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Persistence of Underdevelopment

Does the Type of Natural Resource Endowment Matter?

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Abstract

This paper examines growth successes and failures across countries and notes the latter's perplexing predominance among ex ante low-income economies. An explanation for this persistence of underdevelopment is proposed through an empirical investigation that brings forth evidence on the importance of natural resource endowment type on growth or, more appropriately, lack of it. The results show that, in the absence of social cohesion, the nature of natural resource abundance bears great significance as a natural resource endowment characterized by oil and/or mineral resources is more negatively correlated with growth than a resource endowment that is agricultural. 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, underdevelopment, cross-country studies

JEL classification: O13, O47, O50

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1 Introduction

While the world has witnessed several exceptional advances in growth and development achieved by developed and developing countries alike, the majority of developing economies have made relatively modest gains. On the cross-country level, dynamics within global distribution of income have been well researched and there exists little disagreement about established stylized facts. Danny Quah (1996) has brought forward solid evidence that cross-country distribution of incomes exhibits a tendency towards polarization, clustering of countries into a higher and lower income groups, thus forming a 'twin peaked' distribution. Furthermore, others have argued that there exists a definite tendency for club formation (Baumol 1986). Poor economies have remained relatively poor, as the correlation of income rankings between 1960 and 1998 is high across countries implying a lack of upward mobility within and across income rankings.[1] Furthermore, repeated empirical observations supporting the absence of absolute convergence within large cross-country samples have been brought forward.[2] Baumol (1986) brings forth empirical evidence showing that less developed countries have not converged, a result that is reiterated in Baumol and Wolff (1988).

While this research gives a bleak view of cross-country growth dynamics, it is not deterministic in its conclusions. The evidence also shows that it is possible for an economy to start initially at a low-income level, to achieve rapid growth, and to be able to crossover to the richer income groups (e.g., Botswana, Singapore, and South Korea). In other words, the possibility that a poor economy might converge with a rich one remains; however, it seems to be much more of an exception than a rule.

A brief investigation into growth successes and failures across countries shows the striking absence of long-term failures among ex ante high-income economies as well as their prevalence within ex ante lower income groups, especially that of low-income ones. In effect, there are groups of low-income and lower middle-income economies, mostly located in Sub-Saharan Africa and Latin America and the Caribbean, that have experienced persistent economic stagnation or even continuous regress for nearly four decades.

This troublesome finding brings forth questions regarding the underlying forces contributing to long-term growth failures. Are there particular factors that have impeded these economies from achieving sustainable gains in development? Have there been some common conditions that have contributed to the persistence of underdevelopment in these economies? This paper uses the *nature* of natural resource endowment and its influence upon political economy considerations to explain long-term growth or, perhaps more appropriately, the lack of it in a group of developing economies. As initial conditions analysis and cross-country growth regression framework are extended to

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1 Note that high rank correlation *does not* show evidence against convergence, since it is possible to observe *absolute* and *conditional* convergence among a group of economies that retain an identical income ranking. Rank correlation between 1960 and 1998 for 102 economies with available data in Heston, Summers, and Aten (2001) is 0.82.

2 These contributions include: Grier and Tullock (1989), Baumol and Wolff (1988), Barro (1991, 1997), and Barro and Sala-i-Martin (1995).

different types of natural resource endowment and to political economy considerations such as lack of social cohesion, the empirical results bring forward evidence supporting the argument most recently advocated in Auty (2001) and earlier in Hirschman (1981). That is, natural resource endowment type and ensuing political economy considerations bear significant influence on economic performance. The results presented suggest that natural resource endowment predominated by oil and/or mineral exports when coexisting with lack of social cohesion has potentially contributed to a number of severe and even catastrophic growth failures. Similar effect is not present when considering agricultural commodity producing economies and lack of social cohesion. The robustness of this result is tested across a number of growth regression specifications within the literature.

The paper proceeds as follows. Simple statistical analysis in section 2 highlights some stylized facts of growth failures: their regional concentration in Sub-Saharan Africa and Latin America and the Caribbean and the predominance and the long-term nature of growth failures in ex ante low-income and lower middle-income economies. Drawing upon the literature on African growth failures and that on the natural resource curse thesis, the following section, section 3, discusses the previous contributions explaining some possible reasons for persistently poor economic performance. Section 4 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 5. Section 6 then briefly summarizes the empirical findings and provides concluding remarks. Details on the stage of development categorizations used in this paper and information on the calculations and the sources of the variables used are provided in the appendix.

2 Stylized facts of growth failures: geography, size, and stage of development

A brief investigation into long-term growth failures shows that they are regionally concentrated in Sub-Saharan Africa and Latin America and the Caribbean and that they tend to occur at early stages of development in economies characteristic of small size. Table 1 lists long-term growth failures that are categorized based on the decade during which the level of current real per capita income was first reached.[3] Catastrophic growth failure is considered to have occurred in economies which attained their contemporary real per capita income (PCI) level during 1960s or before. It can be observed that the economies fitting this criterion are mostly located in Sub-Saharan Africa (SSA) and, to a much lesser extent, in Latin America and the Caribbean (LAC).

Severe growth failure, in turn, is considered to have occurred in those economies that have had more than a decade of stagnation having reached their current real per capita income level either during 1970s or 1980s. Again, the regional representation is largely the same, although a few Middle East and North African (MENA) economies and one East Asia and Pacific economy (Philippines) also belong to this group. This confirms with the evidence that East Asia and Pacific as well as South Asian economies have experienced strikingly strong growth. Not surprisingly, all long-term growth failures have occurred in developing economies. It is remarkable to observe that growth in over 43 percent of all economies has failed and more than a half (56.2 percent) of all

[3] See Table A1 for a list of economies included in this analysis.

Table 1 Economies with Persistent Growth Failures

Catastrophic [a]		Severe [b]	
Burundi	Somalia	Cameroon	Guyana
Central African Republic	South Africa	Congo, Rep.	Honduras
Chad	Togo	Kenya	Paraguay
Congo, Dem. Rep.	Zambia	Malawi	Peru
Cote d'Ivoire		Mali	Trinidad and Tobago
Ghana	Bolivia	Mauritania	
Liberia	Haiti	Nigeria	Iran
Madagascar	Jamaica	Zimbabwe	Jordan
Niger	Nicaragua		Saudi Arabia
Rwanda	Venezuela	Ecuador	
Senegal		El Salvador	Philippines
Sierra Leone		Guatemala	

Note: Sample includes a total of 95 economies with real per capita income series available in World Bank (2001). See appendix for sample details. Countries are grouped according to their geographical region and ordered alphabetically within regions.

[a] *Catastrophic* growth failure is defined to have occurred in those economies in which current per capita income level was reached during 1960s or before.

