$$H = u(c_t)e^{-\rho t} + \lambda(w + ra + \frac{[1 - p(\sigma^*, m)]\,(1 - \sigma^*)\widetilde{R}}{(1 - s)N} - c_t) \tag{10}$$

The optimal consumption path is the same as eq.(9)

4.0 Final Output Sector

Firms operate in a perfectly competitive environment taking prices as given and maximizing profits over time subject to certain constraint. Rents expropriated from the elite-maximization problem have to be accounted for when considering the total production in the economy such that only $(1 - \sigma)\widetilde{R}^{\beta}$ is utilized in productive activities. The final output can be written down as

$$P(Ak_t^{\alpha}[(1 - \sigma_t)\widetilde{R_t}]^{\beta}) \tag{11}$$

where price can be normalized to 1.The constraints faced by the firms include the natural resource constraint and the capital constraint.

$$\dot{S}_t = S_0 - \int_0^t R_t \tag{12}$$

and

$$\dot{k}_t = I_t - \delta k_t \tag{13}$$

A present-value profit maximization problem is setup using I and $\widetilde{R}_t$ as choice variables with S_0 and k_t as state variables. μ and q are the shadow prices of natural resources and capital respectively. μ_0 is the non-negativity constraint on $\widetilde{R}$.

First-order conditions yield the following results

$$H = (Ak_t^{\alpha}[(1-\sigma_t)\widetilde{R_t}]^{\beta} - w - I_t)e^{-rt} + q(I - \delta k) - \mu(\widetilde{R}_t) + \mu_0(\widetilde{R}_t) \tag{14}$$

The First-order conditions are as follows[3]

$$\frac{dH}{dI_t} = e^{-rt} = q \tag{14.1}$$

$$-\frac{dH}{dk_t} = \dot{q} = -[\alpha A k^{\alpha-1}[(1-\sigma)\widetilde{R}]^{\beta}e^{-rt} - q\delta] \tag{14.2}$$

$$\frac{dH}{d\widetilde{R_t}} = \beta k^{\alpha}(1-\sigma)^{\beta}\widetilde{R}^{\beta}e^{-rt} - \mu = \mu_0 \tag{14.3}$$

$$-\frac{dH}{dS_0} = \mu = 0 \tag{14.4}$$

Combining eq. 14.1 and 14.2 by taking taking time derivatives

$$(1-\alpha)\frac{\dot{k}}{k} = \beta\frac{\dot{R}}{\widetilde{R}} - \beta\frac{\dot{\sigma}}{1-\sigma} \tag{14.5}$$

Similarly combining eq 14.3 and 14.4 and taking time derivatives

[3] For equation (14.3), using Kuhn-Tucker complementary slackness condition yield $\frac{dH}{d\widetilde{R}} * \mu_0 = 0$

$$\alpha\frac{\dot{k}}{k} - (1-\beta)\frac{\dot{\widetilde{R}}}{\widetilde{R}} - \beta\frac{\dot{\sigma}}{1-\sigma} - r = 0 \tag{14.6}$$

Since we are concerned about the behavior of the economy in equilibrium therefore using the steady-state condition of capital i.e. $\frac{\dot{k}}{k} = 0$,the system of equations boils down to

$$\frac{\dot{\widetilde{R}}}{\widetilde{R}} = \frac{\dot{\sigma}}{1-\sigma} = -r \tag{14.7}$$

Plugging in the optimal value for $\frac{\dot{\sigma}}{1-\sigma}$from the elite utility maximization problem

$$\frac{\dot{\widetilde{R}}}{\widetilde{R}} = \frac{QsNm}{\widetilde{R}^2(2m-1) + RmQsN}\dot{R} = -r \tag{14.8}$$

Solving for the optimal value of $\widetilde{R}^*$

$$\widetilde{R}^* = \frac{rmQsN}{(2m-1)(1-r)} \tag{14.9}$$

The optimal value for $\sigma^*$is found by plugging in the optimal value for $\widetilde{R}^*$

$$\sigma^* = \frac{1-2m(1-r)}{2mr} \tag{14.10}$$

The optimal values of rents and natural resource extraction will subsequently determine the size as well as the decision to be corrupt[4].

