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SUB-SAHARAN AFRICA AND THE "RESOURCE CURSE": LIMITATIONS OF THE CONVENTIONAL WISDOM

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Contents

Abstract

The existence of a natural resources curse is widely accepted in academic and policy circles. With its focus on institutional quality, the resource curse thesis is symptomatic of the current 'good governance' agenda. This paper subjects the thesis to critical evaluation and finds it wanting. It is argued that empirical evidence is *ad hoc* and theoretical explanations remain weakly developed. The need for more nuanced approaches is confirmed by exploratory empirical techniques. The thesis does not provide a robust basis for practical interventions. Rather, acknowledgement of our ignorance is a first step towards widening policy space and promoting local solutions.

1. Introduction

Natural resources have been central to debates about economic development since Malthus and Ricardo. Rising global commodity prices, instability in the Middle East and the industrial expansion of major emerging market economies all reinforce the centrality of natural resources in contemporary political agendas. While prevailing ideas come and go, intellectual sway currently is held by the notion of a natural resources curse. In its strong form this argues that natural resource wealth undermines economic growth under weak institutional conditions. As Keynes emphasised, however, ideas such as these 'both when they are right and when they are wrong, are more powerful than is commonly understood' (1936). Not only has a broad consensus developed around the resource curse thesis, but its contours also are clearly discernable in the policies of advanced countries. For sub-Saharan Africa, a region unevenly blessed with extensive untapped natural resources but also mired in poverty, the relationship between natural resources and development thus demands close examination.

This paper undertakes a critical evaluation of the resource curse thesis. From an epistemological perspective, the knowledge claims associated with the thesis can only be considered preliminary. Our understanding of the dynamic relationship between economic rents, institutions and growth is at an early stage. Available explanations for resource curse symptoms amount to a set of plausible narratives rather than adequate theories. Existing approaches also do not sufficiently take into account the distinctiveness of natural resource rents vis-à-vis other factors that contribute to weak institutional conditions. Consequently, simple hypotheses concerning the relationship between natural resources, institutions and growth are hard to sustain and empirical evidence cannot be regarded as conclusive in the absence of adequate explanation. We are not in a position to recommend general policy 'fixes' to a presumed resource curse. Rather, there is a strong case for greater domestic policy experimentation and adaptation – a recommendation backed by the historical experiences of successful resource-based developers.

This paper makes three main contributions. First is the application of an epistemological framework to a debate that has been predominantly empiricist in orientation. This is important given the practical influence of the resource curse thesis. Secondly, a new measure of resource wealth is developed that updates and improves upon existing metrics. Thirdly, exploratory empirical techniques are used to review the adequacy of simple resource curse hypotheses that have dominated the literature to date. Regardless of the resource wealth measure used, the results confirm that any adequate theory of how natural resources affect development must embrace a wider range of factors than natural resources alone.

The paper is structured as follows: Section 2 starts with some background on extractive industries, both in general terms and in sub-Saharan Africa (SSA). Section 3 introduces the resource curse thesis and Section 4 provides a critical analysis of its epistemological status. Based on these analytical findings, Section 5 undertakes exploratory log-linear modelling and rank correlation simulations to review the empirical robustness of resource curse hypotheses. Section 6 reflects on how the resource curse debate can move forward and policy implications; Section 7 concludes.

Before continuing, a few clarifying remarks are in order. Rather than discussing natural resources *in toto*, the focus is on what are known as point resources or extractive industries. These refer to hydrocarbon, metals and mineral reserves which, among other things, represent crucial primary inputs for industrial development including energy production.[1] Secondly, while this paper is primarily concerned with SSA, much of the discussion is generic to developing countries given the broad sweep of the resource curse thesis. Thirdly, as indicated, the paper does not seek to debunk the argument that natural resources may have been inimical to growth in some countries. Examples ranging from Nigeria to Papua New Guinea plainly show there is no automatic mechanism by which countries benefit from the extraction and sale of natural resources. What is at stake, however, is the extent to which we can make valid general claims about how natural resources affect economic development.

Finally, many of the critiques advanced in this paper apply to wider discussions about governance and development. The resource curse thesis coheres tightly with the dominant 'good governance' agenda and can be considered an epi-phenomenon of a broader discourse. However, the empirical turn in development economics has left an ambiguous role for theory (Mookherjee, 2005) and there is often little discussion of the validity of empirical results beyond their econometric merits or tenuous association with stylized 'toy' models. The argument of this paper is that acknowledgement of our ignorance may be a more solid basis for policy than the false certainty of preliminary empirics.

[1] Hereafter the term 'natural resources' is used to refer to this specific subset of resources.

2. Extractive industries

2.1 WHY ALL THE FUSS?

The extraction of non-renewable natural resources is distinctive from an economic point of view. Raw natural resource assets are specific (non-reproducible) and immobile, thus enabling their owners to benefit from scarcity rents, analogous to Ricardian land rent. These will be large where marginal costs of extraction are low relative to the world price of the commodity – a well-known feature of crude oil located at shallow depths, such as in Saudi Arabia. Importantly, however, the value of scarcity rents depends on numerous individual aspects of any extraction project. This includes the quality of the mineral deposit, its size, difficulty of access and distance to export hubs or demand sources. These features are relevant due to the temporally uneven distribution of costs and benefits in large-scale, capital intensive extraction. Significant exploration and start-up costs mean that the cumulative present value of profits from a given project may only turn positive after a number of years. Consequently, relevant economic incentives for operators are highly sensitive to the legal and financial structure of mining contracts over long time periods. Future prices are not known with certainty and, historically, have been highly volatile. How access rights to mineral reserves are defined is also crucial due to the long duration of mining activities as well as that fact that the exact geological dimensions and location of reserves are not known precisely (see below). These give rise to bargaining problems that can affect investment, exploration and extraction rates in the sector.

In addition, the nature of extractive industries in developing countries is often considered to be of an enclave nature. That is, they are oriented to external markets and may have few linkages to the domestic economy. In large part this is because mineral deposits can be situated in remote locations, which are distant from established markets and pools of domestic resources (physical, financial, human). The comparatively weak development and innovative capacity of domestic industries may mean there are few domestic sources of demand for the commodity itself, at least in its raw form. The small size of domestic markets compared to advanced countries also may weaken the economic case for establishing large-scale processing of the raw material in the host economy.

Finally, the existence of large (potential) rents in the natural resources sector frequently gives rise to fierce debates over their appropriate distribution. This is not only the case where the public sector wishes to tax the profits of private operators. There also can be major disagreements between the central treasury and state-owned operators as to how revenue flows are managed.

Even so, it is widely agreed that the public should claim a substantial share in natural resource rents. This is enshrined in the United Nations Declaration which affirms: "The right of peoples and nations to permanent sovereignty over their natural wealth and resources must be exercised in the interest of their national development and of the well-being of the people of the State concerned" (General Assembly resolution 1803, 14 December 1962). The same principle is reflected in the commonplace definition of natural resource wealth as a form of (natural) capital that is comparable to other 'stocks' of national wealth such as physical and human capital. At least in an *a priori* sense, all this indicates a general expectation that natural resource wealth should make a positive contribution to national welfare.

2.2 RELEVANCE FOR SUB-SAHARAN AFRICA

Of what relevance are natural resource industries to sub-Saharan Africa (SSA)? Despite data weaknesses (see Section 4), the historical importance and potential of natural resource industries in SSA is well established. This was not lost on former colonial powers. The description of the Kantanga region of the Congo as a 'veritable geological scandal' by colonial era geologists is well-known (Meredith, 2005). Analogous opinions concerning the region's large (untapped) natural resource deposits are heard today. Echoing the role mineral wealth played in the race for African territory during the late 19th century, the Financial Times of London states that a "new scramble for Africa's resources" is taking place (January 28, 2008), demonstrated by the fastest expansion in oil and gas exploration of any region of the world over the past decade. Significant finds of petroleum (among other resources) in Ghana, Equatorial Guinea, São Tomé & Príncipe, Chad, Sudan and Uganda over the past few years substantiate this claim.

Table 1 provides estimates of the net present value of hydrocarbon, metals and minerals reserves for SSA compared with other regions. These refer to information for 2005 and have been compiled from the latest production and reserves data (where available). The methodology and underlying data sources are described in Appendix A. The table indicates that on average the SSA region is reasonably but not excessively endowed with natural resources. The SSA region holds around 5.6% of global hydrocarbon and 13% of minerals and metals reserves (by value). Together these are worth approximately US$ 1,895 billion, or 6% of global natural resource wealth.

Table 1: Estimates of natural resource wealth by group (region)

	Crude oil	Gas	Hydro-carbons	Metals & minerals	Total (US$, billions)	Av. per capita (US$)
High income countries:						
OECD	2,994	805	6,026	374	6,400	11,864
non-OECD	6,404	863	7,268	1	7,269	207,304
Developing countries:						
Latin America & Caribb.	1,580	397	2,106	467	2,573	5,378
Mid. East & North Africa	2,191	1,997	4,193	8	4,201	9,849
Europe & Central Asia	1,284	3,127	5,997	211	6,208	6,946
S.E. Asia & Pacific	479	556	2,800	320	3,121	1,644
Sub-Saharan Africa	832	345	1,686	199	1,885	4,577
TOTAL	15,764	8,089	30,075	1,582	31,657	17,654
High income as % total	59.6	20.6	44.2	23.7	43.2	-
SSA as % total	5.3	4.3	5.6	12.6	6.0	-

Notes: variables are as described in the text; also see Appendix A
Source: author's calculations

In light of the themes of this study, the modesty of the SSA region's natural resource wealth should be underlined. Of the groups shown, SSA has the lowest level of natural resource wealth by total value despite containing the largest number of countries. However, reflecting the low population densities found across much of SSA compared to other developing regions, SSA's resource abundance in average per capita terms ranks sixth out of the seven groups – placed between South East Asia (seventh) and Latin America & Caribbean (fifth). On both absolute and per capita measures SSA thus ranks well below the higher income economies as well as the Middle East and North African (MENA) developing countries. This is reinforced when we categorise countries into three equal groups (by numbers) corresponding to high, medium and low per capita natural resource wealth.[2] Given in Table **2**, this shows that the SSA region contains the highest proportion of resource poor countries, (20/44 = 45%), as well as a relatively low proportion of resource rich countries by global standards, indicated by the resource rich deviation measure. Of course, one should not dismiss the *relative* economic significance of natural resources in SSA given it has the lowest average income per capita of all groups.

[2] This is equivalent to cutting the data into three groups with divisions running at the 33.3 and 66.6 percentiles respectively.