[b] *Severe* growth failure is considered to have occurred in those economies in which current per capita income level was reached during 1970s or 1980s.

developing economies included in the analysis has suffered from a catastrophic or a severe growth failure.

Table 2 lists those economies that have experienced more contemporary growth setbacks, defined as 1999 real per capita income below that achieved in 1990.[4] These recent failures consist of 20 economies, only one of which is a developed economy (Switzerland). Again, the majority of recent growth disasters have been experienced in the SSA region with LAC as a distant second. Furthermore, all recent growth failures, with the exception of Switzerland, are long-term growth failures. It is especially troublesome to observe that twelve of the economies that have suffered from a catastrophic growth failure as well as seven from a severe one have continued their descent up until the late 1990s. In the worse case scenarios, this translates into more than 'four lost decades' of standard of living improvement.

While it is evident that growth failures have occurred in developing economies, especially in SSA as well as LAC, it is informative to analyze whether any empirical regularities can be deduced from investigating successful growth experiences. Table 3 hence displays relative growth success economies with per capita income higher in 1999 (or 1998) than ever before. There are a total of 52 growth successes, 19 of which are

4 The list of countries in Table 2 is sensitive to the dates chosen (1990, 1999).

Table 2 Recent Growth Failures

Burundi[a]	Niger[a]	Ecuador[b]
Cameroon[b]	Nigeria[b]	Jamaica[a]
Central African Republic[a]	Rwanda[a]	Paraguay[b]
Chad[a]	Sierra Leone[a]	
Congo, Dem. Rep.[a]	South Africa[a]	Saudi Arabia[b]
Congo, Rep.[b]	Togo[a]	
Kenya[b]	Zambia[a]	*Switzerland*
Madagascar[a]		

Note: Sample includes a total of 95 economies with real per capita income series available in World Bank (2001). See appendix for further details. Countries are grouped according to their geographical region and ordered alphabetically within regions. Developed countries in italics.

[a] Countries with continuing *catastrophic* growth failures.

[b] Countries with continuing *severe* growth setbacks.

Table 3 Relative Growth Successes

Burkina Faso	*Australia*	*Austria*	Cyprus
Lesotho	Bangladesh	*Belgium*	Egypt
Mauritius	Hong Kong[b]	*Denmark*	*Israel*[a]
Sudan	India	*Finland*	Lebanon[a]
	Indonesia[b]	*France*	Morocco[a]
Argentina[a]	Japan[b]	*Greece*	Syrian Arab Republic
Brazil[b]	Korea, Rep.	*Ireland*	Turkey[a]
Canada	Malaysia[b]	*Italy*	Tunisia
Chile[a]	Myanmar[a]	*Netherlands*	
Colombia[b]	Nepal	*Norway*	
Costa Rica	*New Zealand*	*Portugal*	
Dominican Republic	Pakistan	*Spain*	
Mexico	Singapore	*Sweden*	
Panama	Sri Lanka	*United Kindgom*	
Uruguay	Thailand[b]		
United States			

Source: Constructed by the author based on World Bank (2001).

Note: Sample includes a total of 95 economies with available statistics. See appendix for sample details. Countries are grouped according to their geographical region and ordered alphabetically within regions. Developed countries in italics.

[a] Per capita income peaked in 1998.

[b] Country categorized as growth success based on long term performance. See figure A1 in appendix for a graph of the logarithm of per capita income.

developed economies, while the rest can be considered as developing ones.[5] Their regional distribution concentrates on Asia and Western Europe, although a number of economies from LAC, MENA, as well as a few from SSA are also present.

It is clear that failing growth is characteristic of low and lower middle-income economies. To illustrate this Table 4 displays the percentages of growth failures and successes by initial income level and size. The first row shows that high-income

Table 4 Percentage of Growth Failures and Successes by Income Level and Size

	Degree of long term failure			Recent growth setbacks [c]		Growth success[d]
	Catastrophic[a]	Severe[b]	Total	Total	Continuing	
Income level						
High	0	0	0	5.9	0	94.1
Middle						
Upper	13.6	22.7	36.4	13.6	13.6	63.6
Lower	27.3	31.8	59.1	18.2	18.2	40.9
Low	35.3	23.5	58.8	35.3	35.3	38.2
Size[e]						
Large						
> 25 million	0	11.1	11.1	5.6	5.6	88.9
> 20 million	0	14.3	14.3	4.8	4.8	85.7
> 15 million	8.0	12.0	20.0	12.0	4.0	80.0
> 10 million	6.9	10.3	17.2	10.3	3.4	82.8
Small						
< 25 million	27.3	23.4	50.6	24.7	23.4	46.8
< 20 million	28.4	23.0	51.4	25.7	24.3	45.9
< 15 million	27.1	34.3	51.4	24.3	22.9	45.7
< 10 million	28.8	25.8	54.5	25.8	24.2	42.4
Mini[f]	5.9	35.3	41.2	26.5	20.6	52.9

Note: All calculations based on 1960 groupings. See appendix for sample description, group definitions and membership.

[a] Catastrophic growth failure is defined to have occurred in those economies in which current per capita income level was reached during 1960s or before.

[b] Severe growth failure is considered to have occurred in those economies in which current per capita income level was reached during 1980s or before.

[c] Recent growth setback is defined as 1999 real per capita income level below that of 1990.

[d] Growth success is defined as 1999 or 1998 real per capita income above that in 1990. See footnote 5 for a more detailed description of the classification method.

[e] Size of an economy approximated by population size.

[f] Defined as those economies with population less than half a million in 1960.

5 One must note that the influence of the recent Asian crisis is stronger with growth successes than with failures. Since the crisis began in mid 1997, many Asian economies' real per capita incomes fell sharply; however, they remained clearly above their 1990 level. Even broadening the success criterion to suit the long run nature of the analysis by including economies which 1998 per capita income is higher than that of 1990 leads to the exclusion of relative growth success economies, such as Hong Kong, Indonesia, Japan, Malaysia, and Thailand. Hence for those economies that did not fall into any of the growth failure categories nor that of success, a graphical examination of the logarithm of per capita income was conducted. This analysis lead to the inclusion of the above-mentioned Asian economies as well as Brazil and Colombia into the relative growth success category, and in addition, it showed that Papua New Guinea could be considered neither a success nor a failure as the pattern of its per capita income level differed significantly from that of others.

economies have seen no long-term growth failures and only a small percentage of the group has experienced a recent growth setback. The picture changes quite sharply when one moves from the upper income groups to the lower income ones. Clearly, economies at earlier stages of development have had greater difficulties in sustaining growth than those at higher income levels sustain. Furthermore, when investigating more recent growth setbacks, it can be noted that failing growth is a persistent problem, since all economies that suffer from recent growth setbacks are long-term growth failure economies.