5.0 The decision to become elite (case1: Rents are dissipated in monitoring costs)

To be corrupt or not corrupt is the question. Given there are associated benefits from not indulging in rent-seeking hence the elite will only choose to rent-seekers when the gains from

[4]Note that $\nabla$of $m \geq \frac{1}{2} \rightarrow p \leq \frac{1}{2}$

becoming corrupt are greater than from being non-corrupt. Mathematically the notion as be expressed as follows

$$U_e \geq U_{ne}$$

$$U_e(w + ra + \frac{(1 - p(\sigma, m)\sigma\widetilde{R}}{sN} - p(\sigma, m)Q - c_t) \geq U_{ne}\left(w + ra + \frac{[1 - p(\sigma^*, m)]\,(1 - \sigma^*)\widetilde{R}}{(1 - s)N} - c_t\right) \tag{15}$$

The only critical determinant of the problem is if the share of net rents (accounting for the costs) is greater than the transfer payments received from the natural resource sector. Solving the problem will result in a threshold level of $\underline{R}$ which will determine when the elite will choose to be corrupt. Since all the elite homogenous thus a single agent is representative of the entire elite population

Solving for a threshold value for $\underline{R}$

$$\underline{R} \geq \frac{2rs(1 - s)[1 - 2m(1 - r)]mQN}{[1 - 2m(1 - r)][2r - 2s(1 - 2m(1 - r) + 2rsm] - 4r^2sm} \tag{16}$$

The threshold depends upon the discounting rate (r), probability of getting caught (p) and the proportion of the elite population or in other words, concentration of political power ($\frac{1}{s}$). For all values of $\widetilde{R}$ below $\underline{R}$, all elite will choose to be non-corrupt. Beyond $\underline{R}$, all elite will choose to be corrupt. The higher the threshold value, the greater the range in which the elite will choose not to be rent-seekers.

A comparative statistics reveal the function is increasing in s and m. The results satisfy our research question. Higher concentration of political power depicted by ($\frac{1}{s}$) reduces the range in which the elite choose to be honest. Another way of looking at this relationship is that higher concentration of political power increases the utility of from being corrupt quantified through greater share in the expropriated rents.

Similarly, more efficient the monitoring quality, the higher the threshold value of $\underline{R}$.Greater transparency in the bureaucratic process deter elite from being corrupt by lowering the returns of becoming a rent-seeker.

Discount rate of the firm however does not play a significant role in determing the value of $\underline{R}$.See Appendix A.

6.0 The size of the elite

As stated earlier, the model is solved using backward induction. The total rents that will be expropriated are decided which will subsequently determine the total elite population (sN). Assuming a von Thunen distribution for the population such that it comprises a circle with a radius of z_i. Assigning a functional form to the size of the elite, the following equality holds,

$$sN = \pi z_1^2 \tag{17}$$

where z_1 denotes the threshold level of distance that distinguishes the elite from the non-elite. Transaction costs are defined by eq(5).

The decision to become elite is contingent upon a cost-benefit analysis such that the marginal benefit of becoming an elite greater than or equal to marginal cost. Equating the marginal benefit and marginal cost from becoming elite (corrupt)

$$\theta z_1 = \frac{\sigma \widetilde{R}}{sN} \tag{18}$$

Plugging in the optimal value of $\sigma^*$and $\widetilde{R}^*$(backward induction), the size of the elite is determined as

$$sN = \frac{(1-2m(1-r))^2 Q^2 \pi}{4\theta^2 (2m-1)^2 (1-r)^2} \tag{19}$$

The size of the elite population is determined endogenously through this process. It is clear that $\frac{\partial sN}{\partial \theta} < 0$. The signs are as expected since higher the degree of ethnic polarization tends to foster concentration of political power. Monitoring efficiency, embodying the concept of institutional quality, has a non-monotonic relationship with sN. At lower probability of getting caught i.e. $m \leq \frac{1}{2}$ a negative relationship holds true. However, when the economy is endowed with more a efficient monitoring system, a positive affiliation holds true i.e. for all values of $m \geq \frac{1}{2}$ the concentration of political power is hindered. Thus a threshold level of probability $\widetilde{p}(m, \sigma^*)$ exists below and above which the relationship changes. Moreover, higher the penalty costs (Q), lower the concentration of political power i.e. higher value of sN.

