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# Resource Curse, Institutions and Non-Resource Sector

by

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**Abstract:** This note presents a simple model of how resource rents can affect economic growth of a region of a centralized country, where sub-national governments have no authority over resource industries. The growth effect of resources appears to be conditional on the quality of institutions in the non-resource sector. Thus, even if the sub-national government does not affect the resource sector directly, the quality of institutions set by this government still influences whether resource boom has a positive or a negative effect on the economic growth.

## 1. Introduction

One of the major conclusions of the modern resource curse literature is that the presence of negative effects of resources in terms of economic growth is conditional on the quality of institutions: well-protected property rights serve as effective remedy negative effect of resource abundance on growth (Mehlum et al. 2006). The effects of political institutions are more debatable: while some studies see democracy as a tool of improving the quality of institutions (Robinson et al. 2006), others consider non-democracies more capable to deal with resource abundance than nascent democracies in the developing world; only mature liberal democracies outperform autocracies in terms of resource management (Collier and Hoeffler 2009).

An interesting research question, which occurs in this case, is whether the argument we have presented can also be applied to the development of sub-national jurisdictions. Some research in this area indeed suggests that the emergence of sub-national resource curse is conditional on the quality of institutions in the regions. Olayele (2010) studies the resource effect on output in Canadian provinces and US states and demonstrates that in states with both high and low levels of economic freedom resources limit growth, while in states with intermediate levels of economic freedom they support growth. Corey (2009) looks at the US states and suggests that resource curse occurs only in states with low level of economic freedom. Libman (2013), looking at the Russian case, demonstrates that oil and gas wealth improves economic growth only in regions ruled by non-democratic governments, which at the same time managed to create an efficient bureaucracy.

However, the fact that institutions have the same influence on growth effect of resources in federations is not straightforward. First, resource effects on growth generally differ in decentralized and centralized states (Perez-Sebastian and Raveh 2012; Raveh 2013). What is more important, however, is that in many federations taxation of resources is organized in a way that the resource rents are appropriated by the federal government rather than by sub-national jurisdictions. Furthermore, resource industry is regulated exclusively by the federal law and federal bureaucrats. If that is the case, it is not trivial why sub-national institutions

(particularly those associated with performance of sub-national governments) should have any impact on how resources affect growth.

This note presents an extremely simple model, showing that even in a centralized federation of this sort sub-national institutions may matter for resource growth effect. The result is due to the influence of sub-national institutions on the non-resource sector, which is, unlike the resource sector, not protected from the central government. Thus, the effect of sub-national institutions is due to their influence on *spillover effect* of resource sector, affecting the growth of non-resource industries.

Specifically, I model a decentralized state, where different regions have different political regimes (from democratic to autocratic, cf. Libman 2012). In particular, I look at a country with at best *weak* democracies in the regions – meaning that the democratic regimes, while indeed are associated with stronger political competition, have no checks and balances in their political system. This is a likely outcome for most developing countries, where ensuring division of powers and rule of law is often much more difficult than simply ‘opening up’ politics in line with the definition of the procedural democracy. The regions regulate the non-resource sector and receive tax revenue from it; federal government regulates the resource sector by appointing bureaucrats in the regions, which in turn may have variable quality.

## 2. Basic model

Assume a region, which has an economy consisting of two sectors: resource extraction implemented by a single company employing  $n$  individuals residing in the region; and a consumer goods sector employing  $m$  individuals residing in the region (with the total regional population  $n + m$ : no individual has a job in both sectors). The region is endowed with natural resources with  $R$  being the total rent from resource extraction. A fraction of these resources is appropriated by the *federal government*; I assume that there exists an exogenous tax rate  $r$ , which denotes the share of resources attributed to the federation. The regional government does not receive any revenue from resource taxation. The remaining part of the natural resources is equally allocated among  $n$  employees of the resource sector, such that each of them receives  $\frac{(1-r)R}{n}$ ; I will briefly discuss what happens if I relax the equal allocation of rents assumption in what follows.