To consider whether failing growth is more common among economies of different size, the bottom two-thirds of Table 4 shows the percentages of growth successes and failures among large, small, and mini state economies groups.[6] The data clearly shows that small economies have suffered proportionally more from growth failures, whether of long-term or short-term nature, in comparison to large economies. This also holds for the long-term growth failures relative to that of mini state ones, and though mini state economies register a larger proportion of recent growth failures, small economies group, in turn, suffers from a higher proportion of continuing long-term growth failures.[7] Furthermore, a greater proportion of large as well as mini economies belong to growth success economies than small ones. These observations are robust across any large and small economy cutoff point between 25 million or 10 million.

This striking pattern raises questions regarding the underlying forces contributing to these growth failures at early stages of development. What factors have impeded these economies from reaching a sustainable growth path? Are there common features that have contributed to these long-term growth failures? Given the fact that a large majority of these growth failures appear to have faced difficulties in initiating growth, it seems appropriate to focus on initial conditions and endowments.

3 Explanations for failing growth

Various explanations for failing growth have been brought forward. This contribution draws from two closely connected research lineages, one with a strong geographical focus on African growth experience and another investigating the impact of natural resource abundance on growth. The striking geographical concentration of failures within Sub-Saharan Africa has fuelled much discussion focusing on this region's experience. In this regard, there have been heated debates on whether the causes of failures are internal or external in nature. This growing literature brings forth a variety of explanations for the prevalence of failing growth in this region including lack of

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6 Given that there is no agreed definition of size and certain level of arbitrariness cannot be avoided using any one criterion to define it, growth success and failure statistics are displayed for various groups of large and small economies. Within the literature, size is generally defined either by area, population, total economic activity, or purchasing power. Total population is chosen since using per capita income to proxy for the purchasing power resembles the income level categorization too closely. Furthermore, since the population size definition varies within the literature, it is modified at an interval of five million inhabitants. Note also that the sample definition excludes mini state economies from the analysis. Statistics are calculated for them in this table for the purpose of illustrating the differences in performance of an average small economy and that of a city state.

7 This suggests that the emphasis on the recent size and growth literature is somewhat misplaced.

openness, ethnic divisions, social conflict, and defective public policies. The natural resource literature, for its part, focuses on 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 economic and political to social influences that natural resources exert upon the growth and development of an economy.

Africa's economic performance during the second half of the twentieth century has recently received much attention. The most forceful claim that lack of openness hampers Africa's economic progress has been made by Sachs and Warner (1997a). While investigating the causes of Africa's slow growth in cross-country framework, they argue that it is not unique relative to other regions. Their empirical analysis indicates that the region's growth failure is mostly explained by poor policies and institutions, most notably by lack of openness. While so-called 'natural impediments', such as geographical factors and ethnic fractionalization, act as a hindrance, they do not form insuperable obstacles to growth according to them. Collier and Gunning (1999) and earlier Dollar (1992) also support the argument that lack of openness hinders growth. Rodriguez and Rodrik (1999), however, find the evidence brought forward unconvincing arguing that the indicators used in these studies are correlated with other factors that impede growth.

Easterly and Levine (1997), in turn, regard Africa's poor performance as a result of poor policies caused by ethnic divisions which have a direct and indirect effect on growth. They consider the latter effect, which acts through public policies, as much more prevalent and important and present empirical evidence supporting the argument that ethnic divisions encourage rent-seeking behavior and frustrate consensus building. Though controlling for ethnic divisions is not enough to eliminate the negative significant Africa dummy variable, the Easterly and Levine (1998) regression analysis eliminates its significance through the inclusion of 'neighborhood effects', thus refuting any claim for 'exceptionalism' of Africa's experience in comparison to other regions. Sachs and Warner also highlight the potential relevance of ethnic divisions on growth in Africa, as they point out that their findings emphasizing policies 'do not mean that Africa's colonial legacy, ethnic divisions, or particular geographical difficulties are unimportant. The colonial legacy or ethnic divisions ... may help to explain Africa's poor choices of economic policy which in turn are responsible for much of the growth shortfall according to our regression estimates' (1997a: 336).

Other literature from which an explanation for these growth failures can be sought is that which has concentrated on explaining the relatively mediocre growth performance of natural resource rich economies in comparison to that of natural resource poor ones. While repeatedly observed in case studies over the years, most recently Sachs and Warner (1997b) brings forth robust cross-country evidence regarding the inverse relationship between natural resource abundance and growth. The explanations for this phenomenon vary from social and economic to political ones. The current paper draws on those contributions emphasizing largely the political economy linkages, although other types of contributions are also briefly reviewed below.

An argument which connects natural resource richness to behavior as well as to the policy realm is the *natural resource curse thesis*, advanced and discussed in a number of case studies such as Gelb and associates (1988). Auty (1995) argues that adverse policy effects of large natural resource endowments manifest in the form of overly

optimistic expectations of resource revenues and implementation of careless economic policies. Furthermore, the consequences of the latter as well as other economic imbalances can be sustained longer in resource rich economies than in resource poor ones, thus causing delays in the necessary adjustments in order to attain competitive forces within manufacturing. Support for this thesis has been found in a number of case studies.

Another often cited phenomenon is the *Dutch disease*, dubbed after an observation of deindustrialization (sectoral reallocation of resources away from manufacturing) in the Dutch economy prompted by the discovery of natural gas in the North Sea during the 1970s. The boom of the natural resource sector created an increase in the price of nontraded goods as a result of an increase in their demand, thus diverting resources away from manufacturing. Similarly, the booming natural resource intensive sector can reduce manufacturing sector profitability through increased competition in the capital markets (or in the labor markets). The long-term growth consequences of this 'malady' can be devastating, especially given that the natural resource intensive sector is generally relatively insular with minimal production-related forward and backward linkages to the host economy. The manufacturing sector, in turn, relies on greater division of labor, is potentially characteristic of increasing returns, and has generally stronger positive technological and pecuniary externalities through which it promotes more broad-based growth and development within the economy. The literature on Dutch disease, reviewed in Corden (1984), Neary and van Wijnbergen (1986), and Ros (2000), discusses a number of different linkages through which this deindustrialization effect can take place.

Another argument tied to the performance of natural resource rich economies is that of the role of *terms of trade* that has been a source of much controversy. The origins of the terms of trade discussion are generally attributed to the works of Raúl Prebisch (1950) and Hans Singer (1950), who argued for a presence of structural tendencies (such as low price elasticity of demand and supply, low-income elasticity of demand, innovations of synthetic substitutes, control of technological superiority, and differing labor and commodity market structures in developing and developed economies) that cause the primary commodity exporting developing countries' terms of trade to deteriorate with respect to that of developed ones (Singer 1989). The outcomes of the policies following from the recommendations of this strand of thought have been much discussed within the literature on growth and development.

