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RESOURCE FLOW CONCENTRATION AND SOCIAL FRACTIONALIZATION: A RECIPE FOR A CURSE?

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Abstract

This paper investigates the dynamics behind the resource curse and brings forth evidence on the importance of natural resource endowment type on growth, especially in the absence of social cohesion. The results suggest for a presence of significant growth disadvantage when looking at fractionalized economies with concentrated resource flows. This is interpreted to reflect a greater prevalence of rent-seeking incentives in these economies as the potential gains from rent-seeking are high and concrete in comparison to a case in which the resource flows are dispersed. The robustness of this result is tested across a number of growth regression specifications within the literature.

Keywords: agricultural and natural resource economies, development, growth, natural resources, resource curse, voracity effect, institutions, cross-country studies

JEL classification: O13, O47, O50

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1. Introduction

The mediocre performance of natural resource rich economies relative to resource poor ones has been accepted as a 'stylized fact' within the literature on natural resource abundance and growth. The explanations for this resource curse, though numerous, ranging from economic, political to social ones, are less well-established. Though the most common arguments are economic in nature, explaining the underperformance of resource rich economies via Dutch disease effects, recently, a number of contributions have provided explanations for the curse that rely on the problems of political economy and/or rent-seeking (Baland and Francois 2000; Lane and Tornell 1996, 1999; Robinson, Torvik and Verdier 2002; Torvik 2002).

Particularly insightful analysis is provided in Lane and Tornell (1996, 1999) which model the fiscal redistribution process between multiple factions within weak institutional environments. This dynamic process creates a 'voracity effect', more-than-proportionate fiscal redistribution (in essence, a form of collective rent-seeking) among the groups in power at the expense of the society at large. Critical to such phenomenon to occur is the presence of an institutional environment that yields to such activity.

Though much of this literature sheds light to an important phenomenon—inefficient redistribution of resources, especially in natural resource rich economies—affecting presently many developing countries, it only gives a partial view as long as the origins of the problem are left unexplained. If weak institutions are the factor explaining the distorted effect caused by the resource booms in present time, why is it that different variations of this 'voracity' effect are consistently replicated across countries (that are very heterogeneous, one might add)? The economic performance of countries with weak institutions differ, recognizing the distinct type of natural resource flows might help up explaining the relative weak performance of some economies as oppose to others.

The central argument brought forward in this study is that in analyzing the resource booms and their subsequent growth effects, the *nature* of resource flow is critical in determining the incentives for their (re)distribution within an economy, a fact overlooked within the current literature. Fuel and mineral resources give occasion to *concentrated* resource flows and ownership, while more agricultural-based resource endowment produces flows and ownership that are more *dispersed*, spread across the economy. The former are more vulnerable for rent-seeking as they are easier to capture by a particular group, while the latter, though not free from this tendency, are not as vulnerable for such inefficient resource distribution since they are more difficult to capture in the first place.

The recognition that weak institutions give occasion to 'kleptocratic rule', corrupt governance for the benefit of the few, has recently been analyzed in Acemoglu, Johnson and Robinson (2003). The authors describe two kleptocratic regimes, the Trujillo regime in the Dominican Republic and that of Mobutu Sese Seko in the Democratic Republic of Congo. While both of the regimes were relatively abusive—geared towards the welfare maximization of the regime beneficiaries—the authors note that the economy of the Dominican Republic was able to grow under the Trujillo regime, while that was not the case in the Democratic Republic of Congo. In looking at the natural resource endowments and the rent flows generated by them, this observation for the differential growth performance within economies with weak institutions can be explained.

This paper extends the literature on natural resource abundance and growth by empirically testing whether there is evidence for the presence of distinct growth effects for fractionalized economies characterized by different types of resource flow. The innovation of this paper is to test for the relevance of the resource flow type within fractionalized societies in cross-country framework and hence it can be considered to be a test for the relevance of

this distinction in the context of political economy—rent-seeking considerations brought forward in contemporary resource abundance literature.

The results suggest for the presence of a significant growth disadvantage when looking at fractionalized economies with concentrated resource flows which supports the argument that in these economies, there is a greater prevalence of rent-seeking incentives and weaker institutional impediments to realize these incentives. The recognition of these incentives is critical not only in terms of understanding the current phenomenon, but also in gaining insight into how they may affect institutional building and policy formulation in the future.

The paper proceeds as follows. Section 2 reviews the literature explaining some possible reasons for persistently poor economic performance of natural resource rich economies with focus on the contributions highlighting the political economy and rent-seeking mechanisms. Section 3 introduces the regression methodology as well as the sample and data sources used to conduct the analysis. The results, in turn, are discussed in section 4, while section 5 provides concluding remarks. Information on the calculations and the data sources are provided in the appendix.

2. Explanations for the resource curse

The natural resource abundance and growth literature has concentrated in explaining the mediocre growth performance of resource rich economies in comparison to that of resource poor ones. The explanations for this somewhat surprising phenomenon range from the original formulation of natural resource curse thesis within policy realm by Gelb and associates (1988) and Auty (1990) to different types of Dutch disease[1] or terms of trade

[1] See Ros (2000) for an analytical survey.

arguments, following Prebisch (1950) and Singer (1950). While these arguments are interesting and do capture a part of the phenomenon occurring in these economies, more recently, the literature has begun emphasizing political economy and institutional failure as a cause for the resource course.

Some recent contributions derive their motivation from the rent-seeking literature, seeking to explain the differences in rent-seeking across countries and attributing this phenomenon as closely linked to resource rent flows whether from natural resources or those from physical capital. Baland and Francois (2000) analyze the conditions under which resource boom (in the form of rents from import quotas) leads to an increase in rent-seeking or entrepreneurship, considered as the opportunity costs of one another. Skills between these two activities are assumed to be comparable, hence transferable between each other. While entrepreneurship is considered to reduce the scope for rent-seeking, there is a bias towards the latter activity as entrepreneurship faces a positive marginal cost. The ultimate growth outcome is found to depend on the initial conditions, the proportion of entrepreneurs to rent-seekers, while the resource boom itself is left unanalyzed.

More political economy analysis on the effects of resource boom is provided in the contributions by Lane and Tornell (1996, 1999). Tornell and Lane (1999) model an economy that has multiple powerful groups that are able to use the fiscal process of an economy as a distributive mechanism to appropriate resources for themselves. The critical insight is that this lowers the degree of capital stock privacy which gives an occasion to a "voracity effect", that leads to a proportionally larger fiscal redistribution of resources than originally generated by, say, the terms of trade improvement. The effect is assumed to affect the modern sector by causing a reallocation of resources to a shadow (informal) sector that has lower productivity and hence lowering growth in the long-run. In an earlier contribution, Lane and Tornell

(1996), the same effect is modelled in a one-sector neoclassical growth model where the adverse growth effect is reproduced via reduction in savings.

Though much of this literature sheds light into an important contemporary phenomenon (inefficient redistribution occurring in natural resource rich economies), it only gives a partial view as long as the origins of the problem are left unexplained. If weak institutions are the factor explaining the distorted effect caused by the resource booms in present time, why are different variations of this 'voracity' effect consistently replicated across countries that have relatively distinct institutional settings? What can be argued to be common across these economies?