In order to collect resource tax, federal government appoints a bureaucrat in the region. The bureaucrats have variable quality, which determines the share of revenue federal government actually receives. Specifically, the federal government’s revenue is  $\frac{rR}{1+b^R}$ , with  $b^R$  denoting the quality of bureaucrats responsible for the resource sector. I assume that the quality of bureaucrats depends upon the federal effort and a random component, such that

$$b^R = b(E^R) + \varepsilon^R \quad (1)$$

where  $E^R$  denotes the effort of the federal government invested in improving the quality of bureaucracy (e.g. monitoring effort, salaries paid to bureaucrats etc.) and  $\varepsilon^R$  is a random term with distribution known to the federal government. For simplicity, I assume that  $b(E^R) = \frac{1}{E^R}$ .

The non-resource sector operates as follows: the consumption goods are produced and sold on a perfectly competitive market. There are no fixed costs and no economies of scale in production of consumer goods; in order to produce a unit of consumption good, a fixed number of employees is required. The only input used is labor of the individuals not employed in resource sector: I assume there are sufficiently many of them so that one can disregard possible upper limit of production of consumption goods. The labor market is

characterized by fixed wages, such that in case of reduction of demand the only reaction of producers of consumption goods is to reduce supply and lay off labor force; reduction of prices for consumption goods is impossible since marginal costs of production remain the same.

After receiving the resource revenue, employees of the resource sector can only spend their income for consumption goods; there are no savings. However, they can acquire consumption goods either in the home region from the domestic consumer goods industry, or “abroad” in another region, which, however, belongs to the same federation. The access to “foreign” market can be interpreted in various ways: as a decision to buy goods abroad, or even as a decision to emigrate. There is only one homogenous consumption good  $c$ . I normalize the price of this good to 1 in the home region and  $p$  abroad, and assume that both prices are exogenous (it also implies that the consumption goods sector is incapable of decreasing the price below the level of 1 in order to respond to the reaction of demand). In order to acquire goods abroad, individuals have to pay a fee  $f$  (e.g. travel cost), which is exogenous.

The consumer goods industry is also monitored and regulated by the federal government, which appoints a bureaucrat for this purpose as well. Similarly to the bureaucrat appointed in the resource sector, the bureaucrat appointed in the consumer goods sector can be of variable quality (which is specific to the region). It means that for consumers there exist additional costs influenced by the quality of institutions, which result in an increase of price of consumer goods sold on the domestic market by  $b^C$  (“bribe”). It means that the price to be paid by consumers is actually  $1 + b^C$  (since the consumption goods sector cannot reduce the price given fixed labor costs and perfect competition, it is forced to pass the entire cost of bribery on the consumers). The quality of bureaucrat in the consumer goods sector is determined by

$$b^C = b(E^C) + \varepsilon^C \quad (2)$$

where notation is the same as in expression (1) except for the superscript C denoting the consumer goods sector. I also assume the  $b(\cdot)$  function in (1) and (2) is the same, and that the random disturbance for both types of bureaucrats has the same distribution (as they are recruited from the same group in the regional population). Furthermore, the federal government is limited in its resources it can spend for monitoring the bureaucrats, i.e.

$$E^C + E^R = E \quad (3)$$

The federal government imposes a sales tax on the consumer goods industry, which is equal to the share  $\tau^F$  of the official price of each good sold, i.e. the price of the good for consumers in the region is  $(1+b^C)(1+\tau^F)$  and outside this region  $p(1+\tau^F)$  (the federal government also taxes markets in other regions of the country as well). The tax rate is exogenous and should be smaller or equal to 1. I assume that the collection of this tax is independent of the quality of bureaucracy, but this assumption is entirely without loss of generality: if the quality of bureaucracy affected federal tax revenue from taxation directly, it would merely strengthen my results. I also ignore the quality of bureaucracy and sub-national politics in the remaining part of the federation outside the region of interest for simplicity.

After the federal government taxes the regional consumer goods industry, the regional government has an opportunity to request an *informal payment* from this sector. This informal payment de-facto acts as a tax on each unit of goods sold, which I denote as  $\tau^R$  and which has the same properties as the federal tax. It is, however, not exogenous as the federal tax, but endogenous and depends on the sub-national political system. I will present details on how sub-national politics operates in what follows.