Economic instability is yet another factor highlighted within the literature explaining the poor performance of natural resource rich economies. Instability is argued to be greater when an economy is either small in size (Tarshis 1986) and/or largely a mineral exporter (Gelb and associates 1988). The fluctuations in international prices of country's agricultural exports have been noted to be greater than that of manufacturing ones, given that agricultural goods' demand is price inelastic and supply varies with climatic changes (Gelb and associates 1988). Furthermore, since the demand and supply for mineral exports are both price inelastic and the former is influenced by economic fluctuations in the developed countries, the prices of mineral exports can be expected to be even more volatile (Gelb and associates 1988). Both of these tendencies can be assumed to be stronger in the case of developing economies, since their export structure tends to be more concentrated, relying on fewer primary and/or mineral exports. Under these circumstances, international price fluctuation can generate economic booms and

busts, causing instability and augmenting uncertainty, and thus, reducing investment and growth.

While at a first glance the literature on natural resources and growth gives a pessimistic impression with regards to natural resource endowments' growth generating capacity, a selective analytical survey of the economic mechanisms through which natural resources can influence growth in Ros (2000) gives a more balanced view. The model based comparison of the various linkages shows that the impact that natural resources may have upon the economy depends on the *nature* of the sector(s) a resource boom stimulates. This same notion is also present in Sachs and Warner (1999). They highlight the potential growth impetus a natural resource boom can create through a generation of a big push-like demand expansion. Furthermore, they emphasize that the potential growth effect of a natural resource boom is contingent on timing and characteristics of the sector stimulated by it. If the invigorated sector, traded or nontraded, is characterized by increasing returns, growth effects of the boom can be beneficial and of long-term nature. However, if the boom stimulates a sector not characterized by increasing returns as opposed to a one that is, causing a reallocation of resources hereby undermining the increasing returns sector, the negative growth consequences of the boom can be long lasting. While the potential for a positive stimulus is present, the preliminary empirical evidence brought forward in Sachs and Warner (1999) fortifies the conventional, negative view, at least in the case of Latin American economies, for none of the economies included in their analysis that have experienced a resource boom have attained stronger growth afterwards.

Within the development economics literature, the importance of natural resource endowment type to development and growth has been recognized most notably in Hirschman (1981), and recently, empirical evidence for it has been brought forward in a series of contributions included in Auty (2001). Hirschman (1981) broadens the notion of linkages to entail consumption and fiscal linkages, in addition to the physical production ones (backward and forward) discussed in Hirschman (1958), and applies them to primary production, illustrating that the importance of a certain linkage might arise from the nature of a particular economic activity. Mining and fossil fuel extractive industries Hirschman considers as typical 'enclaves' that give rise to very limited production and consumption linkages and hence the importance of fiscal linkage is intensified. The development promoting capacity of each linkage is equal in Hirschman's mind, though the fiscal linkage is more indirect and the most challenging one as it requires not only the ability to collect taxes but also well-designed development policy as well as the capacity to implement it and to target the funds in most productive activities (Hirschman 1981). Hirschman argues that the indirectness of the fiscal linkages leaves more room for mistargetting of the funds and even for their loss through rent-seeking. Since linkages promote development and growth, their absence can hamper it. Hence, in this view, it is plausible that improper functioning of the fiscal linkage, importance of which is bolstered by the absence of other consumption and production interdependencies, can pose a serious impediment to development in primary production activities characteristic of 'enclaves'. Though considering mining and fossil fuel extractive industries as particularly characteristic of this phenomenon, Hirschman discusses the primary production in general terms and points out how certain agricultural crops can lead to production processes with limited growth enhancing linkages. Technological factors can be of importance as backward and forward linkages in agricultural production can be missing when they require the local agents to have technological 'know how' that is beyond their capacity.

While pointing out that characteristic differences between staples can lead to distinct development outcomes, Hirschman emphasizes that the technological aspects of the staple production are not deterministic. Rather the sociopolitical environment in which the staple production takes place also bears great relevance as to whether a particular staple is able to generate more broad-based development. In this view, those economies in which production units are characteristic of enclave type economic activity, sociopolitical environment that is not conducive to coherent policy formulation and aimed at maximizing the welfare for the society as a whole can stall the development process. If, in turn, the socioeconomic environment is beneficial to long-term development, the limited development potential of the staple due to limited or nonexistent consumption and/or production linkages can be overcome through efficient management of the fiscal linkage. Akin to Hirschman, recent contributions addressing the role of natural resource endowment and its influence on political economy factors in economic development by Auty (2001), in essence, emphasize the challenges that natural resource rich economies experience in managing the fiscal linkage. The case study contributions included in Auty (2001) bring forth evidence that economies characteristic of concentrated rent flows (such as mineral economies) have underperformed relative to those in which the rent flows are more widely dispersed throughout the economy.

Given that these development economics contributions highlighting political economy factors, much like the early contributions to resource curse thesis literature, are case studies in nature and no empirical test on the fiscal linkage highlighted in Hirschman (1981) exists in cross-country framework, this contribution addresses this shortcoming and examines whether evidence for the notions brought forward in this literature, emphasizing the importance of natural resource endowment type, can be found within cross-country regression framework. If there is evidence that the type of natural resource endowment matters in the presence of social factors that correlate with poor policy environment then it is no surprise that natural resource booms especially that of oil or minerals have not had a growth boosting effect as envisioned by the big push literature.

Interestingly, as a point of departure from the general pessimism within the political economy literature on natural resource endowment and growth, Auty (2001) brings forth the argument that natural resource curse of developing countries is reversible, since policy matters. He points out that natural resource curse is only characteristic of post war development experience, as natural resource rich economies experienced a stronger growth during the nineteenth and early twentieth centuries than resource poor ones. Hence fast growth in these economies is possible. Further evidence supporting this is the fact that though natural resource rich economies have underperformed during the past three decades, even during this time one can find examples of fast growth in natural resource rich economies, even those rich in mineral exports. Botswana, a mineral rich economy, has managed to achieve the world's fastest per capita growth rate of 6.1 percent over the period of 1960-99, climbing from low-income status to upper middle-income one within a few decades.[8]

8 Other examples are Chile and Malaysia.

4 Methodology

The possible correlation between growth and natural resource endowment type 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, such as Sachs and Warner (1997b), Barro (1991), Mankiw, Romer and Weil (1992), King and Levine (1993), and DeLong and Summers (1991). To establish that natural resource endowment type in fact matters for growth in the sense that economies characteristic of 'point' rents (i.e., oil and/or mineral economies) and those with more 'diffuse' rent flows (i.e., agricultural economies) have differential impact on growth, the same regressions are also run on the latter group.