Much of the contemporary analysis, whether explaining the resource curse by an apolitical rent-seeking phenomenon or by actually building on a more extensive political economy explanation for it, considers resource rents as relatively homogeneous. That is, within the analyses, a resource boom may consist of an increase in the terms of trade of a primary product (fuels, minerals or agricultural commodities) and, in addition to more traditional natural resources, the concept of a resource boom has even been extended to an increase in the resource flows from physical capital as a result of a productivity increase (Tornell and Lane 1999).

This treatment stands significantly apart from the approach taken by development economists like Hirschman (1981). Though much of Hirschman's actual argument is based on his linkages view on development and hence has relative affinity to Dutch disease type explanations of natural resource curse, the recognition of the importance of natural resource endowment *type*[2], especially when brought together with rent-seeking and political economy

[2] In the terminology of Hirschman, the technological characteristics of a staple matter in terms of its growth and development producing capacity. In the context of the political economy arguments, it is not as much the

considerations, is an intuitively important distinction, the recognition of which is largely missing from the contemporary literature.

In applying this in the context of contemporary literature, to its focus on analyzing the resource booms and their subsequent growth effects, the *nature* of natural resource flow should be given consideration in order to recognize the types of incentives that they create. Fuel and mineral resources give occasion to *concentrated* rent flows and ownership structure, while those generated by agricultural resource endowment are typically more *dispersed*, spread across the economy. Recognizing the distinct incentives that such rent flows generate is critical, especially when taking rent-seeking and political economy considerations into account.

It is evident that concentrated resource flows are easier to capture by a particular group whether motivated by apolitical rent-seeking consideration or whether a more full-fledged political economy dynamics for resource redistribution is present in an economy, while that does not hold for the resource flows that are more dispersed. Hence concentrated rent flows can be considered to generate an incentive for rent-seeking, while dispersed ones are more insular, less vulnerable for such phenomenon. Given the initial condition nature of resource endowments in general—their geologically determined distribution—and greed being part of human nature—the lure for the riches, the desire to accumulate wealth, has tempted human beings from the origins of time—, these two characteristics can be expected to have generalizable explanatory power and their presence might provide an explanation for the natural resource curse.

4. Empirical methods

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technological characteristics of the staple rather than the distinct *nature* of resource flows that different

The possible correlation between growth and natural resource endowment type interacted with social fractionalization is first investigated in a cross-country regression framework that associates initial conditions to growth. Then the robustness of the correlation found is tested in a standard cross-country growth regression framework within some common regression specifications. To establish that natural resource endowment type in fact matters for growth in the sense that economies typified by concentrated rent flows (fuel and/or mineral resources) and those with more diffused ones (agricultural) have differential impact on growth, the same regressions are also run on the latter group.

Arguably initial conditions influence growth and development during the subsequent period. Temple (1998) brings forth evidence that they potentially explain nearly a half of cross-country variation in growth rates. Initial conditions are factors that can generally be taken as given though there are others that can be argued to change gradually over time. Social factors are of this type as they can be rigid, though through a consistent policy, they can be influenced.

Given that the large majority of empirical literature on cross-country growth derives its framework of analysis from the extended neoclassical growth model, the second half of the empirical analysis in this study examines the robustness of the correlations found within a number of different specifications brought forward in key contributions within this literature (Sachs and Warner (1997b), Barro (1991), Mankiw, Romer and Weil (1992), King and Levine (1993), and DeLong and Summers (1991)). This method is applied from Sachs and Warner (1997b) and it not only helps to assess the relative robustness of the correlation found within other established regression specifications, but it also helps in binding the present contribution into the existing empirical literature in a manner that addresses one of the

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resource endowments generate.

shortcomings of the empirical cross-country literature, namely, the fragility of results to any given regression specification.

The sample used in this study consists of market economies[3] with a population of more than a half a million in 1960. Within the World Development Indicators 2001 (WDI) database, there are 101 economies fulfilling the above criteria, from which Eritrea, Germany, Libya, Namibia, and Uganda were excluded due to incomplete data. Furthermore, Oman was left out, as it did not fit the natural resource endowment criteria.[4] Furthermore, Barro and Lee (2001), Easterly and Levine (1997), and Penn World Tables, mark 6 (Heston, Summers, and Aten 2001) posed additional limitations, leaving 82 economies in the full sample for the initial conditions regression analysis.[5]

The dependent variable for the initial conditions regressions, the logarithmic growth rate of real per capita income, is from the WDI. Annual real per capita income growth is calculated from local currency constant price series. This choice is made based on the recommendation by Nuxoll (1994), and it is also a convenient choice given the fact that it allows the largest sample with maximum number of observations for the time period.

The independent variables for the analysis are initial income and its square (to capture the convergence effect) and initial conditions, such as human capital, natural resource endowment type (extractive, agricultural, and poor), a proxy for lack of social cohesion, and the latter interacted with natural resource endowment types. Initial income estimate for 1960 is the purchasing power parity adjusted real per capita income for that year from Penn World

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[3] Market economies are economies characteristic of nonsocialist economic organization as defined in table 7 of Gastil (1980).

[4] Based on the first criterion, per capita cropland, Oman falls into natural resource poor economies category, yet the second criterion, fuel and mineral exports as a percentage of GDP classifies it as an economy rich in oil and mineral natural resources.

[5] For a list of economies included in the sample, see table A1 in the appendix.

Tables, mark 6 (Heston, Summers, and Aten 2001). Initial human capital endowment is approximated by the estimates of total years of schooling per capita for population over fifteen years of age provided in Barro and Lee (2001).

Natural resource endowment characterization, in turn, is a qualitative variable adopted from Auty (2001) that distinguishes oil and mineral exporting countries from predominantly agricultural exporting ones. Natural resource rich economies are considered to be those with per capita cropland greater than 0.3 hectares. These economies then are divided into two types based on the composition of their merchandise exports. Those economies which fuel and mineral exports amount to more than 40 percent of total exports are considered as *concentrated* (extractive) resource economies, and the remaining ones are defined as *dispersed* (agricultural) resource economies.[6]

When constructing the variable for empirical estimation, Auty (2001) categorization of countries was followed, though those economies for which suitable data was available but were missing in his analysis, his classification criteria was followed to distinguish between the type of natural resource endowment. Furthermore, Auty (2001) refrains from classifying large economies as he does not consider them to be as disadvantaged by natural resource richness as their small economy counterparts, since their manufacturing potential is much larger. Given that certain arbitrariness cannot be avoided in following any size definition, no distinction for economy size was introduced into the regression analysis. The rationale for doing this was that if evidence for the differential impact of natural resource endowment type was found for the full sample, its influence can be expected to be stronger in the case of small

[6] It is important to note, however, that the distinction between concentrated and dispersed resource economies is not always clear-cut. Hirschman (1981) points out that the nature of a fiscal linkage may change over time, as, on occasions, has been the case with institutions like cocoa or coffee boards that at first have been implemented to shield producers from the adverse effects of price volatility and that later on have turned into a state taxing device (e.g. Ghana).

economies. Natural resource endowment classification was extended by using WDI 2001 data on fuel and ores and metals exports as a percentage of merchandise exports.