Table 2: Distribution of countries by natural resource abundance (% within group)

	Count	Resource abundance			Res. rich
	N	Low	Medium	High	deviation (%)
High income countries:					
OECD	22	21.7	43.5	34.8	-5.8
non-OECD	11	36.4	18.2	45.5	34.6
Developing countries:					
Latin America & Caribb.	24	41.7	20.8	37.5	11.1
Mid. East & North Africa	11	27.3	27.3	45.5	61.5
Europe & Central Asia	23	13.0	47.8	39.1	15.9
South East Asia & Pacific	19	31.6	52.6	15.8	-53.2
Sub-Saharan Africa	44	45.5	25.0	29.6	-12.5
ALL	154	32.9	33.6	33.6	0.0

Notes: resource abundance groups are as described in the text; "resource rich deviation" refers to the percentage difference between the observed and expected number of resource rich countries (abundance = high) for the group (region), the latter being based on the null hypothesis that resource riches per capita are randomly distributed across countries – a positive result indicates the group has a higher than expected count of resource rich countries.
Source: author's calculations

Two other points stand out from these tables. Firstly, the high income countries account for a large share of resource wealth of all forms, but particularly hydrocarbons. This reflects the inclusion of some of the major Middle Eastern oil producers (e.g., UAE, Saudi Arabia and Kuwait) in the high income category, as well as Canada and the United States which also have large hydrocarbon reserves. Secondly, hydrocarbon fuels dominate other natural resources commodities in terms of their contribution to total natural resource wealth. This reflects both the size of the underlying reserves and the high value of these commodities under current global conditions. Thus, hydrocarbons (and especially oil and gas) should be seen as a distinctive form of resource wealth compared to other sources. Notably, however, while hydrocarbons are important in various cases such as in the Gulf of Guinea, resource wealth in SSA does not stem purely from these sources. A wide variety of minerals and metals are found in SSA, including very large reserves of specific mineral assets that are not prevalent elsewhere (e.g., cobalt, industrial diamonds, phosphate rock, platinum group metals, vermiculite and zirconium).

The dominant role of foreign companies in resource extraction in SSA also can be highlighted. Given the technical sophistication and capital intensity of large resource extraction projects, it is commonplace for multinational corporations (MNCs) rather than domestic firms (private or public) to dominate the mining sector in lower income countries. Even exploration for new deposits is often both initiated and undertaken by MNCs, with public agencies taking an oversight (regulatory) role only. In SSA, therefore, it is unsurprising that there have been substantial inflows of foreign direct investment (FDI) into the natural resources sector. According to data

compiled by UNCTAD (2007), summarised in Table 3, levels of foreign ownership in the petroleum sector appear to be highest in SSA at around 57%. Of all regions SSA also recorded the largest jump in the share of foreign production in oil and gas sectors over the period 1995-2005. These figures may under-estimate the true role of MNCs in SSA as they consider the share allocated to the public sector under production service agreements (PSAs) or other contract forms to be part of domestic production, even though exploration and extraction frequently is undertaken by MNCs (see notes to Table 3). This is the case in Angola, for example, where the government's petroleum agency Sonangol (*Sociedade Naçional de Combustíveis de Angola*) is the sole concessionaire for oil exploration and field development. However, since its formation in 1976 the agency has developed no in-house exploration or extraction capacities. As Morris puts it, the government's involvement in the oil business amounts to little more than 'signing rights away, waiting, and cashing out' (2006: 235). Although patchy, the available evidence therefore suggests that domestic or public agencies in SSA play a comparatively small role in resource extraction activities.

Table 3: Percentage of oil and gas production undertaken by foreign companies (by region)

	1995	2005	Change
Developed economies	-	36.0	-
Europe	46.8	35.9	-10.9
North America	-	34.0	-
Developing economies	17.8	18.9	1.1
North Africa	12.0	26.4	14.4
Sub-Saharan Africa	35.4	57.2	21.8
Latin America & Caribb.	10.7	18.4	7.7
West Asia	9.4	3.5	-5.9
Other Asia	40.5	32.1	-8.4
S.E. Europe and CIS	2.5	10.8	8.3

Note: Oil and gas production by foreign companies refers to extraction carried out by *and* attributed to majority foreign-owned firms under PSAs, concessions, joint ventures or other contractual forms. Foreign company participation through pure service contracts is excluded. For each block or field of production, annual production has been split between the firms involved according to their net percentage share of the output.
Source: UNCTAD, 2007: Table IV.2

Lastly, it is widely recognised that natural resources have an important strategic dimension. These considerations are especially pertinent in SSA due to the location of major African petroleum fields on the Eastern side of the Atlantic, providing easy transport to North America and Europe. The United States of America has adopted an explicit policy of reducing dependence on oil from the Middle East and sees Africa as a major source of supply over the medium- and long-term. The U.S. undersecretary of state for African Affairs, Walter Kansteiner, put this clearly in 2002: "African oil is of national strategic interest to us, and it will increase and become more important as we go forward." (quoted in Morris, 2006: 226). At the same time, China and other industrialis-

ing developing economies also have identified Africa as a key future source of fuel and minerals. In part this reflects the fact that there are significant unexplored areas in Africa and, as already noted, the region is highly dependent on foreign firms in the natural resources sector. Furthermore, MNCs from emerging economies may have a comparative advantage over firms from the OECD that often fear reputational and even legal complications (*inter alia*) from operating in high-risk, low income environments.[3] Emerging market firms also may have greater credibility in and experience of operating in these difficult contexts. For example, China's policy of "non-interference" represents a stark contrast to historical relationships between Africa and advanced countries and may act in China's favour. Although the full implications of these trends remain to be seen, the issue is that access to Africa's natural resources is an increasingly critical factor in global geopolitical dynamics.

3. The resource curse thesis

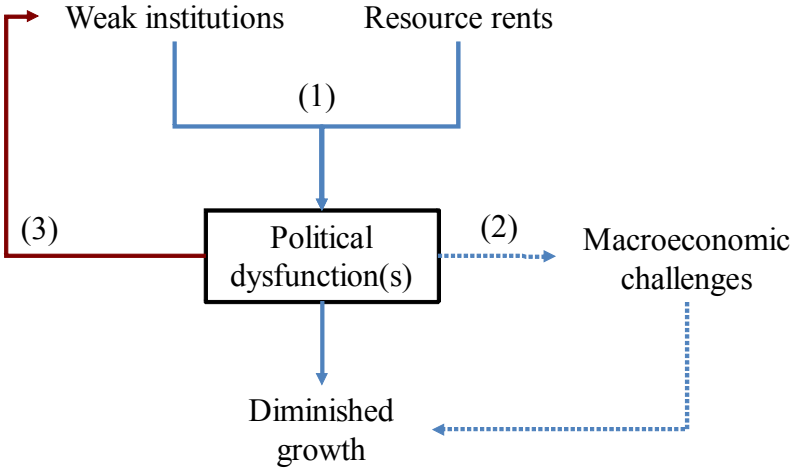
Discussion of the relationship between natural resources and economic development tends to concentrate on the existence of a 'natural resource curse' or 'paradox of plenty'. The extensive literature on this topic has been surveyed at length (Isham et al., 2003; Davis and Tilton, 2005; ICMM, 2006; Rosser, 2006) and need not be repeated here. Crudely put, the thesis contends that natural resource wealth can diminsh rather than support economic growth in developing countries. Debate around this question has progressed in two main phases. During the 1990s, attention focussed on the empirical association between economic performance and natural resource wealth. Seminal contributions here include Auty (1990) and Sachs and Warner (1995; 2001), which affirm the existence of a resource curse among developing countries. From the late 1990s to date, a second phase in the literature has sought to uncover the mechanisms behind the resource curse, often taking its empirical existence as a given.

Weak and strong versions of the thesis can be distinguished. The weak version starts by recognising that a number of countries have wasted or gained little from their natural resource wealth. Widely cited cases of resource 'failure' include Nigeria, Angola and the Democratic Republic of the Congo. Sala-i-Martin and Subramanian (2003), for example, estimate that although over US$

[3] The experience of Talisman Energy in Sudan is a case in point. Following allegations of involvement in genocide, law suits lodged in the United States and threats of divestment by major shareholders forced the company to pull out of the country, selling its interests to the overseas arm of India's (public sector) Oil & Natural Gas Corporation.

350 billion has been earned in oil rents in Nigeria since 1965, poverty has risen from 19 to 90 million people and per capita GDP has remained stagnant. At the same time, the principle that natural resource wealth can support sustainable economic development is admitted. This is a conventional perspective that derives directly from the definition of natural resources as a stock of 'natural capital' (Davis and Tilton, 2005). Supporting evidence for the positive developmental effects of resources comes from Norway, Canada, Australia, Chile and Botswana among others. The argument is that there is no automatic relationship between natural resource wealth and economic growth; but this does not amount to a general theory.

Figure 1: Schematic representation of the 'resource curse' hypothesis



Over recent years, a consensus has emerged around a stronger version of the thesis. This builds on the empirical results of earlier studies and provides a generic explanation for the (presumed) curse. The general form of explanation is outlined schematically in Figure 1 and goes as follows: where weak governance institutions occur alongside large natural resource rents [arrow 1] then political dysfunctions emerge, which in turn undermine economic growth.[4] Different studies tend to stress different kinds of political pathology; these include corruption (Kronenberg, 2004), rent-seeking (Mehlum et al., 2003), inefficient investment (Sala-i-Martín and Subramanian, 2003), and authoritarianism (Jensen and Wantchekon, 2004). These political pathologies are determined by the extent of discretion over public funds and the size of natural resource rents. An outcome of

[4] As one author summarises the mainstream view: "In short, when governance is poor, resources can be a development 'curse'. Unable to control corruption and manage revenues wisely, the government is unable to capture the benefits. Without the rule of law, the government is unable to implement legal, regulatory, and policy solutions that would allow it to control the costs and risks." (Thomas, 2004: 7)

these processes is an erosion of existing domestic institutions [arrow 3] or at least the persistence of poor governance. Reflecting substantial analytical work regarding Dutch Disease phenomena, macroeconomic difficulties [arrow 2] also often are viewed as symptoms of policy failure. This is because technical interventions have been identified to ameliorate, if not fully mitigate, the macroeconomic and fiscal effects of large (volatile) foreign exchange inflows (e.g., IMF, 2007). Orthodox recommendations include establishing binding fiscal rules and investing (saving) a minimum proportion of revenues in overseas assets. Thus, failure to implement suitable policies is seen to be symptomatic of weaknesses at the political level.

Stylization of any viewpoint runs the risk of caricature. However, the emergence of a broad-based consensus around institutional or governance explanations for a resource curse has been noted elsewhere (Dietsche, 2007). Although stated at different levels of sophistication, the same basic position is encountered in eclectic sources, ranging from academics to activists. An exhaustive review by the World Bank's Operations and Evaluation Department is illustrative:

> Many resource-rich countries perform worse than resource-poor countries in key aspects of development … Much research, at the WBG [World Bank Group] and elsewhere, has been done to better understand and address this paradox. The emerging consensus is that the underperformance of resource-rich developing countries is not inevitable, because most of the factors that explain it result from institutional and policy failure. ... creating good governance is at the heart of the institutional and policy changes needed to sustain sound fiscal management and maximize the benefits from the extraction of mineral resources. (Liebenthal et al., 2003: 1-2)

The opinion of the World Bank is significant given its self-proclaimed function as a knowledge bank, linking funding to policy advice (Kapur, 2006). Indeed, the core ideas of the strong thesis are echoed at the Bank's operational level. For example, a recent technical annex of a project to support 'sustainable development of natural resources' in Afghanistan states:

> Worldwide experience shows … that resource-rich countries have grown more slowly than resource-poor countries since the 1970s ... Good governance is essential to avoid misallocation of national resources that could lead to increased poverty, corruption, and conflict. (World Bank, 2006a: 39)

Policy advice outside the Bank also takes the resource curse as an empirical reality, thereby motivating far-reaching interventions such as immunising the deleterious effects of rents on

public institutions via direct distribution to the population (e.g., Birdsall and Subramanian, 2004). Variants of the strong thesis are repeated frequently in academic circles, as well as among a diverse range of NGOs (e.g., Power, 2002). In the *Economic Journal*, for example, Mehlum et al. conclude that: "the quality of institutions determines whether countries avoid the resource curse or not." (2006: 16). Finally, popularisation of the thesis into general politico-economic laws confirms its status as an established consensus. Collier (2007) suggests a law of the 'survival of the fattest' to describe electoral competition in the context of natural resources and weak institutions; Friedman's 'First Law of Petro-Politics' (2006) holds that oil prices and political freedoms in oil-rich states move in opposite directions. In sum, there is substantial agreement around a strong version of the thesis.