4.1 Initial conditions analysis

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.

The initial conditions relationship to growth can be summarized as follows:

$$\hat{y} = f(y_0; h_0, n_0, x_1, x_2, ...)$$

Where $\hat{y}$ denotes growth rate of real per capita income, y_0 and h_0 denote initial level of real per capita income and human capital, respectively, and n_0 and x's in turn, denote initial natural resource endowment and political economy considerations as well as other relevant variables such as institutions and geographical characteristics like climate and access to sea.

The empirical equation estimated in the first part is formalized as follows:

$$g_i = \alpha_0 + \alpha_1 y_0 + \alpha_2 h_0 + \alpha_3 n_0 + \beta_1 x_1 + \beta_2 x_2 + ... \beta_n x_n + \varepsilon_i$$

Where g_i denotes the average growth rate of country i over the period 1960-99, while α_0, α_1, α_2, and α_3 stand for a constant and estimated coefficients for initial income, human capital, and natural resource endowment, respectively. In turn, β's and x's are estimated coefficients and variables, respectively, that proxy for political considerations as well as other relevant variables such as institutions and geographical factors. Lastly, ε_i stands for error terms with the usual assumptions.

4.2 Cross-country growth regression analysis

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. 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 shortcomings of the empirical cross-country literature. Namely, the fragility of results to any given regression specification that is by now an established fact within the literature and brought forward in studies by Levine and Renelt (1992) and Sala-i-Martin (1997).

Following Barro (1997), a simple formalization of the extended neoclassical growth regression framework is as follows:

$$\hat{y} = f(y_t, y^*)$$

Where $\hat{y}$ denotes the growth rate of real per capita income, y_t is the level of real per capita income at time t, and y^*, in turn, denotes the steady state per capita income level. Due to the convergence property of the neoclassical model $\hat{y}$ is a negative function of y_t and a positive one of y^*, i.e., increase in the steady state income level as well as a reduction in the initial income level both increase the growth rate and vice versa.

The empirical counterpart of the above equation is formalized as follows:

$$g_i = c + \beta' X_i + \varepsilon_i$$

Where g_i denotes the average growth rate of country i over a specified period, while c and β stand for a constant and a vector of estimated coefficients, respectively. In turn, X_i is a vector of variables that proxy the steady state determinants for a country i, and lastly, ε_i stands for error terms with the usual assumptions.

In an attempt to establish the relative robustness of the correlation, it is tested in the presence of determinants of growth as suggested by established regression specifications, such as Barro (1991), DeLong and Summers (1991), King and Levine (1993), Mankiw, Romer, and Weil (1992), and Sachs and Warner (1997b).

4.3 Sample and data sources

The sample used in this study consists of market economies with a population of more than a half a million in 1960. Market economies are economies characteristic of nonsocialist economic organization as defined in table 7 of Gastil (1980). Within the World Development Indicators 2001 database, there are 101 economies fulfilling the above criteria, from which the following economies were excluded due to incomplete data for the period of analysis: Eritrea, Germany, Libya, Namibia, and Uganda. Furthermore, Oman was left out, as it did not fit the natural resource endowment criteria.[9] This left a total of 95 economies into the full sample for the growth failures analysis. Furthermore, Barro and Lee (2001), Easterly and Levine (1997), and Penn World Tables, mark 6 (Heston, Summers, and Aten 2001) posed additional limitations,

[9] 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 point source natural resources.

leaving 82 economies in the full sample for the initial conditions regression analysis. For a list of economies included in the sample, see Table A1 in the appendix.

The dependent variable for the initial conditions regressions, the logarithmic growth rate of real per capita income, comes from the real income series of World Development Indicators 2001 (WDI) database. 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) initial conditions, such as human capital, natural resource endowment type (point source, diffuse, 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 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 *point source economies,* and the remaining ones are defined as *diffuse economies*. The former group is characteristic of high rents under concentrated ownership and limited production and consumption linkages elevating the importance of prudent fiscal management and good policy. In the latter group, in turn, rent revenues derived from agriculture are considered to be more 'diffused', spread across the economy and hence consumption and production linkages can be expected to be much more prevalent. It is important to note, however, that the distinction between point source and diffuse 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.

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, and hence not classified by him, 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, the economies that Auty considers as large were also classified by natural resource endowment type and 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 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.

Since Hirschman argues that for the process of economic development, not only do the technological characteristics of the staple production matter but that features of the sociopolitical environment also bear relevance whether a particular linkage, most notably the fiscal one, has growth enhancing effect, cohesiveness of a society or its absence can be considered to capture the sociopolitical environment in a given country. Hence to capture the political economy challenge that a prudent management of natural resource rents face, lack of social cohesion is proxied by ethnolinguistic fractionalization index, used in Easterly and Levine (1997). They argue that a bulk of ethnolinguistic fractionalization manifests itself in poor public policies, which is also correlated with corruption according to Mauro (1995). Hence, the interaction term between point source resource endowment and ethnolinguistic fractionalization seeks to capture the culmination of rent seeking and deterioration in public and development policies in economies with concentrated ownership and limited development potential through consumption and production linkages. Alternatively, the interaction term between diffuse resource rich economies and ethnolinguistic fractionalization seeks to capture the same phenomenon in economies where rent flows are more dispersed throughout the economy, generating consumption and production linkages that are more conducive to growth.

In an attempt to establish the relative robustness of the correlation, it is tested in established regressions 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 section A4 in the appendix.

5 Empirical analysis

Table 5 modifies the previously discussed growth failures table in order to visualize the natural resource endowment types of the troubled economies. The upper half of the table presents country specific information, while the lower half provides summary statistics on the degree of growth failure and the natural resource endowment type. The data seems to confirm the previous findings within the natural resources and growth literature as it can be observed that nearly 62 percent of resource rich economies suffer from long-term growth failure, a proportion significantly greater than that among resource poor economies. Furthermore, a difference between the relative performance across resource rich economies groups can also be noted as an astonishing proportion, 77.3 percent, of point source economies suffer from a long-term growth failure in comparison to 51.5 percent of economies characterized by diffuse natural resource endowment. While close to a half of diffuse economies have experienced successful growth, as expected, the resource poor economies register the highest proportion of growth successes among all comparison groups displayed in Table 5.