Fractionalization, lack of cohesion in a society is an indication that there are potentially multiple powerful groups, combined with weak institutional setting. Given that ethnic fractionalization has been found to be correlated with corruption (Mauro 1995) and with poor public policies (Easterly and Levine 1997), it is can be considered to proxy for the potential presence of a voracity dynamics within the fiscal process of an economy. Whether this effect is stronger in economies with more concentrated rent flows or those which are more dispersed throughout the economy can be tested by interacting fractionalization with the natural resource endowment variable.

Hence, the interaction term between extractive resource endowment and ethnolinguistic fractionalization seeks to capture the concentration of rent seeking incentives in fractionalized societies (or alternatively in societies with weak institutions). Alternatively, the interaction term between agricultural resource rich economies and ethnolinguistic fractionalization seeks to capture the same phenomenon in economies where rent flows are more dispersed throughout the economy, making these less vulnerable for rent-seeking dynamics.

In an attempt to establish the relative robustness of the correlation, it is tested in established regression specifications within the literature. This not only ensures that the results are comparable with other central contributions within natural resources and growth literature, but it also allows an assessment of the relative strength of the estimated correlation within these contributions to cross-country growth literature. For this part of the study, variation in the number of observation occurs depending on the variables included in a given regression specification. In all cases, the sample consists of an intersection of the initial conditions analysis sample (82 economies as discussed above) and Sachs and Warner (1997b)

dataset. For detailed definitions and sources of the variables used in the robustness regressions, see table A3 in the appendix.

5. Empirical analysis

5.1 Initial conditions and growth

Preliminary evidence on natural resource endowment type, social fragmentation[7] and growth can be found in table 1 which groups economies according to their level of social fragmentation to two different groups (above or below average[8]) and then sorts them by their natural resource endowment type (extractive, agricultural, other[9]). Average levels of social fragmentation and growth are provided for all subgroups. Both groups of natural resource rich economies, extractive and agricultural, have lower average growth rates over the period of 1960-99 than their resource poor and developed economy counterparts. Hence, the preliminary evidence in table 1 indicates that natural resource rich economies groups have experienced a lower average growth than their natural resource poor and developed economy counterparts and that the growth rate differential between the social fragmentation groups is significantly higher for extractive economies (1.3 percent) than in the case of agricultural ones (-0.3 percent) indicating that social cohesion potentially has more important growth effects in the former group of economies than in the latter one.

To investigate this tendency further, the empirical analysis continues in cross-country regression framework that investigates the influence of these initial conditions on growth. Table 2 displays the first set of growth regressions associating natural resource endowment type with growth while capturing the convergence effect with initial income and controlling

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7 Social fragmentation and lack of social cohesion are used interchangeably. For this section, using the former concept clarifies the discussion considerably.

8 The average level of social cohesion for this sample is 40.9. This average was compared to that of the dataset (41.8). However, using either criterion produces identical groupings.

9 The 'other' natural resource category consists of resource poor economies as well as developed, industrialized economies.

for initial human and physical capital endowments. In line with the previous findings within the natural resources and growth literature, the results verify the disappointing growth performance of natural resource rich economies. Both extractive and agricultural economies in this sample exhibit a significantly lower growth, about 1.8 and 0.9 percent, respectively, than that of an average economy.

When the model is extended to account for the lack of social cohesion, its coefficient estimate shows a negative, statistically nonrobust correlation with growth, while the significance levels and sizes of other coefficients remain nearly identical. Augmenting the model by an interaction term that simultaneously captures fractionalization (presence of a weak institutional environment) in concentrated resource flow economies produces a statistically significant and relatively large negative coefficient while at the same time it renders the separate effects by the natural resource endowment and lack of social cohesion statistically insignificant. Interestingly, the absence of social cohesion in oil and mineral economies has a larger negative effect on growth than the variable denoting for their resource endowment type in general (see regressions 2 and 3). This suggests that natural resource endowment itself is not necessarily a negative influence on growth, but rather that its coexistence with lack of social cohesion can lead to disastrous growth outcomes. Moreover, the explanatory power of the regression increases slightly to about 41 percent of the cross-country variation in growth rates within this sample.

The following regression verifies that the effect captured in the previous regression is not merely caused by regional effects, which are usually captured by Sub-Saharan African or Latin American dummy variables in cross-country regressions. The inclusion of regional variables induces a minor reduction in the coefficient for the lack of social cohesion in extractive economies, which, nonetheless, remains significant at a 10 percent level. The regional dummy variables, however, cause a significant change in the qualitative variable for

agricultural economies, as its coefficient not only diminishes notably in size, but also loses significance all together indicating that regional effects better capture their below average performance. The significance of the regional dummy variables is expected in the light of the Easterly and Levine (1998) findings of relevant neighborhood effects and the Gallup, Sachs, and Mellinger (1999) contribution on the importance of geographical factors.

Furthermore, the results are robust the inclusion of the square of initial income, as it has often been suggested that a quadratic (nonlinear) relationship between initial income and the subsequent growth more accurately captures the convergence effect. The argument that oil and mineral natural resource endowment coupled with lack of social cohesion potentially acts through a political economy channel. Once again, this result is robust to the inclusion of regional effects.

To establish that this result is specific to extractive economies, the same regressions are run on agricultural economies and lack of social cohesion in a similar manner. Results which are displayed in table 3 show that the coexistence of lack of social cohesion in extractive economies and that in agricultural economies clearly have a distinct impact on growth. Furthermore, these regression results for extractive and agricultural economies are robust to the inclusion of a third natural resource endowment category, (qualitative variable for natural resource poor economies).

Next, regression specification is modified to include Sachs and Warner (1997a) initial conditions, that control for geographical and climate-related factors, such as whether a country has access to sea (or is landlocked) or whether it is affected by tropical climate, in addition to the quality of institutions. Table 9 reports the estimation results for the regressions associating natural resource endowment type with growth while controlling for Sachs and Warner (1997a) initial conditions. The results confirm the previous ones in the case of oil and mineral economies. That is, the negative correlation of lack of social cohesion in extractive

economies remains robustly negative and relatively large in size and its introduction renders the qualitative variable for oil and mineral economies in general insignificant in all of the specifications. In the case of agricultural economies, no clear evidence for the pattern discovered is found. The interaction term between lack of social cohesion and agricultural economies does not produce a significant estimate in any of the specifications and hence it must be concluded that it is not robust to the inclusion of these alternative initial conditions.

In sum, the initial conditions analysis shows clear results that indicate that natural resource endowment type matters for growth, especially so in the presence of lack of social cohesion which can be interpreted as weak institutional environment that can give rise to rent-seeking or collective redistribution geared to maximization of welfare for the few and not the nation as a whole. The regression results consistently show evidence for a negative correlation between the lack of social cohesion in extractive economies and growth, while no such result is found in the case of economies rich in agricultural natural resources. Hence, in the next section, the robustness of lack of social cohesion in oil and mineral economies is investigated further by examining the significance of the interaction term within cross-country growth regression framework.