6.2 High growth equilibrium when $\sigma = 0$

We consider the case when there are no rent-seeking activities i.e. $\sigma = 0$. It is interesting to note the impact of no rents on the three tiered decision of the elite

When $\sigma = 0$ the sources of income for the elite would only include wages and interest income. Elites will now maximize their utility only with respect to consumption. Moving on the second tier of the decision problem i.e. to decide whether to be corrupt or not by comparing their respective utilities. The non-corrupt agents of the society receive an additional source of income (other than wages and interest income) in the form of transfer payments which takes the following functional form

Transfer payments=

$$\frac{\widetilde{R}}{(1-s)N} \tag{22}$$

It is clear just by looking at the setup of the problem that the utility from being honest (U_{ne}) will always be greater than (U_e). Therefore, all elite decide to be honest in the absence of rent-seeking.

The first tier of the decision was decide whether to become an elite. Since the marginal benefit from rent-seeking is now zero. Thus equation (18) would now look like

$$\theta z_{_1} = \frac{(\sigma = 0)\widetilde{R}}{sN}$$

$$sN = 0 \tag{23}$$

We used backward induction to solve the elite decision problem. It can be seen that there will no elite in the economy and all agents would receive an equal share in income i.e. $\frac{\widetilde{R}}{(1-0)N} = \frac{\widetilde{R}}{N}$. A perfectly egalitarian economy is the resultant of such a setup.

6.2.1 Final Output sector In the absence of rent-seeking, the final output function takes the standard Cobb-Douglas form. Each factor of input will receive its marginal product.

$$MPK = \alpha A k_t^{(\alpha-1)} \widetilde{R}_t{}^{\beta} = \frac{\alpha \breve{y}_t}{k_t} = r \tag{24.1}$$

$$MPR = \beta A k_t^{\alpha} \widetilde{R^{\beta}} \ = \frac{\beta \breve{y}_t}{\widetilde{R_t}} \tag{24.2}$$

$$MPL = \breve{y}_t - \beta \breve{y}_t - \alpha \breve{y}_t = w \tag{24.3}$$

Comparing the system of equations to eq.3.3.,3.4 and 3.5 it is clear that the share of marginal product of each factor of input is much higher in the absence of corruption. Thus it can be seen that more equitable distribution of income is also associated with high-growth rates.

In the steady state, the growth of natural resource extraction would be the same as in the case of Hotelling's theorem i.e. $\frac{\dot{\widetilde{R}}}{\widetilde{R}} = r$

See Appendix D

6.3 Equilibrium states with $\sigma = 0$ and $\sigma > 0$

We can see that there are three equilibrium states in the economy dependent upon the degree of polarization in the society: 1) High-corruption equilibrium with $\widetilde{R}^* \geq \underline{R}$ and all elite are corrupt corresponding to $\sigma > 0$. 2) Low corruption equilibrium with $\widetilde{R}^* \leq \underline{R}$ and no concentration of political power corresponding to $\sigma > 0$ 3) No-corruption equilibrium with $\widetilde{R}^* \leq \underline{R}$ and no concentration of political power corresponding to $\sigma = 0$

We will see that degree of polarization is the crucial link through which the fate of the economy is determined. There exists a threshold value of $\bar{\theta}$ beyond which the economy is stuck in a high-corruption equilibrium.

$$\bar{\theta} = \frac{Q}{2(2m-1)(1-r)} \sqrt{\frac{\pi(1-2m(1-r)[(1-2m(1-r)(rm+(2m-1)(1-r)-(1-2m(1-r))-2r^2m}{N[(2m-1)(1-r)-r]}}$$

$\forall \theta \geq \bar{\theta} \Rightarrow \widetilde{R}^* \geq \underline{R}$,all elite are corrupt, there is high concentration of political power and the economy converges to a low-growth equilibrium.$\forall \theta < \bar{\theta} \Rightarrow \widetilde{R}^* < \underline{R}$,all elite are non-corrupt, there is no concentration of political power,and the economy converges to a high-growth equilibrium