4. Status of the debate

4.1 PRELIMINARIES

To evaluate the resource curse thesis it is necessary to reflect on the nature of the knowledge claims it makes. One can hardly criticise a speculative theory for failing to be comprehensive; but speculation cannot be a valid basis on which to construct policy. From this perspective, the weak version of the thesis is uncontroversial and does not necessitate further analysis. The stronger version, however, seems to make bolder claims that add-up to a more coherent and general position. This becomes clear when one condenses the strong thesis into its four principal claims, namely: (i) conditional on pre-existing weak institutions, a resource curse operates as an empirical regularity; (ii) mismanagement of public resource rents is its defining feature; (iii) weak public sector governance is the fundamental explanatory mechanism; and (iv) an appropriate solution is to improve governance conditions. Thus, the strong thesis would appear to combine explanation, tested empirical predictions and policy advice. As elaborated below, these features are often associated with 'good' quality research.

Table 4: Outline of stages in empirical research

Stage	Characteristics	Desirable outcomes
1. Pre-theory exploration	• Empirical description • Exploratory analysis	• Empirical puzzles • Hypotheses of interest
2. Theory development	• *As-if* models • General theory • Applied theory-models	• 'Good' theory • Unique & falsifiable hypotheses
3. Theory testing	• Hypothesis testing • Robustness tests	• Non-falsification • Valid inference
4. Application	• Prediction • Policy design	• Praxis

Appearances can be deceptive. A useful starting point to evaluate the claims of the strong resource curse thesis is through the lens of the different stages of empirical research. Following Haavelmo (1944) and others, four broad stages can be distinguished. Outlined in Table 4, these trace the process through which robust (social) scientific knowledge is generated. The first point to note is that although empirical work plays a dominant role (Stages 1 and 3), theory is indispensable. As set out in the famous 'measurement without theory' debate (Koopmans, 1947), empirical results alone do not provide an adequate understanding of observed patterns or the extent to which they may occur more generally over time and/or space. *Ad hoc* empirics provide only *ad hoc* insights (Colander, 2000). Theory is necessary to delimit the domain of inquiry, identify all non-negligible relationships and distinguish between spurious and systematic behaviour (Wacker, 1998). It also is essential for explanation and prediction, in turn laying the foundation for credible policy-making (Bear and Orr, 1967; Koopmans, 1947). Secondly, attempts to falsify theoretical predictions are essential for making genuine advances in (social) scientific knowledge. Predictions that cannot be easily falsified, at least in principle, are seen as uninformative. This is encapsulated in the movement from the 2nd to the 3rd research stage where good theories are subjected to empirical testing. Of course, conclusive falsification in a Popperian sense is unattainable as per the Duhem-Quine thesis; however, a fallibilist perspective accepts that over time a theory can be refuted where it fails to produce new insights and its presumed veracity comes to rely on degenerative problem-shifts (Salanti, 1987). Thirdly, the research process does not progress in a neat linear fashion, but often involves iteration between stages. Even so, it is reasonable to expect that the move to praxis (Stage 4), such as policy-making, should be predicated on the satisfactory completion of prior steps. In other words, policy-making needs to combine good theory with strong empirics.

The recent phase of the resource curse literature has given greater attention to theory, suggesting a maturation of the research process. Evaluation of the status of these contributions turns on the degree to which they approximate the requirements of 'good' theory, suitable for progression to (interaction with) Stage 3 testing. But, what constitutes 'good' theory? This is a controversial topic in the philosophy of science and cannot be resolved here. However, there is sufficient consensus to argue that theories are more than a set of hypotheses or empirical predictions. A good theory provides a distinctive and credible explanation for how, why and when particular outcomes occur and not otherwise (Wacker, 1998; Sutton and Staw, 1995).[5] There is also an important distinction between models and theories. In and of itself a model does not constitute 'good' theory; rather, its adequacy derives from the explanatory capacity of the general theory on which it rests. At the same time, models play a key role in theory development and, as such, often take two main forms (Goldfarb and Ratner, 2008): (Type I) the highly abstract 'toy' models, used for working through the general principles of a theory in stylised and unrealistic scenarios; and (Type II) applied theory-models that seek to fit general theories to data for the purposes of testing. Both have their part to play; but, as argued by Rogeberg and Nordberg (2005), it is a mistake to see the 'as-if' (Type I) models of Stage 2 research as anything more than useful building blocks for further theory development and exploratory empirics.

4.2 HALLMARKS OF EARLY STAGE RESEARCH

The preceding exposition is useful because it provides a coherent take on a number of seemingly disparate weaknesses in the resource curse thesis. According to the research stages framework, many contributions to the strong thesis resemble Stage 1 or early Stage 2 efforts. Most obviously this applies to the initial phase of the literature that was strictly empirical in orientation (i.e., Stage 1), but to date remains an essential reference to 'confirm' the existence of a curse. This applies to the frequent use of Barro-type growth regressions in the resource curse literature, including recent studies in line with the strong thesis. Such models are theoretically ambiguous, in the sense that they are reduced-form and informal specifications which can incorporate a wide range of competing theories. This is captured in criticisms of the *ad hoc* choice of explanatory variables and the difficulty of valid interpretation of coefficients (Temple, 1999; Fine, 2000). Unsurprisingly, a

[5] This is in contrast to Milton Friedman's instrumentalist position, which considers only the predictive capacity of a model as its mark success. However, the so-called 'F-twist' has been widely rejected across the social sciences and the role of theory in providing credible explanations is well accepted. Wacker (1998) also suggests the following desirable features of any 'good' theory: uniqueness, conservatism, generalizability, fecundity, parsimony, internal consistency, empirical riskiness and abstraction.

wide range of specifications have been employed to study the resource curse. However, many of these seem to overlook important results from the wider growth literature. For example, Iimi (2007) does not include physical capital investment as an explanatory variable in his growth regression; also, Sachs and Warner (2001) do not control for differences in human capital (e.g., schooling). Omitted variables can produce inconsistent results and, in any case, these kinds of regressions essentially only describe the long-term correlates of growth. In this vein it is understood that simple linear growth regressions are not appropriate to test for multiple growth equilibria (Temple, 1999); but it is exactly these kinds of growth traps which the strong resource curse thesis describes. In sum, many of the empirical techniques used to investigate the resource curse are *ad hoc* in nature and do not provide reliable tests of credible theories.

A second point is that the institutional models employed to explain the occurrence of a resource curse are distinctly of the 'as-if' variety. On the one hand, explanations attached to early empirical studies were explicitly acknowledged to be stories rather than well-developed theoretical structures (Isham et al., 2005). Although adding sophistication, recent theoretical contributions remain highly stylised and *ad hoc*. For example, Mehlum et al. (2006) imagine an economy populated by grabbers and producers; Robinson et al. (2006) construct a neo-classical political economy model based around three policy choice variables – the resource extraction rate, public sector employment and public sector wages (taxes or transfers are zero). These are useful, but they are as yet inadequate for progression to later research stages precisely because the theory on which they are constructed is weakly developed. Although it is not always clear *what* theory is being applied, many models used to address the resource curse have a clear affinity with a rational choice approach. As a theory of institutions this school has been roundly criticised. Any observed behaviour can be deemed 'rational' depending on preferences and discount rates, leading one scholar to describe rational choice as a "universally applicable construct that simultaneously explains everything and therefore nothing" (Smelser, 1992: 403). The predominant rational choice explanation for institutions is functionalist (Pierson, 2000). A political pathology persists if its benefits outweigh the costs for political actors. However, this is a static account that gives minimal room for how institutions emerge or change over time. Germane to our case, it does not illuminate why weak institutions may have been optimal prior to the discovery of natural resources. Leading economic theorists explicitly admit our considerable 'ignorance' about how institutions evolve and affect development. Moreover, they argue that theory development should focus on the implications of social conflict over the distribution of resources (Acemoglu et al., 2005: 463-464) – issues that are not adequately captured by existing models with homogenous representative agents.

This discussion points to a more general observation about the type of theory appropriate for understanding how natural resources affect development. Applying the classic argument of the second best, one notes that if the core problem is an absence of robust institutions *before* discovering natural resources, then a first best solution is to identify and tackle the root causes of these weaknesses. Consequently, (rents from) natural resources must be understood in the context of other factors that shape the emergence and persistence of institutions. In this regard, it is striking that governance-type explanations for the resource curse are indistinguishable from other arguments about the impact of rents on political decisions. Rents accruing to the public sector from alternative sources (e.g., import duties, public companies, foreign aid etc.) are seen to have comparable effects to natural resource rents (Djankov et al., 2007). It is widely recognised that where two theories are identical then they should be considered a single theory (Wacker, 1998). Thus, an adequate theory pertaining to the resource curse debate must be a more general theory of institutions that applies to a wide range of rents. Perhaps this insight is unoriginal; but it holds significant implications for empirical investigation. It says that an appropriate theory-model from which testing can proceed must accommodate a variety of influences over institutional outcomes. Alternatively, if something specific is to be said about natural resources, then one must identify the distinctive effects of these rents vis-à-vis other factors that also promote political pathologies (which also must be controlled for). However, this strategy is notable only by its absence from previous studies that rely predominantly on isolated hypotheses about natural resource rents.[6] This point is taken up further in Section 5.

4.3 BRIDGING THEORY AND EMPIRICS

A further set of weaknesses refers to the models employed to test for a resource curse. Three distinct problems arise. Firstly, key concepts are vague and operationalized in highly problematic ways. In common with the wider 'good governance' literature, the notion of institutions frequently is stated at such a high level of generality that it tends towards an empty truism (i.e., good governance is that which generates good outcomes). Broad notions of governance are often criticised for their definitional ambiguity (Grindle, 2007), making them little more than 'general figure[s] of speech' and devoid of operational meaning (Doornbos, 2001: 107). In the absence of guidance as to the relevant defining properties of institutions, the validity of any empirical proxies becomes uncertain. The expansion of governance indicators that has characterised the recent development literature only reflects the absence of clear theoretical limits to these measures. It is not surpris-

[6] An exception here is Djankov et al. (2007) who include both aid and oil rents in their empirical analysis; however, other potential sources of rent are excluded.

ing, therefore, that contributions to the resource curse debate use an eclectic mix of empirical proxies, often running regressions across a wide array of individual institutional dimensions (e.g., Iimi, 2007). These studies bear a striking resemblance to 'measurement without theory', the point being that any genuine advance in understanding is more likely to come from improving the formal conceptual definitions rather than more sophisticated empirics.