5.2 Robustness regressions for lack of social cohesion in oil and mineral economies

The lack of social cohesion in oil and mineral economies seems to exhibit a relatively robust negative correlation with respect to growth in initial conditions framework, while no such effect is found in the case of economies rich in agricultural natural resources. It is important to investigate whether this correlation is robust in the presence of variables deemed significant in other empirical growth studies as plausible determinants of growth. To test for this, the approach used in Sachs and Warner (1997b) is applied by including social fractionalization in extractive economies variable (FE) in a number of established growth

regression specifications: Sachs and Warner (1997b), Barro (1991), Mankiw, Romer, and Weil (1992), King and Levine (1993), and DeLong and Summers (1991).

Sachs and Warner (1997b) is the first contribution that brought forward robust evidence of 'natural resource curse' in cross-country regression framework. Given its pioneering role within empirical growth literature, it is of interest to investigate whether fractionalization in extractive economies (FE) commands any explanatory power within their specification that, in addition to initial income (LGDPEA70), controls for natural resource intensity, measured by a share of primary exports (SXP), open trade policy (SOPEN), investment (INV7089), rule of law (RL), and terms of trade (DDT7090).

Table 10 displays the estimation results for the original specification by Sachs and Warner (1997b) as well as it augmented by FE. The estimation results for the original specification (regression 1) closely resembles that of the originators (see table 1, regression 1.5 in Sachs and Warner 1997b). Interestingly, the introduction of FE into the regression model produces expected results as its coefficient estimate is negative and significant at 1 percent level. Furthermore, it increases the overall explanatory power of the regression to nearly 80 percent of the cross-country variation, and in most cases, it causes only slight changes in the coefficient estimates of other variables. Terms of trade, which produces an insignificant coefficient within the original specification, gains size and significance in the augmented specification, indicating that when controlling for lack of social cohesion in oil and mineral economies, the positive correlation of terms of trade with growth is more clearly picked up by this cross-country regression specification. Though an interesting result, the most important finding of this estimation exercise is that the introduction of the SFOM into the Sachs and Warner specification improves its overall explanatory power, in addition to which the interaction term's coefficient estimate is robustly negative, hence consistent with the results found within the initial conditions framework.

The next specification to which FE is introduced is Barro (1991). Though not the first cross-country growth regression contribution, it widely enjoys the status as a seminal growth contribution to this literature. Table 11 displays the estimation results for Barro (1991) original specification and it augmented by FE. The original specification controls for primary and secondary schooling (PRI70 and SEC70), share of government consumption (net of military and education expenditure) (GVXDXE), revolutions and coups (REVCOUP), assassinations (ASSASSP), deviation of investment price level (PPI70DEV), as well as investment (INV7089) and initial income (LGDPEA70). Once again, the estimated equation roughly resembles the original estimate.[10] The introduction of the FE interaction term increases the explanatory power of this regression specification and its estimated coefficient is negative and significant giving further support for the correlation found so far.

Table 12, in turn, displays the estimation results for the introduction of SFOM interaction term to a basic growth regression specification by Mankiw, Romer, and Weil (1992). Once again, controlling for lack of social cohesion in oil and mineral economies within this framework causes an improvement in the explanatory power of the overall regression specification, in addition to which the coefficient estimate for the interaction term is negative and highly significant at 1 percent level.

The last two specifications within which the robustness of the negative correlation between lack of social cohesion in oil and mineral economies and growth is tested are King and Levine (1993) and DeLong and Summers (1991). The estimation results for these specifications are displayed in Tables 13 and 14, respectively. The negative correlation

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10 As Sachs and Warner (1997b) note the difference in the time period of the analysis causes slight changes in the coefficient estimates. Furthermore, the number of economies in the sample varies along with the new variables introduced. Hence though estimated coefficients have largely the same signs, slight differences in them from the original Barro estimates can be observed. This is not disconcerting to the analysis since its focus is on investigating whether the negative correlation between lack of social cohesion in oil and mineral

between SFOM and growth is robust to these specifications as well, in addition to which its introduction improves their explanatory power as in all other specifications.

To conclude, the most notable fact that is evident from the estimation results of these robustness regressions is that in all cases, the inclusion of SFOM improves the overall explanatory power of the original specification between 4 to 15 percent. Furthermore, in all specifications, FE variable is highly significant at least at 5 percent level of significance, hence providing relatively robust results in support for the strong negative correlation between lack of social cohesion in oil and mineral economies and growth.

6. Conclusions

This paper brings the relevance of natural resource endowment type to the forefront and shows evidence for it within initial conditions and cross-country growth regression frameworks. It broadens the debate on the effects of natural resource endowment on growth into different types of endowment and how political economy factors matter as argued within the recent theoretical literature on resource curse. The empirical results brought forward find support for the argument that it is not just extractive natural resource endowments that have a capacity to retard growth, rather it is their coexistence with lack of social cohesion that consistently exhibits a robust negative correlation with growth within initial conditions and growth regressions frameworks. The correlation is found to be relatively robust, as it remains significant in the presence of various initial conditions variables as well as across different growth regression specifications that control for a lieu of established determinants of growth.

The innovation of this paper is to widen the cross-country growth regression framework to natural resource endowment type and to tie it into fractionalization within a

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economies remains robust in regression specifications in which a number of 'established' determinants of

society. This contribution can be considered as an empirical test for the potential operation of voracity dynamics affecting the natural resource rents in concentrated resource flow economies.

The chain of causation suggested runs as follows. The type of natural resource endowment determines the nature of the resource flow generated by it and this, in turn, generates differential incentives within an economy. Concentrated rent flows are more vulnerable for rent-seeking as they are easier to capture by a particular group and this can be expected to have an impact on the political economy and institutional development of the economy and hence has consequences for the resource redistribution mechanism and determines formation and implementation of policies within an economy. Given the rent-seeking tendencies, the institutional development is unlikely to be geared towards maximizing the welfare for the society as a whole. Dispersed rent flows, though not immune to them, are not as vulnerable for the rent-seeking tendencies as they are more difficult to capture and hence the institutional development of the economy is not as vulnerable to this phenomenon.

The nature of resource flow generates differential incentives especially within a fractionalized society. Concentrated rent flows are more vulnerable for rent-seeking as they are easier to capture by a particular group and is likely to influence the political economy as well as the institutional development of an economy. Given the rent-seeking tendencies, the institutional development process is not necessarily geared towards maximizing the welfare for the society as a whole. Dispersed rent flows, though not free from this effect, are not as vulnerable for rent-seeking as they are more difficult to capture and hence the institutional

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growth are controlled.

development process of the economy is not as vulnerable to specific interests and is more likely to be geared towards maximizing welfare for the society as a whole.

In light of this interpretation, the voracity effect described in Lane and Tornell (1996, 1999) then can be considered as a spillover effect created by the fractionalized rent-seeking phenomenon that has been set in motion, or incentives for which were generated originally by the concentrated rent flows.

Experiences of countries, like Botswana, point to the fact that despite the presence these tendencies, rapid development is possible via effective institution building and political process that is geared towards maximizing the general welfare of the society as a whole. The recognition of the perverse incentives created by concentrated rent flows, especially in factionalized societies, and the incentives that they create for institutional development in these societies captures an important insight that helps us to gain additional insight for the resource curse.