Table 5 Growth Failure Economies and Natural Resource Endowment Type

Catastrophic [a]		Severe [b]	
Burundi [d]	Somalia [e]	Cameroon [d]	Guyana [d]
Central African Rep. [c]	South Africa [d]	Congo, Rep. [c]	Honduras [d]
Chad [d]	Togo [c]	Kenya [e]	Paraguay [d]
Congo, Dem. Rep. [c]	Zambia [c]	Malawi [d]	Peru [c]
Cote D'Ivoire [d]		Mali [d]	Trinidad and Tobago [c]
Ghana [f]	Bolivia [c]	Mauritania [e]	
Liberia [c]	Haiti [e]	Nigeria [c]	Iran [c]
Madagascar [d]	Jamaica [c]	Zimbabwe [d]	Jordan [e]
Niger [c]	Nicaragua [d]		Saudi Arabia [c]
Rwanda [d]	Venezuela [c]	Ecuador [c]	
Senegal [d]		El Salvador [e]	Philippines [e]
Sierra Leone [c]		Guatemala [d]	

	Degree of growth failure (%)			
Resource endowment	Catastrophic	Severe	All failures	Success
Resource rich	34.5	27.3	61.8	36.4
Point source	45.5	31.8	77.3	18.2
Diffuse	27.3	24.2	51.5	48.5
Resource poor	11.1	27.8	38.9	61.1

Note: Countries grouped according to geographical regions and listed in alphabetical order.

[a] *Catastrophic* growth failure is defined to have occurred in those economies in which current per capita income level was reached during 1960s or before.

[b] *Severe* growth failure is considered to have occurred in those economies in which current per capita income level was reached during 1980s or before.

[c] Point source natural resource economy

[d] Diffuse natural resource economy

[e] Resource poor economy

[f] Diffuse economy in which rent extraction channel is argued to operate in a fashion common to point source economies.

Further evidence on natural resource endowment type, social fragmentation[10] and growth can be found in Table 6 which groups economies according to their level of social fragmentation to two different groups (above or below average[11]) and then sorts them by their natural resource endowment type (point source, diffuse, other[12]). Average levels of social fragmentation and growth are provided for all subgroups. Both groups of natural resource rich economies, point source and diffuse, have lower average growth

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

11 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.

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

rates over the period of 1960-99 than their resource poor and developed economy counterparts. The lowest average annual growth, 0.2 percent, is recorded in point source economies with above average social fragmentation.

Table 6 Growth according to Natural Resource Endowment and Level of Social Fragmentation

	Natural resource type					
	Point source		Diffuse		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.)

Interestingly, the two groups of natural resource rich economies (point source and diffuse) record different results in terms of average growth rates with groups that have below average social fragmentation than those that have it above. In the case of point source economies, the difference in the average growth is a significant 1.3 percent in favor of economies with low social fragmentation, while for diffuse economies above average social fragmentation group actually records an average growth of 0.3 percent higher than its below average counterpart. This indicates that the level of social fragmentation potentially influences countries' economic performance in a distinct manner, depending on their natural resource endowment type.

Another interesting feature in the data is that while the level of social fragmentation in above average category is relatively equal across point source, diffuse, and poor economies groups,[13] their growth rates vary greatly across different natural resource endowment types. Resource poor economies register the highest average annual growth at 2.7 percent, while diffuse and point source economies record much lower ones at 1.4 and 0.2 percent, respectively. This provides evidence for the argument that it is not lack of social cohesion *per se* that hampers growth, rather it is its coexistence with natural resource richness, especially that of point source type that creates unfavorable conditions for sustained economic growth.

In the case of below average social fragmentation, the variance in growth performance across different natural resource endowment categories is not as pronounced. Resource poor developing economies, once again, do register the highest average growth rate (1.9 percent), however, between different natural resource endowment types, point source economies register a higher average growth (1.5 percent) than that of diffuse ones (1.1 percent). This, in turn, indicates that in societies characterized by social cohesion, the differences in growth performance across natural resource endowment types are not as significant.

Hence, the preliminary evidence in Table 6 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 point source economies (1.3 percent) than in the case of diffuse 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.

5.1 Initial conditions analysis for point source and diffuse economies

Table 7 displays the first set of growth regressions associating natural resource endowment type with growth while capturing the convergence effect with initial income and controlling for initial human 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. The first regression shows that, given initial income and human capital, both types of natural resource rich economies

[13] Group average data for resource poor economies are given in parentheses.

have performed below average. Both *point source* and *diffuse* economies in this sample exhibit a significantly lower growth, about 1.8 and 0.9 percent, respectively, than that of an average economy. Variations in initial conditions explain about 37 percent of the cross-country variation in growth rates within this sample.

Regression 2, in turn, extends the model 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. In the next regression (3), the model is augmented by an interaction term to capture lack of social cohesion in point source economies, which seeks to capture the effect that natural resource endowment of point source type, when existing with absence of social

Table 7 Natural Resource Endowment, Absence of Social Cohesion, 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								
Point source	-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)
Diffuse	-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 point source 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, section A3 for variable definitions.

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

cohesion, has over and above the separate effects by point source natural resource endowment and absence of social cohesion. The absence of social cohesion in point source economies can be expected to have a negative influence on growth, which is consistent with the estimated results, as the coefficient of this interaction term is relatively large, negative, and significant at 5 percent level.

Interestingly, the absence of social cohesion in point source economies has a larger negative effect on growth than the point source natural resource type in general (see regressions 2 and 3). Most importantly, the inclusion of the interaction term renders the qualitative variable for point source natural resource endowment statistically insignificant. This provides support for the argument 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.

Regression 4 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 dummy variables induces a minor reduction in the coefficient for the lack of social cohesion in point source economies, which, nonetheless, remains significant at a 10 percent level. The regional dummy variables, however, cause a significant change in the qualitative variable for diffuse 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.

It is important to investigate whether the aforementioned results remain robust to 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. Regression 5 expands the reduced form regression, associating the type of natural resource endowment, initial income, and human capital to growth to the square of initial income. Though the initial income term and its square both are statistically significant at 5 percent level and the explanatory power of the regression is slightly better overall than without it; likewise, the natural resource endowment coefficient remains roughly unchanged in terms of size and significance. Augmenting this regression specification to the absence of social cohesion in general, and to that in point source economies in particular, slightly increases the explanatory power of the regression. Lack of social cohesion in point source economies proves equally significant and of same size, but by itself, social cohesion does not seem to exert significant influence. Once again, the inclusion of the absence of social cohesion in point source economies renders the qualitative variable on point source economies insignificant. This provides further evidence for the argument that point source 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 investigate whether this effect is particular to economies characterized by point source natural resource endowment or whether similar negative correlation can also be

found also in the case of diffuse economies, the initial conditions regression are run on diffuse economies and lack of social cohesion in a similar manner. The results are displayed in Table 8. As before, the first and second regression verify the disappointing growth performance of natural resource rich economies and the fact that lack of social cohesion by itself does not produce a significant estimate. When the model is extended to lack of social cohesion in general and that in diffuse economies in particular, the

Table 8 Natural Resource Endowment, Absence of Social Cohesion in Diffuse 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							
Point source	-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)
Diffuse	-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 diffuse 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, section A3 for variable definitions.