Proof. See Appendix B ■

For all values of $\theta \geq \bar{\theta}$, the economy is stuck in a high-corruption equilibrium since in more polarized societies the returns from becoming a rent-seeker are high enough to ensure a high-corruption equilibrium. The channel through which this causal links holds true is that for all values of θ greater than $\bar{\theta}$, a close knit network of elite exists quantified through a smaller value of sN.Transaction costs play a crucial role in ensuring that these networks are impervious and can only be penetrated by those closer to the centre. Two distinct groups will exists namely the insiders and the outsiders. Concentration of politcal power would increase the utility from becoming corrupt by increasing the marginal benefits per elite. Mathematically, this can be expressed as $\frac{\sigma^* R}{sN}$.A positive

feedback mechanism exists between expropriated rents and the extraction of $\widetilde{R}$. Thus high levels of rent-seeking translates into a higher value of $\widetilde{R}$ such that $\widetilde{R}^* \geq \underline{R}$. Thus in highly polarized societies ($\nabla\theta \geq \bar{\theta}$), the natural resource curse exhibits itself.

The proposition is the crux of the study indicating that polarized societies tend to concentrate power within a specific group and lead to growth deterring policies which in this case is greater extraction of $\widetilde{R}^*$ in the steady state. The idea is similar to that used by Deacon (2011) where powerful groups transfer expropriated wealth to themselves. Rent-seeking activities are considered as leakage and divert resources from the productive sector culminating in a high-corruption equilibrium.

Conversely for all values of θ below $\bar{\theta}$ the returns from becoming a rent-seeker are low enough to deter corruption. Again, transaction costs play a decisive role by removing barriers to entry into the political process. Power can no longer be concentrated since all agents experience low coordination and communication costs. This dilution of power makes rent-seeking costly by not only lowering the marginal costs but also the marginal benefit from becoming an elite. Consequently, low levels of σ leads to lower levels of resource extraction such that $\widetilde{R}^* < \underline{R}$. The economy ends up in a high-growth (low-corruption) equilibrium.

7.0 Income Inequality

7.1 *Inequality in high-corruption equilibrium*

In this section, the impact extraction of natural resource in the midst of ethnic polarization will be determined. The idea is to explore the causal relationship between resource extraction on income inequality as well as concentration of political power on income inequality.

Comparing the income share of the elite and the non-elite can quantify differences in income after the rent-seeker takes away $\sigma^*$from the natural resource flows.

$$\frac{y_e}{y_{ne}} = \frac{\left(w + ra + \frac{1 - p(\sigma^*, m)\sigma^* \widetilde{R} - p(\sigma^*, m)Q}{sN}\right)}{\left(w + ra + \frac{[1 - p(\sigma^*, m)]\,(1 - \sigma^*)\widetilde{R}}{(1-s)N}\right)} \tag{20}$$

Plugging in the optimal value of σ^*,the function simplifies to

$$\frac{y_e}{y_{ne}} = \frac{(1-s)(1-2m(1-r))\,(2rR - (1-2m(1-r)) - 2rsNmQ)}{sR\,(4r^2m - (1-2m(1-r))[2rm + 2r + (1-2m(1-r)])} \tag{21}$$

The results again appeal to economic theory. A higher concentration of political power depicted $(1-s)$, would culminate in a greater wedge in income between the two groups. Conversely a smaller s means that the rents are distributed more equitably. We can see how lack of access to political processes can culminate in higher income differences across the groups. A more detailed comparative statistics analysis is present in Appendix C.