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Table 1 Growth according to Natural Resource Endowment and Level of Social Fragmentation

	Natural resource type					
	Extractive		Agricultural		Other	
Above average social fragmentation[a]	Bolivia	0,4	Cameroon	0,6	Belgium	2,6
	Burkina Faso	1,2	Chad	-0,7	Canada	2,1
	Central African Republic	-0,7	Cote d'Ivoire	0,8	Indonesia	3,5
	Congo, Dem. Rep.	-3,0	Ghana	-0,2	Kenya	1,3
	Congo, Rep.	1,1	Guatemala	1,3	Mauritius	3,3
	Ecuador	1,5	Guyana	0,6	Nepal	1,0
	Niger	-1,7	India	2,3	Philippines	1,2
	Nigeria	0,3	Malawi	1,2	Singapore	5,9
	Papua New Guinea	1,5	Malaysia	3,9	Spain	3,3
	Peru	0,6	Mali		Sri Lanka	2,8
	Sierra Leone	-1,2	Morocco	1,7	Switzerland	1,4
	South Africa	0,8	Myanmar	1,6	United States	2,2
	Togo	0,9	Pakistan	2,7		
	Trinidad and Tobago	2,5	Senegal	-0,3		
	Zambia	-1,3	Sudan	0,8		
			Thailand	4,5		
			Zimbabwe	1,1		
Group average						
	Growth	0,2		1,4		2,5 (2.7)
	Social fragmentation	69,9		68,9		60,3 (64.3)
Below average social fragmentation[a]	Chile	2,5	Argentina	1,0	Australia	2,2
	Dominican Republic	2,6	Brazil	2,4	Austria	2,8
	Jamaica	0,5	Burundi	0,3	Colombia	1,8
	Syrian Arab Republic	2,5	Costa Rica	1,9	Cyprus	
	Venezuela	-0,4	Honduras	0,8	Denmark	2,1
			Lesotho	2,9	Egypt, Arab Rep.	3,1
			Madagascar	-1,2	El Salvador	0,7
			Mexico	2,0	Finland	2,9
			Nicaragua	-0,8	France	2,6
			Panama	2,0	Greece	3,4
			Paraguay	1,7	Haiti	-1,0
			Rwanda	-0,4	Hong Kong, China	5,1
			Uruguay	1,2	Ireland	3,9
					Israel	2,9
					Italy	2,8
					Japan	4,2
					Jordan	
					Korea, Rep.	5,8
					Mauritania	1,3
					Netherlands	2,4
					New Zealand	1,3
					Norway	3,1
					Portugal	3,9
					Somalia	
					Sweden	2,1
					United Kingdom	2,0
Group average						
	Growth	1,5		1,1		2,7 (1.9)
	Social fragmentation	11,2		16,7		12,4 (10.5)

Note: This table organizes economies into groups according to their natural resource endowment and level of social cohesion. Within groups, economies are listed in alphabetical order. Growth rates are percentages. Data in parenthesis are for resource poor economies. See appendix for data source information.

[a] Social fragmentation is proxied by an index that measures the probability that two randomly drawn individuals of a country do not belong to the same ethnolinguistic group. Lower values of this index denote a lower level of social fragmentation (and hence greater social cohesion). The countries are grouped according to their natural resource endowment type (point source, diffuse, and other) and whether they have above or below average social fragmentation. (Note that using sample average or median or dataset average or median, all produced same groupings.)

Table 2 Natural Resource Endowment, Absence of Social Cohesion in Extractive Economies, and Growth

Model: OLS

Dependent variable: growth of real per capita income

Independent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.054 **	0.061 ***	0.064 ***	0.078 ***	-0.171 *	-0.140	-0.130	-0.182 *
	(0.020)	(0.020)	(0.021)	(0.021)	(0.099)	(0.096)	(0.095)	(0.108)
Initial income	-0.005 *	-0.005 **	-0.006 **	-0.007 ***	0.055 **	0.048 *	0.046 *	0.062 **
	(0.003)	(0.003)	(0.003)	(0.003)	(0.026)	(0.025)	(0.025)	(0.028)
(Initial income)^2					-0.004 **	-0.004 **	-0.003 **	-0.005 **
					(0.002)	(0.002)	(0.002)	(0.002)
Initial human capital	0.008 ***	0.008 ***	0.008 ***	0.008 ***	0.008 ***	0.008 ***	0.008 ***	0.008 ***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Natural resource type								
Extractive	-0.018 ***	-0.016 ***	-0.003	0.005	-0.019 ***	-0.018 ***	-0.005	0.006
	(0.004)	(0.004)	(0.007)	(0.006)	(0.005)	(0.004)	(0.007)	(0.006)
Agricultural	-0.009 **	-0.009 **	-0.010 **	-0.002	-0.010 **	-0.010 **	-0.011 **	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Lack of social cohesion		-0.009	-0.002	-0.004		-0.007	0.0003	-0.003
		(0.007)	(0.008)	(0.006)		(0.007)	(0.008)	(0.006)
Lack of social cohesion in extractive economies			-0.028 **	-0.022 *			-0.028 **	-0.023 **
			(0.012)	(0.011)			(0.012)	(0.011)
Regional dummy variables								
Sub-Saharan Africa				-0.018 ***				-0.016 ***
				(0.005)				(0.004)
Latin America				-0.016 ***				-0.019 ***
				(0.004)				(0.004)
R^2	0.40	0.42	0.45	0.60	0.43	0.44	0.48	0.64
Adj. R^2	0.37	0.38	0.41	0.56	0.40	0.40	0.43	0.60
Countries	82	82	82	82	82	82	82	82

Note: White heteroskedasticity consistent standard errors in parentheses. See appendix for variable definitions.

* Statistically significant at 10% level
** Statistically significant at 5% level
***Statistically significant at 1% level

Table 3 Natural Resource Endowment, Absence of Social Cohesion in Agricultural Economies, and Growth

Model: OLS							
Dependent variable: growth of real per capita income							
Independent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.054 **	0.061 ***	0.064 ***	0.079 ***	-0.171	-0.127	-0.162
	(0.020)	(0.020)	(0.020)	(0.021)	(0.099)	(0.098)	(0.112)
Initial income	-0.005 *	-0.005 **	-0.005 **	-0.007 ***	0.055 **	0.046 *	0.057 *
	(0.003)	(0.003)	(0.003)	(0.003)	(0.026)	(0.026)	(0.029)
(Initial income)^2					-0.004 **	-0.003 *	-0.004 **
					(0.002)	(0.002)	(0.002)
Initial human capital	0.008 ***	0.008 ***	0.008 ***	0.008 ***	0.008 ***	0.008 ***	0.008 ***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Natural resource type							
Extractive	-0.018 ***	-0.016 ***	-0.015 ***	-0.005	-0.019 ***	-0.016 ***	-0.005
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Agricultural	-0.009 **	-0.009 **	-0.017 ***	-0.006	-0.010 **	-0.017 ***	-0.004
	(0.004)	(0.004)	(0.006)	(0.006)	(0.004)	(0.006)	(0.006)
Lack of social cohesion		-0.009	-0.016 **	-0.012 *		-0.013 *	-0.010
		(0.007)	(0.007)	(0.007)		(0.007)	(0.007)
Lack of social cohesion in agricultural economies			0.020 *	0.012		0.019 *	0.009
			(0.012)	(0.009)		(0.011)	(0.009)
Regional dummy variables							
Sub-Saharan Africa				-0.019 ***			-0.018 ***
				(0.005)			(0.004)
Latin America				-0.015 ***			-0.018 ***
				(0.004)			(0.004)
R^2	0.40	0.42	0.44	0.59	0.43	0.46	0.62
Adj. R^2	0.37	0.38	0.39	0.54	0.40	0.41	0.57
Countries	82	82	82	82	82	82	82

Note: White heteroskedasticity consistent standard errors in parentheses. See appendix for variable definitions.