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

coefficient estimate for the interaction term is positive and statistically significant at 10 percent level, indicating that absence of social cohesion in diffuse economies has the opposite effect to that in point source economies. Furthermore, the negative coefficient estimate for lack of social cohesion in general not only increases in size, but it also gains significance at 5 percent level, while the qualitative variable for diffuse economies in general remains negative and significant at 1 percent level. Interestingly, the introduction of the interaction term causes the coefficient estimate for the diffuse economies qualitative variable to increase in size and significance, in addition to which it also renders the lack of social cohesion variable statistically significant while increasing it in size as well. Though this effect is not robust to the inclusion of the continental dummy variables since in regression 4 the interaction term looses significance. Once again, the aforementioned results remain robust after the inclusion of the square of initial income term. Hence, it can be concluded that the evidence derived show support for the argument that the coexistence of lack of social cohesion in point source economies and that in diffuse economies clearly have a distinct impact on growth.

The negative correlation is specific to lack of social cohesion in point source economies as the interaction term for diffuse economies shows a positive and significant correlation for those specifications that do not control for regional dummy variables. These regression results for point source and diffuse economies are robust to the inclusion of a third natural resource endowment category, (qualitative variable for natural resource poor economies).

To investigate whether the correlations found are robust to other initial conditions, 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 point source economies. That is, the negative correlation of lack of social cohesion in point source economies remains robustly negative and relatively large in size and its introduction renders the qualitative variable for point source economies in general insignificant in all of the specifications. In the case of diffuse economies, no clear evidence for the pattern discovered is found. The interaction term between lack of social cohesion and diffuse 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. The regression results consistently show evidence for a negative correlation between the lack of social cohesion in point source economies and growth, while no such result is found in the case of economies rich in diffuse natural resources. Hence, in the next section, the robustness of lack of social cohesion in point source economies is investigated further by examining the significance of the interaction term within cross-country growth regression framework.

Table 9 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								
Point source	-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)
Diffuse	-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 point source economies		-0.022 **		-0.022 **			-0.020 *	-0.020 **
		(0.009)		(0.009)			(0.010)	(0.011)
Lack of social cohesion in diffuse 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, section A3 for variable definitions.

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

5.2 Robustness regressions for lack of social cohesion in point source economies

The lack of social cohesion in point source 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 diffuse 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 point source economies variable (SFPS) 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[14] 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 lack of social cohesion in point source economies (SFPS) 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 SFPS. 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 SFPS 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 point source 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 SFPS 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 SFPS 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 SFPS. 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.[15] The introduction of the SFPS 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.

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14 Or more accurately, the earlier version of the same paper, Sachs and Warner (1995).

15 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 point source economies remains robust in regression specifications in which a number of 'established' determinants of growth are controlled.

Table 10 Sachs and Warner (1997c)

Model: OLS		
Dependent variable: GEA7090		
Independent variable	(1)	(2)
SFPS		-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, section A4 for variable definitions and sources.

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

Table 11 Barro (1991)

Model: OLS		
Dependent variable: GEA7090		
Independent variable	(1)	(2)
SFPS		-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, section A4 for variable definitions and sources.

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

Table 12, in turn, displays the estimation results for the introduction of SFPS interaction term to a basic growth regression specification by Mankiw, Romer, and Weil (1992). Once again, controlling for lack of social cohesion in point source 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 point source 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 between SFPS and growth is robust to these specifications as well, in addition to which its introduction improves their explanatory power as in all other specifications.

Table 12 Mankiw, Romer, and Weil (1992)

Model: OLS		
Dependent variable: GEA7090		
Independent variable	(1)	(2)
SFPS		-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, section A4 for variable definitions and sources.

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

Table 13 King and Levine (1993)

Model: OLS		
Dependent variable: GEA7090		
Independent variable	(1)	(2)
SFPS		-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, section A4 for variable definitions and sources.

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

Table 14 DeLong and Summers (1991)

Model: OLS		
Dependent variable: GEA7090		
Independent variable	(1)	(2)
SFPS		-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, section A4 for variable definitions and sources.

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

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 SFPS improves the overall explanatory power of the original specification between 4 to 15 percent. Furthermore, in all specifications, SFPS 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 point source economies and growth.

6 Conclusions

This study has investigated growth failures by drawing on two different literatures that seek to explain the below average growth performance of African and natural resource rich economies. In doing so, it 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 development economics literature by Hirschman (1981) and more recently by Auty (2001). Hence, the paper has examined whether the type of natural resource endowment has a potential to influence growth through political economy considerations.

The innovation of this paper is to widen the cross-country growth regression framework to natural resource endowment type and to tie it into political economy considerations through the absence of social cohesion proxy. In doing so, this work also addresses a methodological shortcoming in the African growth literature by seeking to bridge a gap between the cross-country studies and the case study literature on this issue. More specifically, natural resource endowment type, cited as an important influence on growth within development economics case study literature, is incorporated and tested in cross-country growth framework. In the same vein, this contribution can be considered as an empirical test of Hirschman (1981) theory of linkages in staple production.

The empirical results brought forward in this study find support for the argument that mere natural resource richness does not retard growth, rather the type of natural resource endowment matters as well as its interaction with political economy considerations which potentially operate through a fiscal linkage as argued by Hirschman (1981). Namely, it is not just point source natural resource endowment that retards growth, rather it is its 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. Though it is important to recognize that this correlation is found within cross-country framework and hence no specific policy recommendations should be made based on these results, the results do find support for the immense difficulties developing countries have and the challenges they face in managing the fiscal linkage. Recognizing that political economy (or fiscal management) of resource rents in economies characteristic of primary production with limited production and consumption linkages has potentially posed an insuperable challenge for many developing economies, currently suffering from a long-term growth failure, is a step closer to shifting attention towards development policies that aim to maximize the welfare for the society as a whole as oppose to a faction of it successful in capturing those rents.

As mentioned before, there is evidence that certain economies, such as Botswana, have been able to manage the fiscal linkage in a manner that maximizes the general welfare of their society as reflected by their ability to pass from one stage of development to the next. The recognition of natural resource endowment type and the ensuing political economy considerations points to one of the possible sources of the so-called curse of natural resources, namely, the notable challenge posed by the management of the fiscal linkage.