Similar definitional problems apply to the concept of natural resource abundance. Taking recent models as an appropriate starting point, the formal notion of resource abundance generally refers to the expected present cumulative value of natural resource rents accruing to the public sector. A major problem is that the empirical proxies predominantly employed in the resource curse literature bear little resemblance to this concept. Following Sachs and Warner (1997, 2001), the most common proxy is the ratio of natural resource exports to GDP at a specific historical point, often 1970. Similarly, Papyrakis and Gerlagh (2004) use mineral production in GDP and Iimi (2007) uses natural resource exports per capita. These proxies suffer from a generic problem – as measures of resource dependence they reflect the outcome of multiple political and economic processes and, thus, proxy for the level of development. A stylized fact of less developed countries is their heavy reliance on raw primary commodity exports alongside a weak manufacturing sector. Hypothetically, two countries with an equal flow of rents from natural resources would differ on dependence measures owing to differences in national income and/or the extent to which resources are used as intermediate inputs into domestic production. Thus, these kinds of proxies may be endogenous for regression purposes and it is doubtful whether they accurately capture the underlying variable of interest.[7]

In recognition of the empirical inadequacy of resource dependence measures, alternatives can be employed. Data on production and/or underlying natural resource reserves have been used to calculate the net present value of the flow of rents from these assets (World Bank, 2006b; Appendix A).[8] Such measures of resource abundance are considerably closer to the desired theoretical concept of resource wealth and, consequently, are to be preferred. Of course, technical problems are encountered when it comes to estimation and data quality is not consistent across countries.

[7] Some studies acknowledge the possibility of endogeneity and employ internal instruments, such as lagged values of the resource measure (e.g., Iimi, 2007) or a fixed historical value (e.g., Sachs and Warner, 2001). Technically speaking, such strategies for dealing with endogeneity are not entirely satisfactory and remain contested. For example, export structure is highly persistent and past observations may have a direct effect on long-run growth rates. As a result, the exclusion restriction required for valid instrumentation may not be fulfilled.

[8] Some authors use pure production or reserve volumes (e.g., Brunnschweiler, 2008), but these also stray from the underlying concept of rental income and are not analysed here.

There are also outstanding ambiguities surrounding how resource rents can be made comparable across countries (e.g., standardization by population or income) and how differences in the government take (share of total rents) should be dealt with. Nevertheless, it is remarkable that recent studies continue to employ measures of resource dependence despite having an explicit theoretical focus on resource rents (e.g., Mehlum et al., 2006).

A second problem is the incomplete treatment of causal relationships. According to Wacker (2002) a 'good' theory must include a fully explained set of conceptual relationships. It has been noted that the strong resource curse thesis gives an incomplete treatment of institutional evolution. In addition, the volume of natural resource rents may be affected by development outcomes (Stijns, 2005). It is uncontroversial to argue that advanced countries have access to higher levels of finance, technology and expertise to explore and assess their mineral potential. In contrast, the actual reserves of lower income countries may be poorly quantified *due to* low levels of development and security. This reflects the general point that mineral reserves are not fixed and known, but are substantially determined by current knowledge and institutions (Wright and Czelusta, 2002). Case studies of the developmental trajectory of the United States (David and Wright, 1997), among others such as Norway, show that direct public sector support for local adaptation of technologies and the development of deep and extensive knowledge networks around strategic natural resources have been critical to success.[9] Maloney (2002) suggests the Chilean government's failure to promote local knowledge of copper mining helps explain the relative weakness of the industry compared to that of the United States during much of the twentieth century.

The same point is relevant for the share of rents going to the public purse. A number of studies argue that liberalisation of investment regimes across Africa (and globally) during the 1990s has led to an excessive decline in the government take from resource projects operated by multinationals (Campbell, 2003). Empirical verification is frustrated by the specificity of individual mining projects, a lack of relevant data and differences in risk-premia demanded by MNCs for operating in poor countries. Even so, it stands to reason that the volume of resource rents going to the public purse is not 'manna from heaven' but rather reflects complex endogenous processes, including how resource contracts are negotiated and the nature of foreign involvement in the sector. To this author's knowledge, no study seems to have adequately addressed this issue either theoretically or empirically.

[9] Note that technical knowledge has properties of a public good and therefore may not receive adequate investment through private sector activity alone.

The preceding discussion raises the spectre of external influences over resource management outcomes. A dominant theme of the globalization debate refers to the increasing power of corporations versus the nation state. The commission of ethically and legally dubious acts by MNCs in the resources sector hardly needs mention, exemplified by the complex deal-making pursued by Elf Aquitaine in Africa during the 1980s and 1990s (Shaxson, 2007).[10] However, the relationship between political elites and MNCs goes beyond orthodox cases of corruption. As noted by Moran (2008), MNCs in developing countries often support the intricate domestic private business networks of political elites. Such activities exploit a loophole in the anti-corruption guidelines (regulations) operating in advanced countries as these exclude all practices that are permissible in the host country, where conflict of interest legislation often is inexistent. Thus, relations between domestic elites and external actors (MNCs) may be critical for sustaining the 'poor' governance conditions lamented by advocates of the resource curse thesis. However, the same thesis fails to give due account to external factors and, instead, treats countries as 'lithe leviathans' (Kenny, 1999) with complete autonomy and foresight over domestic policies.

In similar fashion, there is a lack of clarity as regards *how* institutions and natural resources interact. On the one hand some studies focus attention towards the effect of resources on institutional quality (e.g., Sachs and Warner, 1995), while others emphasise the direct effect of resources on growth under different institutional conditions (e.g., Mehlum et al., 2006). Similarly, while many studies focus on what happens under high levels of resource wealth, there is minimal discussion of what is expected to occur in its absence. In other words, the counterfactual case is left open. This is aggravated where, alongside the deleterious effects of resource wealth under poor governance, it is also argued that resource wealth can boost growth under 'good' institutions (Robinson et al., 2006). Thus, is the relevant growth benchmark all resource poor countries? What happens to growth under weak institutions *and* low resource wealth? Do threshold effects operate and, if so, where do these lie? Grappling with these questions is crucial if we are to develop distinct, concrete and refutable hypotheses. At a deeper level these weaknesses indicate that available explanations fail to account for the considerable diversity of experiences under different combinations of resources and institutions. We observe numerous slowly-growing countries that are both poorly governed and resource-scarce. The Gambia, for instance, saw a significant deterioration in political freedoms during the 1990s; but this had nothing to do with its minimal (known) natural resource wealth (Saine, 2008). Resource-rich Bolivia, on the other hand, has shown substantial improvements in its formal institutional environment compared to the early

[10] One Elf Aquitaine insider claimed that over a period of 20 years the company spent around US$40 million per year on bribes to politicians worldwide ('Angola rejects bribery claims', BBC News, 20th July, 2000).

1980s, but growth has been unexceptional. A better understanding of this variation is needed before we can speak of a curse that is particular to natural resources.

Finally, and reflecting the above weaknesses, a major concern with existing explanations for a resource curse is their ambiguous empirical implications. A defining feature of 'good' theory is that it generates concrete predictions that can be refuted in the sense of being possible to identify outcomes that would be inadmissible. However, the literature provides multiple, sometimes conflicting, hypotheses that cannot easily be proven false. Partly due to the conceptual ambiguity of 'good institutions', it often is not clear when an observation would be inconsistent with the strong resource curse thesis. This is obvious in the case of Indonesia. According to governance scores, political freedoms in Indonesia deteriorated significantly during the 1980s and 1990s alongside corruption on a grand scale. However, this was accompanied by rapid growth in *per capita* income at over 5% per year (1980-1997). The interpretation given by Robinson et al. (2006) is that this success derives from good macroeconomic policies pursued by technocrats who were free from substantial political manipulation. This may be correct; but it only serves to illustrate the flexibility of what counts as 'good' institutions.[11] The heyday of minerals exploration and industrialisation in the United States also did not take place in a context that conforms to 'good governance' by today's standards. Of course, a feat of historical reinterpretation may show how some feature of the institutional environment enabled resource-based success.[12] Yet if we can simply fit definitions to suit the circumstances, then any model becomes irrefutable and of little practical value.

5. An exploratory contribution

5.1 EMPIRICAL METHOD

Inconsistencies and ambiguities are all part of a healthy research process and do not invalidate previous studies. However, they do illustrate that the current research programme is at an early

[11] An alternative argument is that the oil sector was somewhat isolated from political interference because the allocation and management of forestry concessions was the main focus of political machinations, particularly by President Soharto.

[12] In contrast, historians of the period have argued that the infamy of America's robber barons had the unintended consequence of encouraging entrepreneurship and generating a broad constituency for political reform.

stage. The explanatory apparatus is both incomplete and conceptually vague. Much remains to be done and constructive iteration between exploratory empirics and theory development would seem appropriate. This section takes up this challenge. It seeks to investigate the validity of simple or isolated hypotheses about how natural resources affect development under varying institutional conditions. To date, these have dominated the resource curse literature. However, one of the insights gained from the preceding analysis is that a 'good' theory about how natural resources affect development may need to incorporate (*inter alia*) non-resource factors that have analogous effects to resource rents. Absent this wider context, the growth prospects of resource-poor countries are ambiguous and it becomes difficult to distinguish the unique effects of natural resources from other factors that promote political dysfunctions.

The analysis employs two exploratory techniques. Regression-based approaches are eschewed for reasons already discussed. There is also a more basic motivation – given the widespread assumption that some form of resource curse holds, one would expect this relationship to be manifest in the data independent of specific techniques. In other words, if exploratory techniques are unsupportive, then evidence for the thesis must rely on the additional sophistication of advanced methods which may be *ad hoc* where strong theoretical backing is missing. Additionally, exploratory analysis is designed to identify the kinds of hypotheses that appear fruitful for further theoretical and empirical work (Tukey, 1980). They are flexible techniques that are suited to early stage empirical research; notably, existing resource curse empirics have been distinctly confirmatory in orientation due to their (exclusive) reliance on econometrics.

The first technique involves log-linear modelling, which takes as its starting point the formulation of data into ordinal categories. An advantage of this approach is that it is not necessary to distinguish between independent and dependent variables. Rather, one can handle all observed variables as 'responses', thereby sidestepping endogeneity concerns (Agresti, 2007). The influence of (moderate) measurement error in the response variables may be diminished by a categorisation approach. Also, these models do not impose specific (linear) restrictions on interaction terms from the outset, but rather allow these restrictions to be tested. However, there are obvious limitations to log-linear analysis – e.g., loss of information from reducing continuous variables into ordinal categories. Consequently, a second exploratory technique is employed which retains the variables in continuous form. This focuses on the simple hypothesis that under weak (strong) institutional conditions there will be a negative (positive) association between economic growth and resource wealth. It does so by estimating the rank correlation between growth and resource wealth for successive sub-samples, formed by removing individual countries in systematic fash-

ion.[13] For the hypothesis that resource wealth is detrimental to growth under weak institutions, one orders observations in sequence of declining institutional quality and removes from top to bottom – described as a backward simulation. For the story that resource wealth boosts growth under 'good' institutions the opposite ordering is pursued – described as a forward simulation.