Proposition 1 *Inequality increases with the degree of ethnic polarization*

Proof. See Appendix C ■

It is interesting to note that the effect of natural resource extraction on income inequality is nullified after accounting for concentration of political power. The only channel through which $\widetilde{R}$ has an impact on the redistribution of income is through rent-extraction. The results reveal an interesting aspect that coincides with empirical evidence. Natural resource extraction in itself is not the problem but the associated rent-seeking activities with it. The causal link is via the formation of elite networks which inhibit outsiders from entering the political process. Ethnic polarization facilities the mechanism. We can see in the comparative statistics in appendix C. that income inequality is increasing is increasing in $\frac{[1-s(\theta)]}{s(\theta)}$.Thus the redistribution of rents sets off a vicious cycle by allowing power to be concentrated in a few hands which further increases

the inequality between the two groups. Alternatively, inequality is decreasing in s implying that a more equitable distribution of political power is associated with equitable distribution of wealth

7.2 *Inequality in no corruption equilibrium*

No corruption corresponds to no rents in the economy. We were able to see how in the absence of rent-seeking activities the network of elite collapses i.e. $sN = 0$.The marginal bene t would also shrink to zero such that marginal costs will always be greater than the marginal bene t from becoming elite. The incentive compatibility constraint is no longer satis ed in this setting. Thus the economy converges to a no-corruption equilibrium.

The differentiating factor between the elite and the non-elite was the share of the former in natural resource rents. With no rents in the picture, all agents will choose to be non-elite culminating in an equal share of income in the national output. A perfectly egalatarian economy is formed with no inequality amongst the agents.

8.0 Conclusion

The lack of unifying framework to explain the underlying cause behind the presence of natural resource curse has been of much interest. The dichotomy between resource rich countries convinced the economist that there is more to the story. The transition of economic thought began with the market theories and ended with political and conflict based models. The study built on the gap in literature by using a unique theoretical framework to explain the empirical regularities.

The paper uses a detailed mechanism involving two types of agents in the economy namely the elite and the non-elite. The paper shows that natural resource curse is prominent in ethnically polarized societies in accordance with the view held by Acemoglu, Robinson and Verdier (2004) , where the curse is most likely to exhibit itself through the implementation of kleptrocratic policies. In this study, natural resource extraction in the presence of ethnic polarization leads to limited

access to political power. Access to political power is contingent upon ones distance from the centre which in-turn determines ones transaction costs i.e. the cost of coordinating between agents based upon their cultural and normative values. Thus closer to the centre an agent lies, the greater the chances that he/she becomes part of the political process. In this study, political process is associated with corruption since an elite will find it feasible to be rent-seeker in the presence of ethnic polarization. Ethnic polarization not only increases the costs to the outsiders to enter into the elite circle but also fosters corruption through concentration of political power. Similarly, in the absence of rent-seeking, the returns from becoming honest are always greater than from being corrupt. Such a setup is likely to take place in homogenous societies where there no barriers to political entry and retention of political power is much more costly.

Institutional quality embodied through the concept of monitoring efficiency plays a quintessential role in determining the degree of rent-seeking in the society and consequently the size of the elite. In societies endowed with inclusive institutions, it is costly for the elite, quantified through penalty costs, to indulge in an act of corruption. Thus ending up in a low-corruption equilibrium. Conversely, grabber-friendly institutions of Mehlum, Torvik and Moene (2005) with reinforce a high-corruption equilibrium.

Lastly, the study is novel due to its focus on income inequality. Income inequality as discussed earlier has an imperative role in determining the growth trajectory of an economy. Expropriated rents leads to greater divide between the income of the elite and the non-elite. Thus high levels of corruption are associated with high levels of inequality. The findings are no different from the previous studies. However, the channels used to explain the rent-seeking process is distinct.

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Appendix A

In this section, we will compare the utilities from being corrupt and honest and determine the threshold value for $\underline{R}$

$$U_e \quad \geq \quad U_{ne}$$

$$\frac{(1-\sigma m)\sigma\widetilde{R}}{sN} - \sigma mQ \geq \frac{(1-\sigma m)(1-\sigma)\acute{R}}{(1-s)N}$$

$$\frac{\sigma\widetilde{R} - \sigma^2 m\widetilde{R} - \sigma mQsN}{sN} \geq \frac{\widetilde{R} - \sigma\widetilde{R} - \sigma\widetilde{R}m + \sigma^2 m\widetilde{R}}{(1-s)N}$$