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Appendix

A1 Tables

Table A1 List of Economies

ARG	Argentina	MUS	Mauritius
AUS	Australia	MEX	Mexico
AUT	Austria	MAR	Morocco
BGD	Bangladesh	MMR	Myanmar
BEL	Belgium	NPL	Nepal
BOL	Bolivia	NLD	Netherlands
BRA	Brazilf	NZL	New Zealand
BFA	Burkina Faso	NIC	Nicaragua
BDI	Burundi	NER	Niger
CMR	Cameroon	NGA	Nigeria
CAN	Canada	NOR	Norway
CAF	Central African Republic	PAK	Pakistan
TCD	Chad	PAN	Panama
CHL	Chile	PNG	Papua New Guinea
COL	Colombia	PRY	Paraguay
ZAR	Congo, Dem. Rep.	PER	Peru
COG	Congo, Rep.	PHL	Philippines
CRI	Costa Rica	PRT	Portugal
CIV	Cote d'Ivoire	RWA	Rwanda
CYP	Cyprus	SAU	Saudi Arabia
DNK	Denmark	SEN	Senegal
DOM	Dominican Republic	SLE	Sierra Leone
ECU	Ecuador	SGP	Singapore
EGY	Egypt, Arab Rep.	SOM	Somalia
SLV	El Salvador	ZAF	South Africa
FIN	Finland	ESP	Spain
FRA	France	LKA	Sri Lanka
GHA	Ghana	SDN	Sudan
GRC	Greece	SWE	Sweden
GTM	Guatemala	CHE	Switzerland
GUY	Guyana	SYR	Syrian Arab Republic
HTI	Haiti	THA	Thailand
HND	Honduras	TGO	Togo
HKG	Hong Kong, China	TTO	Trinidad and Tobago
IND	India	TUN	Tunisia
IDN	Indonesia	TUR	Turkey
IRN	Iran, Islamic Rep.	GBR	United Kingdom
IRL	Ireland	USA	United States
ISR	Israel	URY	Uruguay
ITA	Italy	VEN	Venezuela
JAM	Jamaica	ZMB	Zambia
JPN	Japan	ZWE	Zimbabwe
JOR	Jordan		
KEN	Kenya		
KOR	Korea, Rep.		
LBN	Lebanon		
LSO	Lesotho		
LBR	Liberia		
MDG	Madagascar		
MWI	Malawi		
MYS	Malaysia		
MLI	Mali		
MRT	Mauritania		

A2 Stage of development groups

To avoid sample selection bias, the income groups are defined according to country's income status in 1960 (i.e., in the beginning of the period). Since the World Development Report categorizing countries into different income groups was first published in 1978, an identical method for determining income groupings to that of the contemporary period is not available. The income definition used by UNCTAD to determine least developed countries in 1972 was considered as an alternative, since today their income criterion is matched to that of the World Bank low-income economies. However, it was inapplicable because it pertained to a later time period, nearly a decade later than the initial period, and, in addition, it is based on per capita GDP as oppose to GNP as per the World Bank Atlas method.

Therefore, to determine 1960 income groups, countries were separated into different stages of development groups by observing the earliest per capita GNP estimate (circa 1960), calculated using the World Bank Atlas method. This analysis led to the following stage of development groupings. Low-income countries are considered to be those with per capita GNP equal to $170 or below. Lower middle-income economies are those with income between $170-$300. Upper middle-income countries, in turn, are defined as those economies with per capita GNP between $340-890. Lastly, the high-income country group contains economies with per capita income greater than $890. For those countries with deficient estimates of per capita GNP in the series in question, their relative income status was defined based on the earliest estimate available with reference to the approximate growth rate over the period.

Based on the above criteria, the income groupings for 1960 are as follows (group averages and country estimates of per capita GNP included in it are in the parentheses. Per capita GNP estimate is not reported when the economy's relative income status was defined based on the earliest available estimate with reference to the growth rate over the period):

1 High-income economies ($1848):

Argentina ($1,110), Australia ($2,010), Austria ($1,210), Belgium ($1,610), Canada ($2,440), Denmark ($1,900), Finland ($1,570), France ($1,820), Israel ($1,330), Italy ($1,140), Netherlands ($1,410), New Zealand ($1,960), Norway ($1,880), Sweden ($2,570) Switzerland ($2,340), United Kingdom ($1,720), United States ($3,390). [17]

2 Middle-income economies ($402):

Upper middle-income ($585): Chile ($670), Costa Rica ($390), Cyprus, Greece ($740), Hong Kong ($620), Iran, Ireland ($890), Jamaica ($600), Japan ($810), Jordan, Mexico ($450), Panama ($510), Peru ($340), Portugal ($420), Saudi Arabia ($430), Singapore ($540), South Africa ($500), Spain ($600), Trinidad and Tobago ($740), Turkey, Uruguay ($700), Venezuela. [22]

Lower middle-income ($246): Bolivia, Brazil ($230), Colombia ($300), Congo, Dem. Rep. ($220), Cote d'Ivoire ($200), Dominican Republic ($270), Ecuador ($210), El Salvador ($280), Ghana ($210), Guatemala ($300), Guyana ($280), Honduras ($200), Lebanon, Liberia ($220), Malaysia ($300), Mauritius ($300), Morocco ($190),

Paraguay ($200), Syrian Arab Republic ($270), Tunisia ($230), Zambia ($210), Zimbabwe ($300). [22]

3 Low-income developing economies ($109)

Bangladesh ($110), Burkina Faso ($70), Burundi ($80), Cameroon ($130), Central African Republic ($80), Chad ($110), Congo, Rep. ($160), Egypt ($160), Haiti ($70), India, Indonesia ($70), Kenya ($100), Korea, Rep. ($130), Lesotho ($60), Madagascar ($130), Malawi ($50), Mali ($60), Mauritania ($120), Myanmar, Nepal ($70), Nicaragua ($160), Niger ($170), Nigeria ($220), Pakistan ($100), Papua New Guinea ($140), Philippines ($170), Rwanda ($40), Senegal, Sierra Leone ($160), Somalia ($70), Sri Lanka ($160) Sudan ($110), Thailand ($120), Togo ($110). [34]

A3 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).

DIFFUSE ECONOMIES: Qualitative variable that takes the value 1 if an economy is a diffuse natural resource economy; 0 otherwise. Economy is defined as diffuse 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 DIFFUSE ECONOMIES: An interaction term between diffuse economies and lack of social cohesion variables.

LACK OF SOCIAL COHESION IN POINT SOURCE ECONOMIES: An interaction term between point source 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).

POINT SOURCE ECONOMIES: Qualitative variable that takes the value 1 if an economy is a point source natural resource economy; 0 otherwise. Following Auty (2001), economy is defined as point source 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).

A4 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 point source 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).