5.2 DATA

With respect to the resource curse, the critical relationships of interest are between economic growth (G), institutions (I) and natural resource wealth (R_i). As noted above, different estimates of resource wealth are available. Following previous studies, resource dependence (R_d) is calculated as the average ratio of fuel and mineral commodity exports to GDP for 1990-2005 from World Bank (2006c).[14] The preferred measure of resource abundance (R_a), which estimates the expected net present value of public resource rents per capita, is described in Appendix A. The methodology broadly replicates the World Bank's (2006b) estimates of per capita subsoil wealth, but has a number of advantages. These include: (i) data for reserves rather than production have been used where possible; (ii) the data refers to 2005 in terms of both volumes and prices; and (iii) various minerals of importance to low income countries have been incorporated. The latter is pertinent as the World Bank's dataset does not account for diamonds, cobalt or platinum metals for which SSA has well known large reserves. Regarding the suitability of 2005 as a reference point, it might be argued it is better to employ a date prior to the period of growth under analysis. While this is correct from an econometric viewpoint, a practical problem is that new discoveries often take many years to come into production and/or enter official (global) statistics. Even so, their political ramifications may be felt much earlier due to changed expectations about future resource rents. In any case, given the long-term horizon of the abundance measure, the choice of start date is unlikely to make a major empirical difference in the absence of vast new discoveries. Arguably, recent data also is better quality and can be preferred on these grounds.

The pairwise rank correlations between alternative resource wealth measures are given in Table 5. As to be expected, there are strong positive correlations across all variables. However, it is evident that the dependence and abundance measures are not equivalent and may be capturing different effects. Figure 2 investigates if there is any pattern to this. It does so by plotting the rank of each country by resource dependence versus resource abundance, including only those cases with a rank difference of more than 35, (note the lowest rank is at position one). The main find-

[13] This has affinities with the Hansen test for parameter stability used in a regression context.

[14] Specifically, this includes exports of fuels, ores and metals.

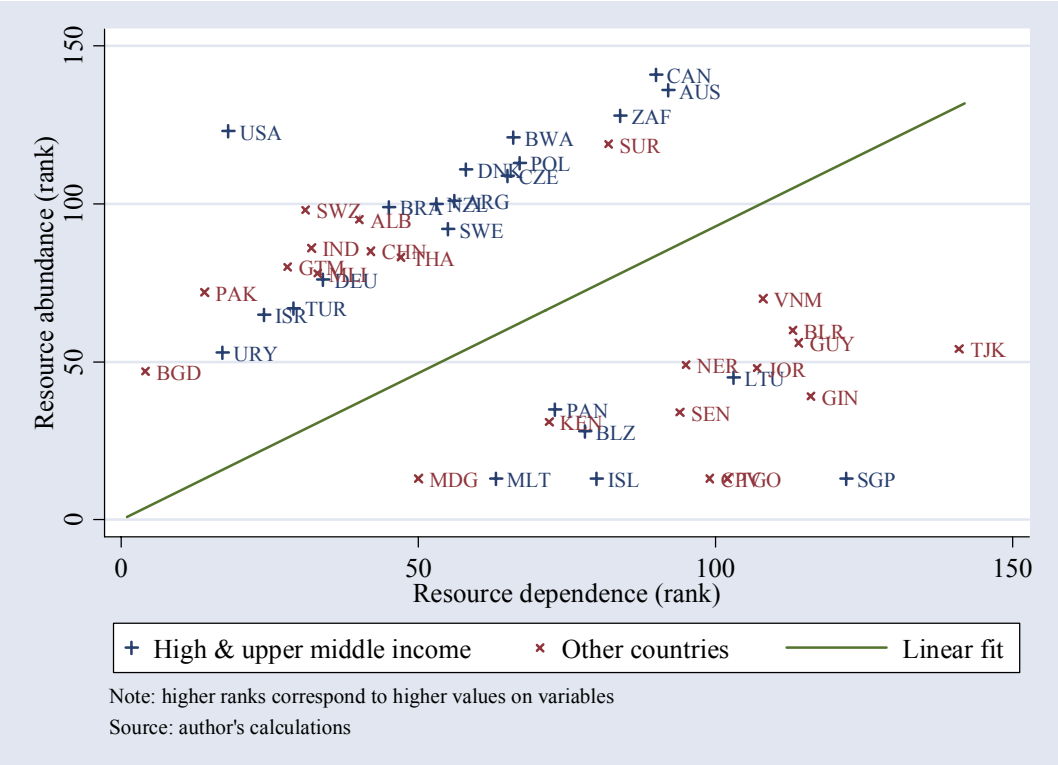
ing is that countries above the fitted line, which receive a lower rank on the dependence measure compared to resource abundance per capita, are predominantly high or upper middle income (and vice versa). The United States, for example, ranks 18th on resource dependence (mineral exports to GDP) but 123rd (of 144) on resource abundance per capita. This reflects the considerable development of its non-mining sectors and the intensive use of natural resources as inputs for processing industries. In short, the resource dependence measure appears not to be independent of past developmental outcomes.

Table 5: Correlation matrix for alternative resource wealth measures

	var.	R_d	R_{dx}	R_s	R_a	R_{ag}	R_m
Resource dependence (% GDP)	R_d	1					
Resource dependence (% exports)	R_{dx}	0.941	1				
Subsoil abundance (per capita)	R_s	0.616	0.626	1			
Resource abundance (per capita)	R_a	0.580	0.604	0.754	1		
Resource abundance (% GDP)	R_{ag}	0.676	0.719	0.639	0.915	1	
Mineral abundance (per capita)	R_m	0.213	0.265	0.315	0.500	0.299	1
Hydrocarbon abundance (per capita)	R_h	0.553	0.600	0.790	0.842	0.800	0.214

Note: all coefficients are Spearman rank correlations and are significant at the 5% level
Source: variables (R_d) & (R_{dx}) calculated from World Bank (2006c); R_s is from World Bank (2006b); R_a to R_m are author's calculations (see Appendix A for further details).

Figure 2: Relationship between resource dependence and abundance measures



Note: higher ranks correspond to higher values on variables
Source: author's calculations

The measure of institutional quality is the 2005 average of three key governance measures in the *Governance Matters V* dataset (Kaufmann et al., 2006), which are widely employed in the literature.[15] Growth is taken as the average per capita GDP growth rate for the period 1990-2005 calculated from the World Development Indicators (World Bank, 2006c).[16] Earlier periods are excluded, mainly as the 1980s were marked by significant structural adjustment across a large swathe of lower income countries, as well as declining commodity prices, which may contaminate the analysis.

5.3 LOG-LINEAR ANALYSIS

The log-linear analysis employs a simple 3×3×2 design, with growth taking two levels. Note that the variables are categorized to create groups with equal numbers of observations. This is somewhat arbitrary but reasonable in the absence of strong priors over where dividing lines should be drawn. Following standard techniques, a hierarchical analysis is undertaken whereby a saturated model is compared against increasingly less sophisticated (more restricted) models that exclude higher-level interaction terms.[17] In the present case, the highest level of interaction found in the saturated model refers to a three-way interaction term (i.e., *RGI*). Moving down the hierarchy, restrictions are placed on the two-way interactions (e.g., *RI*, *GI*) while the most basic model is that of complete independence in which all variables enter separately. As the saturated model exactly predicts the observed frequencies, likelihood ratio tests can be used to decide whether restrictions on the saturated model are statistically significant. The ordinal nature of the variables used here also allows some parsimony to be achieved, where appropriate, by using linear interaction terms in place of multiple dummy variables used for strictly categorical data.

Table 6 gives the results of the hierarchical analysis for the resource abundance (R_a) and dependence (R_d) measures.[18] For each specification, denoted by models 1 through 7, a robust Poisson maximum likelihood model is estimated and the log-likelihood ratio calculated. This statistic, also known as the deviation, compares the fit of the restricted specification against that of the saturated model. When insignificant, one cannot reject the null hypothesis that the restricted model is

[15] These are: voice and accountability, rule of law, and control of corruption.

[16] Sub-sets of this period were also examined but do not alter the principal conclusions (results available from the author on request).

[17] See Agresti (2007) for elaboration.

[18] Other resource wealth measures were analysed in the same fashion with no effect on the principal conclusions (results available from the author on request).

valid. The table also provides the conditional odds ratios for the two-way interaction terms in each specification. These present the ratio of the odds of observing the 'lowest' combination of the two variables to the odds of observing the same combination in which one of the variables takes on its 'highest' value. For example, the *RG* interaction gives the comparative odds of low growth under low versus high resource wealth.[19] The absent third variable (e.g., institutions) represents a conditioning factor as three-way interactions are only included in the saturated model (not shown). Where the odds ratio is not significantly different to one, then the odds of observing either of these two combinations can be treated as equivalent, meaning that the interaction term does not have explanatory power for the specified model.

Table 6: Results of log-linear analysis by General Linear Modelling

	Log-linear results		Odds ratios, by interaction term					
	Deviation stat.		RG		RI		IG	
Model // Measure	R_a	R_d	R_a	R_d	R_a	R_d	R_a	R_d
1 IG, IR, RG (HA)	4.0	2.6	1.76	1.27	0.77	1.42	4.32**	3.72**
2 IG, IR, RG (LA)	10.8	12.7	1.76	1.27	0.78	1.40	4.1**	3.95**
3 RI, IG	12.7	13.0	1	1	0.94	1.51	4.01**	4.01**
4 RG, RI	22.6**	24.5**	1.66	1.37	0.94	1.51	1	1
5 IG, RG	11.1	14.0	1.66	1.37	1	1	4.01**	4.01**
6 R, IG	12.7	14.1	1	1	1	1	4.01**	4.01**
7 I, G, R	24.3**	25.6**	1	1	1	1	1	1
Preferred model	No. 6	No. 3	1	1	1	1.51	4.01**	4.01**

** indicates significant at 5% level.
Notes: deviation gives the likelihood ratio of the specified model versus the saturated model; odds ratios are the conditional ratios for the two-way interaction terms as described in the text; preferred model is derived from information criteria scores; R_a and R_d are the abundance and dependence measures also described in the text.
Source: author's calculations

A key result is that the three-way interaction terms are redundant for both resource measures. This is given by the insignificance of the deviation statistic for models one and two, which include all two-way interaction terms only and, thus, suggests we can treat the data as a situation of homogenous association. The implication is that the interaction between resources and growth (*RG*) is the *same* across different levels of institutions. This rejects the prediction of a conditional effect of resource wealth as per the strong resource curse thesis. Looking at the *RG* odds ratio for these first two models, the interpretation is that conditional on the institutional environment, the odds of low growth are higher for resource poor countries versus the resource rich. However, as

[19] Note for these models the odds are all relative to the base category which comprises the lowest combination of the variables of interest.

these odds are insignificant we cannot reject the null hypothesis that the odds of low growth are invariant to resource wealth, (conditional on given institutional conditions).