∘ Before moving further , a partial derivative analysis with respect to σ shows us that $U_e - U_{ne}$ is an increasing function for all values of

$$\widetilde{R} \geq \frac{mQsN}{2+m}$$

$$\frac{\partial(U_e - U_{ne})}{\partial\sigma} = 2\widetilde{R} + \widetilde{R}m - mQsN > 0$$

Moving to our original exercise i.e. comparing the respective utilities from being elite and non-elite

Dividing both sides by σ and then by $\underline{R}$ we get,

$$\frac{1-\sigma m}{s} - \frac{mQsN}{s\widetilde{R}} \geq \frac{1}{\sigma(1-s)} + \frac{\sigma m - 1 - m}{1-s}$$

Plugging in the optimal value of $\sigma^*$from the steady state

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

$$\frac{2r(1-s)A - A^2(1-s) - A^2 + 2rsA(1+m) - 4r^2sm}{2rs(1-s)A} \geq \frac{mQN}{\widetilde{R}}$$

where $A = (1 - 2m(1-r))$

Simplifying to the following threshold value

$$\underline{R} \geq \frac{2rs(1-s)[1-2m(1-r)]mQN}{[1-2m(1-r)][2r - 2s(1-2m(1-r)) + 2rsm] - 4r^2sm}$$

Comparative statistics

1. *Partial derivative with respect to s shows a positive relationship as shown below*

$$\frac{\partial \underline{R}}{\partial s} = \frac{s(1-s)}{(-2s + 2rsm) - 4r^2sm}$$

$\frac{\partial \underline{R}}{\partial s} > 0$

Note that $s = \frac{(1-2m(1-r))^2Q^2\pi}{4\theta^2(2m-1)^2(1-r)^2N}$ is a decreasing function of θ. By that logic, $\frac{\partial \underline{R}}{\partial \theta} < 0$

2. *Partial derivative with respect to r is as follows yielding no relationship*

$$\frac{\partial \underline{R}}{\partial r} = \frac{4r^2m}{r^2(2m - 4sm)}$$

$$\frac{\partial \underline{R}}{\partial r} = 0$$

No relationship exists between $\underline{R}$ and r

Appendix B.

We show the proof for **proposition 1** and **2** here

Comparing the steady state values of $\widetilde{R} \geq \underline{R}$. Note the results are contingent upon the parameter values of m, s and r

Equating $\widetilde{R}^* = \underline{R}$ respectively.

$$\frac{rmQsN}{(2m-1)(1-r)} = \frac{2r(1-s)AmQNs}{A(2r-2sA+2rsm)-4r^2sm}$$

where $A = (1-2m(1-r))$ and $B = (2m-1)(1-r)$

$$2Ar - 2sA^2 + 2Arsm - 4r^2sm - 2AB(1-s) = 0$$

$$2Arsm + 2ABs - 2sA^2 - 4r^2sm = 2AB - 2Ar$$

Plugging in the optimal value of

$$sN = \frac{(1-2m(1-r))^2Q^2\pi}{4\theta^2(2m-1)^2(1-r)^2} = \frac{A^2Q^2\pi}{4\theta^2NB^2}$$

We can see that sN is decreasing in θ since $\frac{\partial sN}{\partial \theta} = -\frac{1}{2\theta^3} < 0$

Solving for θ

$$\bar{\theta}^2 = \frac{AQ^2\pi(Arm + AB - A^2 - 2r^2m)}{4NB^2(B-r)}$$

Simplifying to

$$\bar{\theta} = \frac{Q}{2(2m-1)(1-r)}\sqrt{\frac{\pi(1-2m(1-r)[(1-2m(1-r)(rm+(2m-1)(1-r)-(1-2m(1-r))-2r^2m}{N[(2m-1)(1-r)-r]}}$$

The converse holds true for **proposition 2**

Appendix C.