Individuals employed in the resource sector live for two periods. In each period they receive rent income from the resource industry. In the first period they acquire goods only at the

domestic market. In the next period they can chose whether to stay at the domestic market or to buy goods elsewhere; I assume that the rationality of consumers is limited in the sense that they make the decision in period 2 not based on the anticipation of how the costs and benefits of period 2 will look like, but based on their experience of period 1. This type of myopic behavior is highly plausible from the point of view of empirical experience, especially in emerging markets with myopic consumers. For instance, if after comparing quantity of goods individuals could have purchased on the domestic market in period 1 they find out that they could have bought more abroad, they move to foreign market. Resource revenue is always assumed to be the same in both periods; hence, whenever I refer to “growth of resource revenue”, I imply that resource revenue increases in an identical way in both periods 1 and 2. I also assume that there is no discounting between periods 1 and 2 in terms of the federal and regional governments’ preferences: the assumption, again, does not change the main results, but simplifies the notation.

The model used in this paper applies the following timing:

- (1) Federal government appoints two bureaucrats in the region, one responsible for resource sector and one for consumption goods sector, i.e. it allocates effort  $E$  between two bureaucrats to ensure their quality
- (2) Regional government determines the informal payment set for two periods
- (3) Consumers observe the prices and make consumption decisions on the domestic market for the first period; federal and regional governments receive their revenues
- (4) Comparing consumption decisions for the first period with possible consumption given the price of goods in the other region consumers make the decision to stay on the domestic market or to move to other market for the period 2
- (5) Consumers make consumption decisions either in the region they live or in other regions in period 2; federal and regional governments receive their revenues

I solve the model by backward induction and therefore start with the consumer decisions given the quality of bureaucrats  $b^C$  and  $b^R$  and informal payment imposed by the region  $\tau^R$ . The quality of bureaucrats captures *economic institutions* (which varies at the sub-national level due to the random shock affecting the quality of bureaucrats).  $\tau^R$  will be determined by sub-national *political institutions* (regions, as mentioned, can be more or less democratic). Thus, the model allows us to investigate the interaction of both types of institutions and their interplay.

### 3. Economic institutions

In the first period consumption of each consumer is determined by the following problem

$$\max c \quad \text{s.t.} \quad (1 + b^C)(1 + \tau^R)(1 + \tau^F)c = \frac{(1-r)R}{n} \quad (4)$$

In the second period, consumer has a choice: if she decides not to pay the fee  $f$ , she has exactly the same consumption as in period 1. If she decides to pay the fee, she has an access to foreign market. Since goods are homogenous and prices are exogenous, paying fee  $f$  is meaningful only if consumer decides to buy the entire quantity of goods at the foreign market (mixing between foreign and domestic market is never optimal). Therefore the problem for consumer if she decides to buy goods at the market in another region is

$$\max c \quad \text{s.t.} \quad p(1 + \tau^F)c = \frac{(1-r)R}{n} - f \quad (5)$$

From this expression one can immediately derive the condition for the consumer to decide to buy goods abroad in period 2: she will do it if and only if in period 1 the following conditions hold

$$\frac{(1-r)R}{n} > \frac{f(1+b^C)(1+\tau^R)}{(1+b^C)(1+\tau^R)-p} \text{ and } (1+b^C)(1+\tau^R) > p \quad (6)$$

The second part of the condition means that the increase of prices caused by low quality of institutions and sub-national informal payments should exceed the price differential between goods in the home region and abroad. The first part suggests several interesting implications. First, federal taxation does not matter for decisions to move to another market, as one could have expected (because it is the same in both parts of the federation). Second, consumer is ceteris paribus more likely to acquire goods abroad if her resource revenue is large. Third, she is more likely to acquire goods abroad if costs of low quality institutions or of informal payments requested by sub-national governments go up (i.e.  $b^C$  or  $\tau^R$  increases). Fourth, she is also more likely to buy goods abroad if  $f$  decreases.