* Statistically significant at 10% level
** Statistically significant at 5% level
***Statistically significant at 1% level

Table 4 Natural Resource Endowment Type and Sachs and Warner (1997b) Initial Conditions

Model: OLS

Dependent variable: GR6590

Independent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.110 ***	0.127 ***	0.118 ***	0.131 ***	-0.328 *	-0.317	-0.289	-0.283
	(0.003)	(0.027)	(0.028)	(0.030)	(0.180)	(0.193)	(0.180)	(0.192)
Initial income	-0.001 ***	-0.014 ***	-0.013 ***	-0.015 ***	0.094 **	0.093 **	0.087 **	0.086 *
	(0.003)	(0.003)	(0.004)	(0.004)	(0.043)	(0.046)	(0.043)	(0.045)
(Initial income)^2					-0.006 **	-0.006 **	-0.006 **	-0.006 **
					(0.003)	(0.003)	(0.003)	(0.003)
ACCESS	-0.010 **	-0.009 **	-0.011 **	-0.009 **	-0.006	-0.006	-0.005	-0.005
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
TROPICS	-0.013 **	-0.015 **	-0.014 **	-0.014 **	-0.011 **	-0.013 **	-0.013 **	-0.013 **
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
INSTITUTIONS	0.004 ***	0.004 **	0.003 **	0.004 **	0.005 ***	0.004 **	0.005 ***	0.005 ***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Natural resource type								
Extractve	-0.011 **	-0.001	-0.012 **	-0.001	-0.011 **	-0.012 **	-0.002	-0.002
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.007)	(0.007)
Agricultural	-0.008 *	-0.010 *	-0.008	-0.007	-0.010 **	-0.011	-0.012 **	-0.010
	(0.005)	(0.005)	(0.008)	(0.008)	(0.005)	(0.008)	(0.005)	(0.008)
Lack of social cohesion in extractive economies		-0.022 **		-0.022 **			-0.020 *	-0.020 **
		(0.009)		(0.009)			(0.010)	(0.011)
Lack of social cohesion in agricultural economies			-0.004	-0.006		0.0005		-0.002
			(0.014)	(0.014)		(0.014)		(0.014)
R^2	0.41	0.44	0.42	0.44	0.46	0.47	0.49	0.49
Adj. R^2	0.36	0.39	0.36	0.38	0.41	0.41	0.43	0.42
Countries	80	79	79	79	80	79	79	79

Note: White heteroskedasticity consistent standard errors in parentheses. See appendix for variable definitions.

* Statistically significant at 10% level
** Statistically significant at 5% level
***Statistically significant at 1% level

Table 5 Sachs and Warner (1997c)

Model: OLS		
Dependent variable: GEA7090		
Independent variable	(1)	(2)
FE		-1.93 ***
		(0.528)
LGDPEA70	-1.78 ***	-1.74 ***
	(0.264)	(0.253)
SXP	-10.34 ***	-7.97 ***
	(1.327)	(1.717)
SOPEN	1.35 ***	1.23 ***
	(0.324)	(0.269)
INV7089	0.80 ***	0.96 ***
	(0.298)	(0.285)
RL	0.41 ***	0.38 ***
	(0.133)	(0.128)
DTT7090	0.09	0.17 ***
	(0.059)	(0.050)
R^2	0.76	0.80
Adj. R^2	0.74	0.77
Countries	70	69

Note: White heteroskedasticity consistent standard errors in parentheses.
See appendix for variable definitions and sources.

* Statistically significant at 10% level
** Statistically significant at 5% level
***Statistically significant at 1% level

Table 6 Barro (1991)

Model: OLS		
Dependent variable: GEA7090		
Independent variable	(1)	(2)
FE		-3.47 ***
		(0.892)
LGDPEA70	-1.31 ***	-1.09 **
	(0.459)	(0.421)
SEC70	3.26 *	1.20
	(1.917)	(1.805)
PRI70	0.02	-1.05
	(1.181)	(1.000)
GVXDXE	1.72	0.62
	(5.314)	(4.277)
REVCOUP	-0.34	0.27 ***
	(0.865)	(0.750)
ASSASSP	0.41	-0.66
	(0.913)	(0.883)
PPI70DEV	-0.34	-0.53 **
	(0.302)	(0.265)
INV7089	0.19 ***	0.19 ***
	(0.038)	(0.041)
R^2	0.44	0.58
Adj. R^2	0.36	0.51
Countries	67	66

Note: White heteroskedasticity consistent standard errors in parentheses.
See appendix for variable definitions and sources.
* Statistically significant at 10% level
** Statistically significant at 5% level
***Statistically significant at 1% level

Table 7 Mankiw, Romer, and Weil (1992)

Model: OLS		
Dependent variable: GEA7090		
Independent variable	(1)	(2)
FE		-1.92 ***
		(0.587)
LGDPEA70	-1.37 ***	-1.41 ***
	(0.246)	(0.254)
GP7090	-0.74 ***	-0.59 ***
	(0.210)	(0.209)
INV7089	0.16 ***	0.16 ***
	(0.026)	(0.024)
R^2	0.44	0.50
Adj. R^2	0.42	0.48
Countries	86	84

Note: White heteroskedasticity consistent standard errors in parentheses.
See appendix for variable definitions and sources.

* Statistically significant at 10% level
** Statistically significant at 5% level
***Statistically significant at 1% level

Table 8 King and Levine (1993)

Model: OLS		
Dependent variable: GEA7090		
Independent variable	(1)	(2)
FE		-1.53 **
		(0.700)
LGDPEA70	-0.96	-0.88 **
	(0.439)	(0.418)
KLLSEC	0.58	0.40
	(0.473)	(0.453)
KLLLY70	4.71	4.52 ***
	(1.237)	(1.215)
R^2	0.27	0.32
Adj. R^2	0.24	0.28
Countries	68	58

Note: White heteroskedasticity consistent standard errors in parentheses.
See appendix for variable definitions and sources.