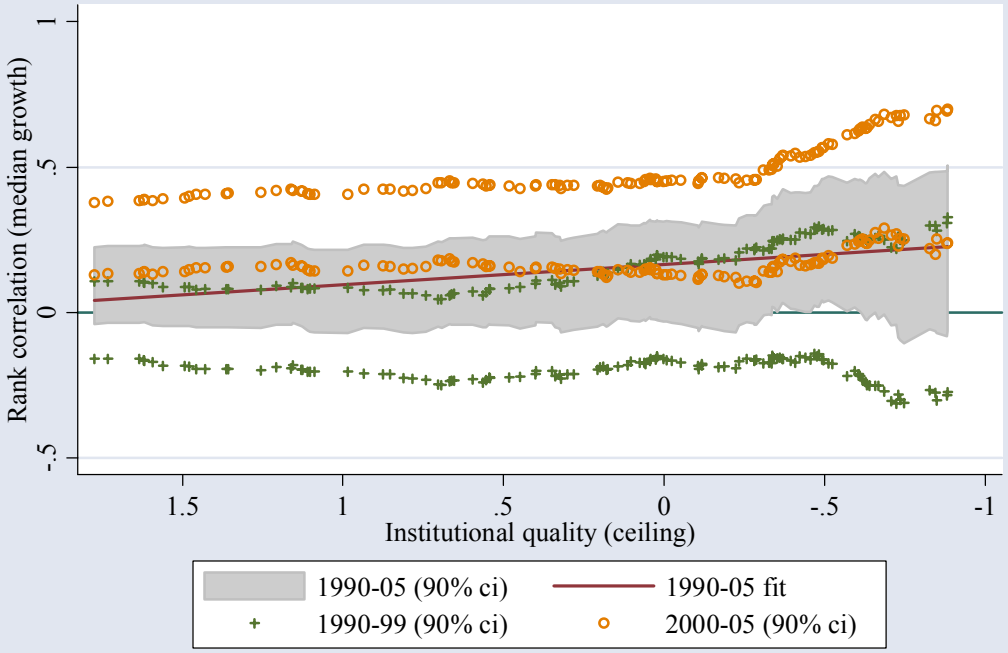
Taking the analysis further, two additional points can be made. Model six, which excludes all interactions between *R* and the other variables, cannot be rejected for either of the two measures – i.e., growth and institutions are jointly independent of resource wealth. According to information criteria scores, model six is preferred against all other specifications including the saturated model for the resource abundance variable. By the same method, the preferred model for resource dependence is model three. However, even here the conditional odds ratio for the *IR* interaction term remains insignificant and LR tests indicate that a restriction placed on model three to give model six cannot be rejected. Secondly, the strong interaction between institutions and growth cannot be ignored. Taking the preferred specification for each resource measure, the conditional odds of low growth are around four times higher under low as opposed to high quality institutions. While this confirms much of recent theorising about economic growth, the key point is that this relationship is invariant to the level of resource wealth. Low growth is just as likely under low quality institutions whether a country is resource rich or resource poor. This confirms the argument that an adequate theory needs to consider a broader range of factors that contribute to poor governance outcomes. To put it another way, one needs to account for the diversity of resource-based experiences – including cases that combine low growth, weak institutions and low resource riches (e.g., Niger, Malawi).

5.4 SIMULATION ANALYSIS

The same conclusions are confirmed by the simulation results. These are shown in Figures 3 to 6 for the two principal resource wealth measures (R_a and R_{di}).[20] Depending on the direction by which the sample is ordered, the *x*-axis shows either the maximum or minimum institutional quality for the sub-sample. The *y*-axis refers to the Spearman's rank correlation coefficient for the selected sub-sample. Note that the figures include results for the entire period (1990-2005) as well as two sub-periods (1990-99; 2000-05). In each case the 90% confidence intervals around the correlation coefficient are shown; the linear fit refers to the full sample only and the grey shading denotes the confidence intervals around the full period coefficient path.

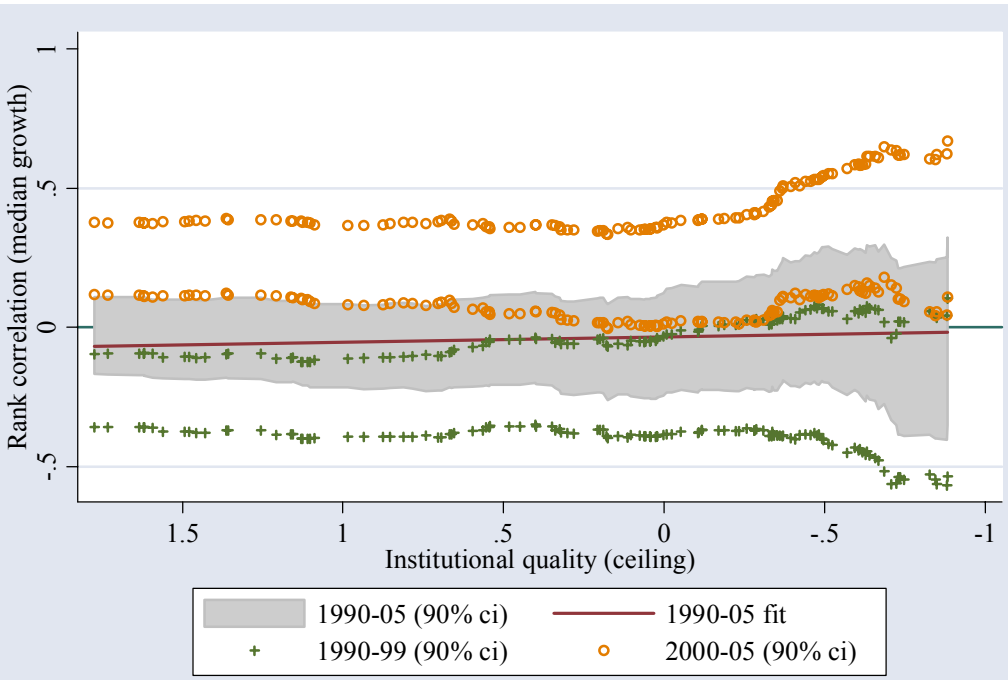
[20] Simulations also were run for subsoil wealth per capita (R_s) but the results were equivalent to the preferred resource abundance measure and are not shown.

Figure 3: Backward simulation for resource abundance (R_a)



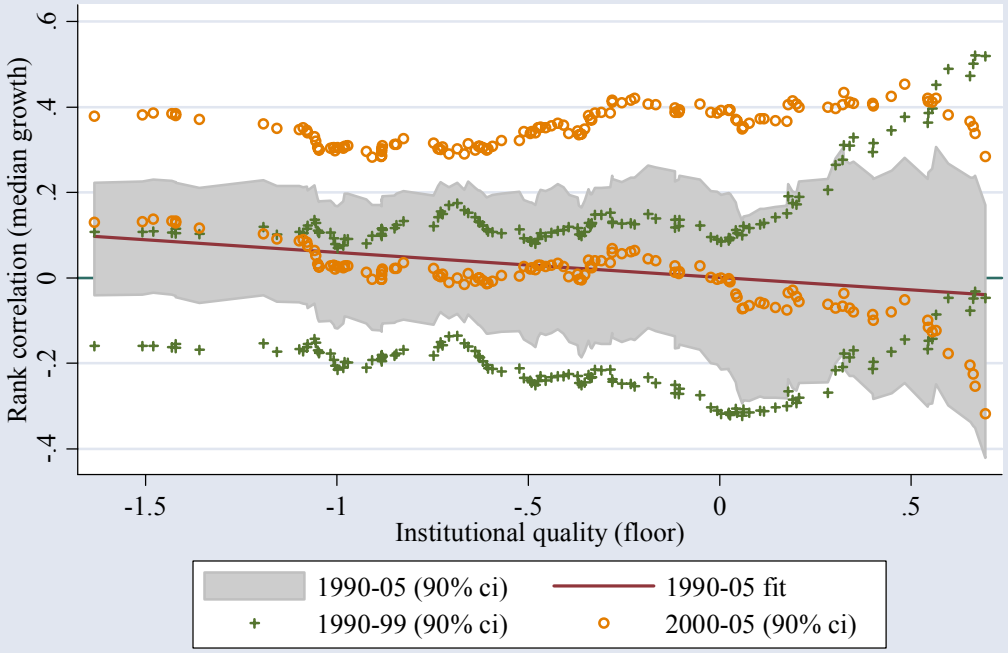
Note: simulation as described in text
Source: author's calculations

Figure 4: Backward simulation for resource dependence (R_d)



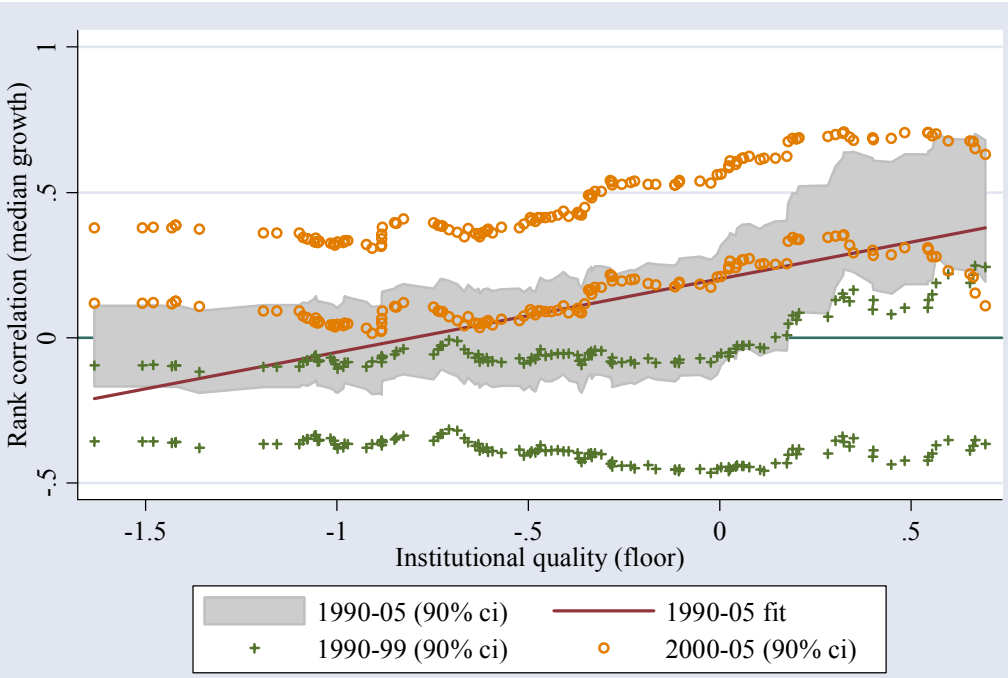
Note: simulation as described in text
Source: author's calculations

Figure 5: Forward simulation for resource abundance (R_a)



Note: simulation as described in text
Source: author's calculations

Figure 6: Forward simulation for resource dependence (R_d)



Note: simulation as described in text
Source: author's calculations

Focussing on the backward simulations first, the hypothesis of lower growth conditional on weak institutions cannot be supported for any of the resource measures or periods analysed. Neither is there a significant negative rank correlation between resource wealth and growth overall, nor does this correlation decline when the analysis is restricted to sub-samples with lower quality institutions on average. For the forward simulations a similar story emerges. Results for the resource abundance measure show no clear trend in the rank correlation between resource wealth and growth as institutional quality improves. Although, the resource dependence measure would seem to support a conditional benefit argument both for the full period and 2000-06 (see Figure 6), this should be interpreted with caution. For the 2000-06 period the correlation coefficient is positive (and significant) *throughout* the simulation path, suggesting a general positive effect from natural resources regardless of institutions. In contrast, for 1990-99 the correlation path remains close to zero with no rising or falling trend. The sharp distinction between the two sub-periods makes the full period results difficult to interpret and may well reflect the effects of global dynamics such as terms of trade movements and/or shifts in the attractiveness of resource-rich economies for foreign investment (commodity cycles).[21] This is reinforced when one recalls the observation that measures of resource dependence reflect export structure and, therefore, may proxy for a country's mode of insertion in the global economy.