Now, I have to differentiate between two cases. If  $(1+b^C)(1+\tau^R) < p$  i.e. quality of economic institutions in the region and is very high and the informal payment in favor of sub-national government is low, increase in  $R$  ceteris paribus results in an increase of revenue of domestic consumer goods sector (because individuals always prefer domestic market). If  $(1+b^C)(1+\tau^R) > p$ , the situation is more complex. If resource rent goes up, but stays below the threshold (6), individuals still spend their entire resource revenue for consumer goods in the domestic market; as a result if  $R$  is high, earnings of consumer goods industry increase. As soon as the condition of threshold (6) is fulfilled, individuals move to a market outside the region and, as a result, the revenue of non-resource sector drops to zero. The effect, however, also depends on  $b^C$ : if quality of institutions is higher, resource rent necessary to make shift to a foreign market attractive should be higher as well. Hence, we can conclude that

*$R$  is unambiguously associated with growth of revenue of consumer goods sector only if the quality of institutions is very high. If the quality of institutions is low, increase of resource rents has an ambiguous effect on revenue of non-resource sector and can possibly even reduce the income of non-resource sector (if, as a result of growing  $R$ , market for consumption goods outside the region becomes more accessible).*

At this stage it is helpful to remark what happens if I abandon the assumption of equal distribution of resource revenue. Assume such that each individual receives  $r_i((1-r)R)$ , where  $r_i$  is an increasing function in  $R$  and  $\sum_{i=1}^n r_i((1-r)R) = (1-r)R$ . Now, the only difference is that condition (6) is fulfilled separately for each individual. Thus, if the quality of economic institutions is sufficiently low, as soon as for some individuals threshold (6) is reached, they shift to a foreign market. However, the remaining consumers still increase the consumption; hence, effect of increase of  $R$  on revenue of domestic consumer goods industry is ambiguous and is associated with distribution of  $r_i$ . Finally, if  $R$  gets very high, all individuals move to a foreign market. Still, the main result of the model stays the same: only in regions with high quality of institutions growth of resource rents is associated with growing revenue of non-resource sector.

#### 4. Political institutions

In the next step, let me introduce sub-national political institutions and their influence on economic performance. For this purpose, as mentioned, I follow Collier and Hoeffler (2009), who discuss the problems of democracies in developing countries in terms of management of

natural resources. In their paper, the key problem of nascent democracies is associated with the use of private patronage for vote-buying. In advanced democracies with developed checks and balances this type of abuse of public revenue by incumbents is limited; in emerging democracies, on the one hand, political competition drives the increase of spending for vote-buying and, on the other hand, weakness of checks and balances prevents social control from limiting the embezzlement of public funds for patronage. I abstract from the possible effects of regime change: I assume that part of the informal payment received by the sub-national government can be spent for vote-buying. In fact, since the payment is informal, probably the entire payment should be spent for vote-buying without any outside control.

First, consider non-democratic regimes. It is reasonable to assume that a revenue-maximizing Leviathan will set the informal payments rate, which is as high as possible in both periods.

Indeed, the revenue of the government is  $\frac{\tau^R R(1-r)}{(1+b^C)(1+\tau^R)(1+\tau^F)}$ , which is strictly increasing in  $\tau^R$ .

However, if informal payment is too large, individuals shift to an external market, and the governmental revenue in the next period drops to zero. Therefore, following the Olson (1993) 'stationary bandit' logic,  $\tau^R$  is determined by the following condition

$$\frac{(1-r)R-nf}{p} = \frac{(1-r)R}{(1+b)(1+\tau^R)} \quad (7)$$

(which is obtained by transforming the inequality (6) into an equation and re-arranging terms), i.e. the consumption on the domestic market and on the market outside the jurisdiction should be exactly the same. Note that if the quality of bureaucracy is higher, the regional government can extract higher rents. Note further that the federal tax does not matter for the informal payment imposed by the sub-national government (since it is uniform across the country; informal payment imposed by other sub-national governments would matter though, creating an interesting form of interjurisdictional competition in informal payments, similar to a tax competition).

Second, consider a nascent democratic political system. In a democracy, let me assume that after period 1 elections take place. In order to win the elections, the incumbent should spend some of the revenue obtained from informal payments extracted for patronage. Staying in office is associated with two benefits: opportunity to gain from taxation and ego-rents (so that even if tax revenue is zero, staying in office is attractive). The chances of a candidate to win elections after period 1 increase if it is able to spend more on vote-buying. In equilibrium therefore it should increase taxation of non-resource sector to spend more resources on vote-buying, as long as extracting additional revenue is feasible *in period 1*: if it sets any other level of taxes, the opposition party sets taxes, which are somewhat higher, wins the elections and at least receives the ego-rents. Specifically, the democracy maximizes the expression is

$\frac{\tau^R R(1-r)}{(1+b^C)(1+\tau^R)(1+\tau^F)}$ , but without the constraint (7). Hence, it always sets  $\tau^R = 1$ .