* Statistically significant at 10% level
** Statistically significant at 5% level
***Statistically significant at 1% level

Table 9 DeLong and Summers (1991)

Model: OLS		
Dependent variable: GEA7090		
Independent variable	(1)	(2)
FE		-2.56 **
		(1.061)
LGDPEA70	-0.65	-0.81 ***
	(0.317)	(0.269)
LFG	-18.24	-6.79
	(24.073)	(23.503)
EQUIP	26.22	27.73 ***
	(10.646)	(8.769)
NES	9.03	9.59 **
	(4.218)	(4.285)
R^2	0.28	0.38
Adj. R^2	0.22	0.32
Countries	54	54

Note: White heteroskedasticity consistent standard errors in parentheses.
See appendix for variable definitions and sources.

* Statistically significant at 10% level
** Statistically significant at 5% level
***Statistically significant at 1% level

Table 10 Robustness Regression Results Summarized

Model: OLS
Dependent variable: GEA 7090

Independent variable	Sachs and Warner (1997)	Barro (1991)	MRW (1992))	King and Levine (1993)	DeLong and Summers (1993)
Fractionalization in extractive economies	-1.93 ***	-3.47 ***	-1.92 ***	-1.53 **	-2.56 **
	(0.528)	(0.892)	(0.587)	(0.700)	(1.061)
R^2	0.80	0.58	0.50	0.32	0.38
Adj. R^2	0.77	0.51	0.48	0.28	0.32
Countries	69	66	84	58	54
Improvement from original specification					
R^2	0.04	0.14	0.06	0.05	0.11
Adj. R^2	0.03	0.15	0.06	0.04	0.10
Change in N	-1	-1	-2	-10	0

Note: White heteroskedasticity consistent standard errors in parentheses. See appendix section A3 varible definitions and sources.
* Statistically significant at 10% level *** Statistically significant at 5% level *** Statistically significant at 1% level.

Appendix

Table A1 List of Economies and Selected Variables

		Natural Resource Endowment				
Code	Country	Rich[a]	Point[b]	Diffuse[c]	Poor[d]	Industrial[e]
ARG	Argentina[f]	1	0	1	0	0
AUS	Australia	0	0	0	0	1
AUT	Austria	0	0	0	0	1
BGD	Bangladesh[I]	0	0	0	1	0
BEL	Belgium	0	0	0	0	1
BOL	Bolivia	1	1	0	0	0
BRA	Brazil[I]	1	0	1	0	0
BFA	Burkina Faso	1	1	0	0	0
BDI	Burundi	1	0	1	0	0
CMR	Cameroon	1	0	1	0	0
CAN	Canada	0	0	0	0	1
CAF	Central African Republic	1	1	0	0	0
TCD	Chad	1	0	1	0	0
CHL	Chile[I]	1	1	0	0	0
COL	Colombia[I]	0	0	0	1	0
ZAR	Congo, Dem. Rep.	1	1	0	0	0
COG	Congo, Rep.	1	1	0	0	0
CRI	Costa Rica	1	0	1	0	0
CIV	Cote d'Ivoire	1	0	1	0	0
CYP	Cyprus	0	0	0	0	1
DNK	Denmark	0	0	0	0	1
DOM	Dominican Republic	1	1	0	0	0
ECU	Ecuador	1	1	0	0	0
EGY	Egypt, Arab Rep.[I]	0	0	0	1	0
SLV	El Salvador	0	0	0	1	0
FIN	Finland	0	0	0	0	1
FRA	France	0	0	0	0	1
GHA	Ghana	1	0	1	0	0
GRC	Greece	0	0	0	0	1
GTM	Guatemala	1	0	1	0	0
GUY	Guyana	1	0	1	0	0
HTI	Haiti	0	0	0	1	0
HND	Honduras	1	0	1	0	0
HKG	Hong Kong, China	0	0	0	1	0
IND	India[I]	1	0	1	0	0
IDN	Indonesia[I]	0	0	0	1	0
IRN	Iran, Islamic Rep.	1	1	0	0	0
IRL	Ireland	0	0	0	0	1
ISR	Israel	0	0	0	0	1
ITA	Italy	0	0	0	0	1
JAM	Jamaica	1	1	0	0	0
JPN	Japan	0	0	0	0	1
JOR	Jordan	0	0	0	1	0
KEN	Kenya	0	0	0	1	0
KOR	Korea, Rep.[I]	0	0	0	1	0
LBN	Lebanon	0	0	0	1	0
LSO	Lesotho	1	0	1	0	0
LBR	Liberia	1	1	0	0	0
MDG	Madagascar	1	0	1	0	0
MWI	Malawi	1	0	1	0	0
MYS	Malaysia	1	0	1	0	0

Table A1 *(continued)*

Code	Country	Natural Resource Endowment				
		Rich[a]	Point[b]	Diffuse[c]	Poor[d]	Industrial[e]
MLI	Mali	1	0	1	0	0
MRT	Mauritania	0	0	0	1	0
MUS	Mauritius	0	0	0	1	0
MEX	Mexico[f]	1	0	1	0	0
MAR	Morocco	1	0	1	0	0
MMR	Myanmar	1	0	1	0	0
NPL	Nepal	0	0	0	1	0
NLD	Netherlands	0	0	0	0	1
NZL	New Zealand	0	0	0	0	1
NIC	Nicaragua	1	0	1	0	0
NER	Niger	1	1	0	0	0
NGA	Nigeria[f]	1	1	0	0	0
NOR	Norway	0	0	0	0	1
PAK	Pakistan[f]	1	0	1	0	0
PAN	Panama	1	0	1	0	0
PNG	Papua New Guinea	1	1	0	0	0
PRY	Paraguay	1	0	1	0	0
PER	Peru	1	1	0	0	0
PHL	Philippines[g]	0	0	0	1	0
PRT	Portugal	0	0	0	0	1
RWA	Rwanda	1	0	1	0	0
SAU	Saudi Arabia	1	1	0	0	0
SEN	Senegal	1	0	1	0	0
SLE	Sierra Leone	1	1	0	0	0
SGP	Singapore	0	0	0	1	0
SOM	Somalia	0	0	0	1	0
ZAF	South Africa[f]	1	0	1	0	0
ESP	Spain	0	0	0	0	1
LKA	Sri Lanka	0	0	0	1	0
SDN	Sudan	1	0	1	0	0
SWE	Sweden	0	0	0	0	1
CHE	Switzerland	0	0	0	0	1
SYR	Syrian Arab Republic	1	1	0	0	0
THA	Thailand	1	0	1	0	0
TGO	Togo	1	1	0	0	0
TTO	Trinidad and Tobago	1	1	0	0	0
TUN	Tunisia	1	0	1	0	0
TUR	Turkey[f]	1	0	1	0	0
GBR	United Kingdom	0	0	0	0	1
USA	United States	0	0	0	0	1
URY	Uruguay	1	0	1	0	0
VEN	Venezuela[f]	1	1	0	0	0
ZMB	Zambia	1	1	0	0	0
ZWE	Zimbabwe	1	0	1	0	0
total	95	55	22	33	18	22

Note: Natural resource endowment type categorization by Auty (2001) unless otherwise indicated.

[a] Economies with per capita crop land greater than 0.3 hectares per person.

[b] Natural resource rich economies with fuel and mineral export share greater than 40 percent of their GDP.

[c] Economies which are natural resource rich according to agricultural potential.