5.5 SUMMARY

The message from this analysis is that there is no systematic or unequivocal relationship between resource wealth and growth under alternative institutional conditions. The kinds of simple hypotheses suggested by the resource curse thesis cannot be supported. Although these results are only exploratory and should not be viewed as conclusive, they do highlight the importance of *multiple* factors in shaping growth outcomes. The diversity of resource-based experiences needs to be explained; meaning a restrictive focus on natural resources must be rejected. There is no robust evidence for a growth curse that is particular to natural resources; only a more general curse of weak institutions can be found. In turn, this points to the need for a more general theory of institutions not just more *ad hoc* empirics.

It also has been argued that resource dependence measures are unsuitable for empirical analysis of the resource curse thesis. This supports the results of previous studies which conclude that

[21] Of course, econometric approaches can control for this by including terms of trade movements within the list of regressors. However, it remains to be established that the latter embraces the full range of relevant external factors, including (structurally-induced) fiscal crises that beset many lower income countries during the 1980s and 1990s.

when measures of resource abundance are used, evidence for the resource curse is ambiguous and, in some cases, outright contradicted (Stijns, 2005; Brunnschweiler, 2008; Brunnschweiler and Bulte, 2008). The exploratory findings go further. They corroborate the empirical fragility of the resource curse thesis and extend this to all measures, at least for the period 1990-2005.

6. Moving the debate forward

6.1 A CRITIQUE OF CURRENT PRACTICE

The analysis of Sections 4 and 5 provides a platform to reflect on the practical implications of the prevailing resource curse thesis. It has already been noted that the notion of a resource curse exerts a distinct influence over policy. A starting point for progressing beyond this agenda is to recognize the extensive gaps in our understanding about the relationship between natural resources and development. The debate is far from over and we are not in a position to recommend robust general solutions. An implication of this stance is the need for a healthy dose of scepticism as regards the interventions proposed to deal with (presumed) resource curse phenomena. Most obvious among there are the widespread calls for 'good governance'. In the absence of a deeper grasp of how institutions evolve (and persist), as well as a better fix on the concept of governance itself, such calls are hollow and devoid of practical content. This point has been made before (Grindle, 2007) and are echoed in critiques of institutional mono-cropping (Evans, 2004), whereby Anglo-American institutions are identified as ideal-types. Notably, this practice is embedded in the widespread use of governance indicators which consistently give top marks to the liberal democracies of Western Europe and North America.

The danger of overconfidence in formal institutional fixes is demonstrated by the experience of the Chad-Cameroon pipeline. Billed by the World Bank as a model for dealing with potential resource curse phenomena, best practice revenue management systems were established including a multi-stakeholder oversight group (*Collège de Contrôle et de Surveillance des Ressources Pétrolières*) and placement of oil revenues into an offshore escrow account over which the Bank had some control. However, as described in detail elsewhere (Kojucharov, 2007; Pegg, 2005) the project has been beset with problems. In 2006 the Bank froze lending to Chad due to the government's failure to fulfil social expenditure commitments. Despite reaching an interim agreement, ongoing security problems culminated in the evacuation of all World Bank personnel from Chad in early 2008 and the application of emergency Presidential decrees which nullify revenue management

agreements.[22] This experience confirms Robinson's (2005) argument that where the underlying political equilibrium is 'good', external reforms or fixes are not needed. Where the equilibrium is less benign, however, it is naive to think that external actors can design and impose politician proof mechanisms.

Two further examples substantiate the importance of holding modest expectations for the effectiveness of externally shaped interventions in the natural resources sector. The first of these concerns the Extractive Industries Transparency Initiative (EITI), launched in September 2002 with the aim of enhancing the transparency of revenue flows between governments and extractive industries in participating countries. Based on a voluntary process of international validation, the EITI promotes full public disclosure of revenue flows backed by independent audit and oversight from a local multi-stakeholder group that includes civil society representation. For implementing countries the posited benefits of the process are improved investor confidence as well as strengthened accountability, good governance and political stability (EITI, 2005). To consider its likely effectiveness, it is useful to note the distinction between accountability and transparency. According to Schedler (1999), there are three dimensions to accountability – the provision of information regarding actions or decisions, their justification, and recourse to punishment in the case of misconduct. From this it is immediately apparent that transparency is only one part of accountability, and may be of limited value where other dimensions are weak. Under EITI, although the dimension of justification is partly covered by the requirement to have a multi-stakeholder oversight committee, domestic enforcement is not formally considered. Compared to disclosing information, which may involve few costs, changing or enhancing enforcement procedures may be much more difficult to achieve. Thus, there is a risk of toothless transparency without full accountability.

The definition of accountability also directs attention to the nature of the participants (i.e., who is accountable to whom) and the quality of the information exchanged between them. With regards to the latter, the EITI focuses only on revenues paid by corporations or state-owned entities to the government treasury. Other financial transactions involving extractive industries, as well as the government's subsequent use of funds, are not formally covered. This begs the question whether transparency around the government's take is the core problem. Misuse of funds does not only occur in the act of the transfer from private to public accounts. Other abuses are, perhaps, more common. According to the estimates of Sala-i-Martín and Subramanian (2003) for Nigeria, the majority of resource rents accruing to the government have not disappeared *per se* but

[22] See Reuters news report, 'Chad decrees avoid World Bank controls – analysts', Thursday 28 Feb 2008.

have been spent on 'wasteful' public investments. Public investment has been notorious for rent-seeking, bribery and corruption. Similarly, the underlying terms and bonus signatures of resource contracts also are considered to be rife with corruption in extractive industries but fall outside the formal purview of the EITI.

The restricted scope of the EITI suggests it may be open to gaming – i.e., it can be manipulated and subverted by players. Where EITI is promoted as a condition (explicit or implicit) for access to finance or other external relations then this possibility is enhanced. Consequently, it may do little to alter political incentives and, in a worst case scenario, may reinforce underlying power structures and behaviours. As a result, it would seem that deeper domestic changes from adherence to EITI will depend on the combination of a broad domestic constituency for reform and genuine political will. However, this suggests a certain paradox. Where these two ingredients obtain then one wonders why the EITI is needed. Where they do not obtain it would seem to negate the very conditions required for success. This should not be taken as a wholesale rejection of the EITI. Improved transparency may stimulate deep reform and genuine accountability; but positive outcomes are not guaranteed. EITI may have only a limited impact and cannot be considered a panacea for weak natural resource management. In this light it is notable that neither Indonesia nor Botswana, nor the majority of developed countries, have prioritised resource rent transparency; indeed, Botswana has made its opposition to the scheme clear.

A second initiative advanced to deal with resource curse phenomena involves the direct distribution of resource rents. The general idea is to bypass (full) government management of resource revenues and allocate a significant share to citizens by direct payment. Not only is this intended to have direct welfare effects, but by giving citizens a stake in the rents it is hoped to mobilise public scrutiny of all aspects of natural resource management, including contract negotiation (Sanbu, 2004). At a theoretical level these proposals seem attractive, implying a more radical approach than tweaking political incentives. There are, of course, significant practical problems. Chief among these is for the host government to agree to the scheme. Here we are returned to the 'politician proofing' issue – if politicians are the root problem, as the conventional wisdom would have us believe, then they are unlikely to accept a scheme of this sort. If they are open to the scheme, then it may not be necessary. There might, however, be a stronger case for a scheme where a reformist but politically less stable government wishes to make deep and irreversible constitutional changes. As Sanbu (2004) notes, direct payments are likely to be seen as a 'right' that cannot be adjusted once started. But this suggests a deeper problem. Where resource revenues become politicised and popularised, they may severely limit the government's ability to avoid Dutch Disease effects (Hjort, 2006). Other design issues also would need to be resolved for these schemes to function smoothly. In particular, lack of institutional and oversight capa-

cities may prove difficult to overcome, enhancing the risk that (presumed) corruption at the central level would be transferred to lower levels.

6.2 TOWARDS A RICHER UNDERSTANDING

It is always easier to criticize than to suggest alternatives. Even so, the analytical insights presented above point towards specific avenues for future theoretical and empirical exploration. If fruitful, these are likely to enrich our understanding of the resource curse domain; however, in doing so they also are likely to increase the complexity of any plausible explanation, thereby complicating the development of neat, parsimonious and empirically tractable models. Nevertheless, at least four explanatory gaps merit further investigation:

(a) *Institutional complementarities*. The need to clarify the formal concept of institutions has been noted, but this means more than disaggregating institutions into separate and isolated dimensions. Haggard et al. (2007) argue there are considerable complementarities between institutions such that a focus on individual components fails to recognise their inherently interconnected nature. Similarly, Collier (2007: 47) argues that democratic competition in the presence of resource wealth may be counter-productive without 'sufficiently powerful restraints' on the public sector. Thus, we need to explore the component parts and interrelationships that comprise the institutional environment.

(b) *Institutional evolution*. The need for better explanation demands a movement away from static description and towards dynamic accounts of institutional change. This calls attention to the ways in which extant institutional formations are embedded in existing social structures, cultural histories and distributional relations.[23]

(c) *Non-resource rents*. The argument of Section 4 was that there are numerous factors that can generate political pathologies. Theoretically, there is no reason to focus exclusively on natural resource rents, especially where there is evidence for institutional dysfunction prior to the discovery of natural resource reserves. An appropriate explanatory theory should be a general one that encompasses a wide range of factors that determine institutional performance/change. Alternatively, to justify a restricted focus on natural

[23] The relevance of this perspective is demonstrated by the mixed experiences of democracy in SSA. By some accounts the complex performativity and 'extraversion' (Bayart, 2000) of the African state and has given rise to 'hybrid regimes' (van de Walle's, 2002), characterised by the simultaneous existence of internationally acceptable formal structures alongside parallel, shadow power networks based on the straddling of public office and private economic influence.

resource rents one must be more specific about how and why such rents produce distinctive effects.

(d) *Additional factors*. A by-product of the resource curse thesis is that it defines the resource management problem as one of sanitising the political effects of resource rents, assuming domestic political autonomy. This fails to give due weight to wider aspects of natural resources management, including the influence of external factors. Incorporating these factors into the analysis may be helpful in grappling with the *prima facie* diversity of resource-based experiences.

6.1 FROM LECTURING TO LEARNING

The corollary of admitting gaps in our knowledge is that hard and fast solutions are illusory. In fact, it is not even clear whether the 'problem' is well-defined. Taking this position seriously has profound practical implications. The link between resources, predatory behaviour and dysfunctional governance becomes tenuous. Consequently, a strong case can be made for local institutional experimentation, adaptation and even pro-active public sector engagement in the resources sector. In other words, the policy space is no longer restricted to formal institutional 'fixes' based on Western transplants. The benefits of a more open and experimental orientation are widely recognised, at least outside mainstream development discourses (Rodrik, 2008; Dunning et al., 2004; Berkowitz et al., 2003). Demsetz puts it as follows: "the basic problem facing public and private policy … [is] the design of institutional arrangements that provide incentives to encourage experimentation … without overly insulating these experiments from the ultimate test of survival." (1969: 20). As argued previously, historical experience indicates that successful cases of resource-based development has been based on treating natural resources as strategic assets to be nurtured for long-term growth. Of course, such an orientation does not arise automatically, but neither is it likely to emerge if all public sector engagement is dismissed as predatory *ex ante*.