There are several possible consequences of this tax policy. On the one hand, if solution to (7) is larger or equal 1, both regimes impose equal taxes on consumer goods sector. It means that even for the highest possible tax rate no individual decides to acquire consumption goods abroad (for example, because the price of access to the market abroad is too high). On the other hand, if solution to (7) is lower 1, democratic government sets higher taxes on non-resource sector than non-democracies. As a result, in period 2 the entire regional population prefers using the foreign market for acquiring consumption goods. However, since the elections take place after period 1 and before period 2, the regional government can at least receive the ego-rents from staying in office. Even if I allowed the government to reduce taxes after period 1, it would still not change the behavior of the regional population in period 2,

since, as described above, people are myopic and backward-looking. Hence, we can predict that

*Democracy over-taxes non-resource sector and, as a result, leads to decreasing non-resource sector revenue.*

Notice that the predictions of the model are different if vote-buying is impossible, as in most democracies with advanced checks and balances. Then the incentives to maximize the informal payment above the non-democracy level in a democratic jurisdiction are absent. Furthermore, notice, that unlike, for example, political business cycle models, this model suggests that democracy tends to increase informal payments (equivalent to taxation) before elections. The reason is that in the model of this paper competition for voters happens through direct vote-buying, and not through reduction of informal payments.

## 5. Central and regional governments

The final element of my analysis concerns the choices made by the federal government. The federal government, as described above, extracts its revenue from two sources: sales tax on consumer goods and tax on resource rent. Both tax rates are exogenous. However, the federal government can manipulate the quality of bureaucracy in both resource and non-resource sector. The revenue of the central government can be written as

$$\pi = \tau^F \frac{(1-r)R}{(1+b^C)(1+\tau^R)(1+\tau^F)} + r \frac{R}{1+b^R} \quad (8)$$

in the first period. In the second period it is either again described by the same expression, or, if the quality of the bureaucracy in the region is too low (or the region is ruled by a democratic government) it becomes

$$\pi = \tau^F \frac{(1-r)R-f}{p(1+\tau^F)} + r \frac{R}{1+b^R} \quad (9)$$

For equation (8) the federal government can increase its revenue from the taxation of consumption goods sector by improving the quality of bureaucrats in this sector: in this case the consumption increases and so does the sales tax. For equation (9) investing into the improvement of sub-national bureaucracy in consumption sector is meaningless, since the consumption shifts into another region. In both cases the revenue of the federal government increases if the quality of bureaucrats in the resource sector goes up.

From (9) immediately follows that the entire effort  $E$  should be invested into  $b^R$ ; then  $b^C$  is determined only by the random term  $\varepsilon^C$ . From (8) investing into  $b^C$  may be reasonable. Given the shape of the  $b(\cdot)$  function introduced above, the first order condition for (8) generates the following optimum

$$\left( \frac{(1+\varepsilon^C)E^C+1}{(1+\varepsilon^R)E^R+1} \right)^2 = \frac{1-r}{r} \frac{\tau^F}{(1+\tau^F)(1+\tau^R)} \quad (10)$$

The expression suggests that investments in the quality of the bureaucrat involved in consumption goods sector increase if (1) the federal sales taxes are higher (so that the federal government is more interested in large retail trade revenue); (2) share of federal government in resource revenue is low (in this case it is reasonable for the federation to concentrate its effort on improving the quality of bureaucrats in resource sector). From this follows that

*If resource revenue is centralized, federal government reduces investments in the quality of sub-national bureaucracy in consumption sector; hence, the variation of the quality is determined merely by the random disturbance  $\varepsilon^C$ .*



## 6. Conclusion

To conclude, this model, although extremely simple, provides a number of interesting conjectures regarding the spillover effect. First, the positive spillover effect should be stronger in case the quality of economic institutions is high and the regions are non-democratic. Second, if the resource revenue is centralized, the federal government ought to invest lower effort in improving the quality of its bureaucracy in the non-resource sector; as a result, the latter should be to a greater extent determined by random fluctuations (e.g. person-specific characteristics of bureaucrats or availability of human capital), resulting into large and mostly random variation of the bureaucratic quality across regions in the federation.

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