[d] Economies with per capita cropland is less than 0.3 hectares per person.

[e] Developed economy not classified by Auty (2001)

[f] Economy's natural resource endowment categorization by author following Auty (2001) criteria.

Table A2 Variable definitions and sources for initial conditions analysis

ACCESS: Qualitative variable that takes the value 1 if an economy is landlocked; 0 otherwise. *Source:* Sachs and Warner (1997a).

AGRICULTURAL ECONOMIES: Qualitative variable that takes the value 1 if an economy is a agricultural natural resource economy; 0 otherwise. Economy is defined as agricultural natural resource economy if it is natural resource rich and its merchandise exports are not oil and mineral dominated.

INCOME GROWTH 1960-99: Growth of per capita GDP in constant local currency units over the period 1960-99, logarithmic end point calculation. *Source:* World Bank (2001).

INITIAL HUMAN CAPITAL: Total years of schooling for population aged over 15 years. *Source:* Barro and Lee (2001) and World Bank (2001).

INITIAL PER CAPITA INCOME: Logarithm of real per capita income in 1960 (Chain index). *Source:* Heston, Summers, and Aten (2001).

INITIAL PER CAPITA INCOME SQUARED: Square of initial per capita income. *Source:* see above.

INSTITUTIONS: An index of institutional quality, an arithmetic average of indicators for bureaucratic quality, rule of law, government corruption, expropriation risk, and government repudiation of contracts. Data published in *International Country Risk Guide* by the PRS Group and discussed in Knack and Keefer (1995). *Source:* Sachs and Warner (1997a).

LACK OF SOCIAL COHESION: Proxied by (Miklukho-Maklai) ethnolinguistic fractionalization index that measures the probability that two randomly selected individuals do not belong to the same ethnolinguistic group. *Source:* Easterly and Levine (1997).

LACK OF SOCIAL COHESION IN AGRICULTURAL ECONOMIES: An interaction term between agricultural economies and lack of social cohesion variables.

LACK OF SOCIAL COHESION IN OIL AND MINERAL ECONOMIES: An interaction term between oil and mineral economies and lack of social cohesion variables.

LATIN AMERICA: Qualitative variable that takes the value 1 if an economy is located in the Latin American and the Caribbean region; 0 otherwise.

NATURAL RESOURCE POOR ECONOMIES: Qualitative variable that takes the value 1 if an economy is natural resource poor; 0 otherwise. Natural resource poor economies are defined as those economies with per capita cropland less than 0.3 hectares per person following Auty (2001). *Source:* World Bank (2001)

NATURAL RESOURCE RICH ECONOMIES: Natural resource rich economies are defined as those economies with per capita cropland greater than 0.3 hectares per person in 1970 per person following Auty (2001). *Source:* World Bank (2001)

PER CAPITA INCOME: Per capita GDP in constant local currency units. *Source:* World Bank (2001).

PER CAPITA INCOME GROWTH: Growth of per capita income, logarithmic end point calculation. *Source:* World Bank (2001).

OIL AND MINERAL ECONOMIES: Qualitative variable that takes the value 1 if an economy is a oil and mineral natural resource economy; 0 otherwise. Following Auty (2001), economy is defined as oil and mineral natural resource economy if it is natural resource rich, its resource base is dominantly mineral or oil-based, and the exports of these products exceed 40 percent of its total exports. *Source:* World Bank (2001).

POPULATION: Total population in 1960. *Source:* World Bank (2001).

SOCIAL FRAGMENTATION: See the definition for lack of social cohesion.

SUB-SAHARAN AFRICA: Qualitative variable that takes the value 1 if an economy is located in the Sub-Saharan African region; 0 otherwise.

TROPICS: Fraction of a country's territory that is affected by tropical climate. *Source:* Sachs and Warner (1997a).

Table A3 Variable definitions and sources for robustness regressions

ASSASSP: Annual number of assassinations per million inhabitants over the period 1970 to 1985. Series used from Sachs and Warner (1997a). See dataset or source for further details. *Source:* Barro and Lee (1994).

DTT7090: Annual growth in the terms of trade between 1970 and 1990. See source for further details. *Source:* Sachs and Warner (1997a).

EQUIP: Equipment investment spending as a share of GDP, averaged over the period of 1970 to 1985. Series used from Sachs and Warner (1997a). See dataset or source for further details. *Source:* DeLong and Summers (1991).

GEA7090: Growth of GDP per economically active population over the period 1970 and 1990. See source for further details. *Source:* Sachs and Warner (1997a).

GP7090: Annual population growth over the period 1970 to 1990. *Source:* Sachs and Warner (1997a).

GVXDXE: Real government consumption, excluding spending on military and education, as a share of GDP. Series used from Sachs and Warner (1997a). See source for further details. *Source:* Barro and Lee (1994).

LINV7089: Logarithm of real gross domestic investment share in GDP over the period 1970 to 1989. See source for further details. *Source:* Sachs and Warner (1997a).

KLLLY70: Financial intermediaries' liabilities and currency in circulation as a share of GDP. Series used from Sachs and Warner (1997a). See source for further details. *Source:* King and Levine (1993).

KLLSEC: Logarithm of secondary schooling years in the population between 1970 and 1989. Series used from Sachs and Warner (1997a). See source for further details. *Source:* King and Levine (1993).

LFG: Labor force growth. Series used from Sachs and Warner (1997a). See source for further details. *Source:* DeLong and Summers (1991).

LGDPEA70: Real GDP per economically active population in 1970. See source for further details. *Source:* Sachs and Warner (1997a).

NES: Investment in other than equipment (structures and goods), an average over the period 1970 to 1985. Series used from Sachs and Warner (1997a). See dataset or source for further details. *Source:* DeLong and Summers (1991)

PPI70DEV: Deviation of the logarithm of investment price level from the sample mean in 1970. Series used from Sachs and Warner (1997a). See dataset or source for further details. *Source:* Barro and Lee (1994).

PRI70: Primary school enrollment rate in 1970. Series used from Sachs and Warner (1997a). See source for further details. *Source:* Barro and Lee (1994).

REVCOUP: Average number of revolutions and coups per year over the period 1970 to 1985. Series used from Sachs and Warner (1997a). See the dataset or source for further details. *Source:* Barro and Lee (1994).

RL: Rule of Law index, variable proxies citizen's willingness to accept institutions that mediate disputes and design and implement laws. Low values indicate 'low willingness' and vice versa. Data published in *International Country Risk Guide* by the PRS Group and discussed in Knack and Keefer (1995). *Source:* Sachs and Warner (1997a).

SEC70: Secondary school enrollment rate in 1970. Series used from Sachs and Warner (1997a). See source for further details. *Source:* Barro and Lee (1994).

SFPS: Social fractionalization in oil and mineral economies. Source: See section A3 in this appendix.

SOPEN: Years economy rated as open between 1970 and 1990, according to Sachs and Warner (1995), divided by the total number of years in the period. See source for further details. *Source:* Sachs and Warner (1997a).

SXP: Share of primary product exports in GNP in 1970. Primary products include fuel and non-fuel commodities. See source for further details. *Source:* Sachs and Warner (1997a).