In this section we will compare the post-rent seeking income between the elite and the non-elite

$$y_e = w + ra + \frac{1 - p(\sigma^*, m)\sigma^* \widetilde{R} - p(\sigma^*, m)Q}{sN}$$

$$y_{ne} = w + ra + \frac{[1 - p(\sigma^*, m)]\,(1 - \sigma^*)\widetilde{R}}{(1 - s)N}$$

Taking ratios of income

$$\frac{y_e}{y_{ne}} = \frac{\left(\dfrac{1 - p(\sigma^*, m)\sigma^* \widetilde{R} - p(\sigma^*, m)Q}{sN}\right)}{\left(\dfrac{[1 - p(\sigma^*, m)]\,(1 - \sigma^*)\widetilde{R}}{(1 - s)N}\right)} \geq 1$$

Plugging in the optimal value of $\sigma = \frac{1-2m(1-r)}{2mr}$

$$y_e = \frac{(1 - s)A}{4r^2 m}\left(2\widetilde{R}r - (1 - 2m(1 - r)) - 2rsNmQ\right)$$

$$y_{ne} = \frac{s\widetilde{R}}{4r^2 m}[4r^2 m - (1 - 2m(1 - r))(2rm - 2r - (1 - 2m(1 - r))]$$

The ratio of income simplifies to

$$\frac{y_e}{y_{ne}} = \frac{(1 - s)(1 - 2m(1 - r))[[2r\widetilde{R} - 1 + 2m(1 - r)] - 2rsNmQ]}{s\widetilde{R}[4r^2 m - (1 - 2m(1 - r))[2rm + 2r + (1 - 2m(1 - r)]}$$

Comparative statistics

1. *Partial derivatives with respect to* $\widetilde{R}$ *shows no relationship with* $\dfrac{y_e}{y_{ne}}$

$$\frac{d(\frac{y_e}{y_{ne}})}{d\widetilde{R}} = \frac{2r\widetilde{R}}{s\widetilde{R}^{\,2}} = 0$$

The effect of $\widetilde{R}$ is now redundant after taking after accounting for s,m and r.

2. *Partial derivatives with respect to s shows a decreasing relationship with* $\frac{y_e}{y_{ne}}$

$$\frac{d(\frac{y_e}{y_{ne}})}{ds} = \frac{(1-s)^2}{s}$$

$$\frac{-2(1-s)^2 - (1-s)^2}{s^2} \geq 0$$

$$-s - 1 \geq 0$$

$$(1+s) \leq 0$$

Thus, inequality is decreasing in s implying that a more equitable distribution of political power is associated with equitable distribution of wealth

3. *Partial derivatives with respect to* θ *shows an increasing relationship with* $\frac{y_e}{y_{ne}}$

Plugging in the optimal value of $s = \frac{(1-2m(1-r))^2Q^2\pi}{4\theta^2(2m-1)^2(1-r)^2N}$ in $\frac{(1-s)^2}{s}$

$$\frac{d(\frac{y_e}{y_{ne}})}{d\theta} = \frac{4\theta^2(2m-1)^2(1-r)^2 - (1-2m(1-r))^2Q^2\pi}{(1-2m(1-r))^2Q^2N}$$

$$= 8\theta > 0$$

High levels of ethnic polarization will culminate in greater levels of inequality.

Appendix D

$H = (Ak_t^{\alpha}\widetilde{R_t}]^{\beta} - w - I_t)e^{-rt} + q(I - \delta k) - \mu(\widetilde{R}_t) + \mu_0(\widetilde{R}_t)$

Taking

First-order conditions

$$-\frac{dH}{dk_t} = \dot{q} = -[\alpha A k^{\alpha-1}\widetilde{R}^{\beta}e^{-rt} - q\delta]$$

$$\frac{dH}{d\widetilde{R_t}} = \beta k^{\alpha}\widetilde{R}^{\beta}e^{-rt} - \mu = \mu_0$$

$$-\frac{dH}{dS_0} = \mu = 0$$

Taking logs and then time derivatives we get two equalities

$$(1-\alpha)\frac{\dot{k}}{k} = \beta\frac{\dot{R}}{\widetilde{R}}$$

and

$$\alpha\frac{\dot{k}}{k} = (1-\beta)\frac{\dot{R}}{\widetilde{R}} + r$$

Combining the system of equations yield the same results as that of Hotellings theorem in the steady state i.e. $\frac{\dot{k}}{k} = 0$

$$\frac{\dot{R}}{\widetilde{R}} = r$$