The question remains, what can be done to support more constructive engagement and improved management of natural resources? Two modest suggestions arise. The first stems from the involvement of external actors in resource management abuses. While advanced countries may not be able to impose political solutions on third countries, they can do much more to minimise their own contribution to resource abuses. A number of possibilities merit further exploration in this regard (also see Open Society Institute, 2005; Moran, 2008). They include:

- expanding schemes to black-list or white-list (Winer, 2003) countries and financial institutions that are non-cooperative with agreed standards for monitoring, reporting and controlling suspicious financial transactions. A model here is the approach of the Financial

Action Task Force (FATF) which could be extended to incorporate flows associated with natural resource extraction;

- tightening the OECD Anti-bribery Convention (1999) and the U.S. Foreign Corrupt Practices Act to prohibit the actual kinds of bribery schemes that occur in practice, particularly those involving partnerships and business deals with family members of ruling elites (Moran, 2008);
- raising the standards that govern insurance and underwriting of major international investment transactions. Risk insurance and export guarantees advanced by OECD governments and financial institutions are essential for large project finance deals. Underwriting agencies could take a tougher stance and demand minimum financial management and transparency standards at a country-wide level. Linking access to project finance with resource management practices could have a much more powerful impact than voluntary initiatives alone. Moreover, this might have an impact on non-OECD multinationals where they take part in multi-corporation syndicates; and
- tightening international law to prohibit purchases of natural resource commodities extracted from highly repressive regimes or governments that do not meet minimum standards pertaining to natural resources management or governance more widely. This could be backed by 'tariff-and-trust' measures whereby imports of goods exported from (non-participating) countries that purchase goods from the same regimes are subject to an *ad valorem* tariff, the revenue of which is kept in trust for the population of the resource owners (Wenar, 2008).

A second suggestion derives from the recognition that sound management of natural resources has properties of a global public good. This may seem absurd given that resource commodities are classic private goods – they are rivalrous and excludable. However, sound management of natural resources generates very broad public benefits given the negative spillovers from resource mismanagement. Also the technical knowledge involved in natural resource contract design, financial control and macroeconomic policy can be considered a public good. As suggested by Humphreys et al. (2007), there is a case for creating a global knowledge bank or resource centre that can aid governments in technical aspects of natural resource management, especially the complex process of contract negotiation where host governments often are at a capacity disadvantage compared to MNCs. This might extend to developing benchmark contracts which may help identify where (proposed) contracts are sub-optimal for the host country government. Note that this kind of assistance need not interfere with domestic innovation, especially if it only responds to domestic requests rather than being imposed as a condition for other actions.

7. Conclusion

The existence of a resource curse conditional on the institutional environment has gained widespread acceptance over recent years. This paper has examined this thesis from a number of angles and found it unconvincing. From a theoretical point of view it is superficial and inadequate. This is because the dynamics of how institutions emerge, interact and evolve is poorly understood. The thesis presents the issue of resources management in narrow terms, thereby ignoring the complexities of contract negotiation, public sector support to domestic knowledge networks and external factors. Resource curse proponents also cannot account for the diversity of resource-based experiences in either low or high income countries. Exploratory empirical results indicate that only a curse of institutions can be found. That this exists regardless of differences in resource wealth suggests that future analysis needs to incorporate a wider range of factors associated with poor governance outcomes. Isolated hypotheses which restrict attention to natural resources alone cannot be supported.

The resource curse thesis has profound practical implications. Fashionable policy responses direct attention to formal institutional design fixes as if these were somehow distinct from the 'bad' political equilibria which lie at the core of the presumed resource curse itself. In light of our actual ignorance about how to nurture institutions, expectations as regards what these policies can achieve should be modest. In contrast, there should be much greater space for local policy experimentation and adaptation. Advanced countries would be advised to focus on the ways in which external actors facilitate poor natural resource management outcomes in lower income countries. Ultimately, this will demand placing developmental goals ahead of domestic geopolitical and economic priorities. However, and if history is any guide, it will remain more convenient to vilify repressive regimes, failed states and 'bad governance', than to excavate skeletons buried closer to home.

Bibliography

Agresti, Alan (2007), *An Introduction to Categorical Data Analysis*, Second edition, Wiley Interscience, Florida

Auty, R.M. (1990), *Resource-Based Industrialization: Sowing the Oil in Eight Developing Countries*, Oxford University Press, New York.

Bayart, J. F. (2000), Africa in the world: a history of extraversion, *African Affairs*, 99:395, 217–269

Bear, D. V. T. and Daniel Orr (1967), Logic and Expediency in Economic Theorizing, *The Journal of Political Economy*, 75: 2, 188-196.

Berkowitz, Daniel, Katharina Pistor and Jean-Francois Richard (2003), The Transplant Effect, *The American Journal of Comparative Law*, 51: 1, 163-203.

Birdsall, Nancy and Arvind Subramanian (2004), Saving Iraq From Its Oil, *Foreign Affairs*, July/August

Brunnschweiler, Christa N. (2008), Cursing the Blessings? Natural Resource Abundance, Institutions, and Economic Growth, *World Development*, 36: 3, 399–419

Brunnschweiler, Christa N. and Erwin H. Bulte (2008), The resource curse revisited and revised: A tale of paradoxes and red herrings, *Journal of Environmental Economics and Management*, forthcoming, doi:10.1016/j.jeem.2007.08.004

Campbell, Bonnie (2003), Factoring in Governance is not enough. Mining Codes in Africa: Policy Reform and Corporate Responsibility, *Minerals & Energy*, 18:3, 2-13

Colander, David (2000), The Death of Neoclassical Economics, *Journal of the History of Economic Thought*, 22: 2, 127 – 143

Collier, Paul (2007), *The Bottom Billion*, Oxford: Oxford University Press

Daniel Kaufmann, Aart Kraay and Massimo Mastruzzi (2006), Governance Matters V: Governance Indicators for 1996-2005, World Bank Policy Research, September

David, Paul A. and Gavin Wright (1997), The Genesis of American Resource Abundance, *Industrial and Corporate Change*, 6, 203-45

Doornbos, M. (2001), 'Good Governance': The Rise and Decline of a Policy Metaphor?, *Journal of Development Studies*, 37:6, 93-108

Dunning, Thad and Grigore Pop-Eleches (2004), From Transplants to Hybrids: Exploring Institutional Pathways to Growth, *Comparative International Development Studies*, Winter, 38, 4, 3-29

Evans, Peter (2004), Development as Institutional Change: The Pitfalls of Monocropping and the Potentials of Deliberation, *Comparative International Development Studies*, Winter, 38, 4, 30-52

EITI (2005), *Extractive Industries Transparency Initiative Source book*, EITI Secretariat, London

Fine, Ben (2000), Critical survey. Endogenous growth theory: a critical assessment, *Cambridge Journal of Economics*, 24, 245-265

Friedman, Thomas L. (2006), The First Law of Petropolitics, *Foreign Policy*, May/June 2006.

Goldfarb, Robert and Jon Ratner (2008), "Theory" and "Models": Terminology through the Looking Glass, *Econ Journal Watch*, 5: 1, 91-108

Grindle, Merilee S. (2007), Good Enough Governance Revisited, *Development Policy Review*, 25: 5, 553-574

Haavelmo, Trygve (1944), The Probability Approach In Econometrics, *Econometrica*, 12, July, Supplement.

Haggard, Stephan, Andrew MacIntyre and Lydia Tiede (2008), The Rule of Law and Economic Development, *Annual Review of Political Science*, 11, 205–34

Hjort, Jonas (2006), Citizen funds and Dutch Disease in developing countries, *Resources Policy*, 31, 183–191

Humphreys, Macartan, Jeffrey D. Sachs and Joseph E. Stiglitz (2007), 'Future Directions for the Management of Natural Resources', chapter 12 in Humphreys et al. (eds)., *Escaping the Resource Curse,* New York: Columbia University Press

Iimi, Atsushi (2007), Escaping from the Resource Curse: Evidence from Botswana and the Rest of the World, *IMF Staff Papers*, 54: 4, 663-699

IMF (2007), *Guide on Resource Revenue Transparency*, International Monetary Fund, Washington

Jensen, Nathan and Leonard Wantchekon (2004), Resource Wealth and Political Regimes in Africa, *Comparative Political Studies*, 37: 7, 816-841

Kapur, Davesh (2006), The Knowledge Bank, in Nancy Birdsall (ed.), *Rescuing the World Bank*, Center for Global Development, Washington DC

Kenny, Charles (1999), Why aren't countries rich? Weak states and bad neighbourhoods, *Journal of Development Studies*, 35:5, 26-47

Keynes, John Maynard (1936), The General Theory of Employment, Interest and Money, Macmillan Cambridge University Press

Kojucharov, Nikola (2007), Poverty, Petroleum & Policy Intervention: Lessons from the Chad-Cameroon Pipeline, *Review of African Political Economy*, 34: 113, 477-496

Koopmans, Tjalling C. (1947), Measurement Without Theory, *The Review of Economic Statistics*, 29: 3, 161-172.

Kronenburg, Tobias (2004), The curse of natural resources in the transition economies, *Economics of Transition*, 12: 3, 399–426

Liebenthal, Andres, Roland Michelitsch and Ethel Tarazona (2003), *Extractive Industries and Sustainable Development: An Evaluation of World Bank Group Experience*, World Bank Operations Evaluation Department, IFC Operations Evaluation Group, MIGA Operations Evaluation Unit, Washington DC

Maloney, William F. (2002), Missed Opportunities: Innovation and Resource-Based Growth in Latin America, *World Bank Policy Research Working Paper*, 2935, December

Mehlum, Halvor, Karl Moene and Ragnar Torvik (2006), Institutions and the Resource Curse, *The Economic Journal*, 116, 1–20

Mookherjee, Dilip (2005), Is There Too Little Theory in Development Economics?, *Economic and Political Weekly*, October 1, 2005

Moran, Theodore (2008), *Combating Corrupt Payments in Foreign Investment Concessions: Closing the Loopholes, Extending the Tools*, Center for Global Development, Washington DC.

Morris, Daniel (2006), The chance to go deep: US energy interests in West Africa, *American Foreign Policy Interests,* 28, 225-238

Papyrakis, Elissaios and Reyer Gerlagh (2004), The resource curse hypothesis and its transmission channels, *Journal of Comparative Economics*, 32, 181–193

Pegg, Scott (2005), Can policy intervention beat the resource curse? Evidence from the Chad–Cameroon pipeline project, *African Affairs*, 105: 418, 1-25

Pierson, Paul (2000), The Limits of Design: Explaining Institutional Origins and Change, *Governance: An International Journal of Policy and Administration*, 13:4, 475–499

Power, Thomas Michael (2002), *Digging to Development? A Historical Look at Mining and Economic Development*, Oxfam America

Robinson, James (2005), Politician-Proof Policy?, *Desarrollo y Sociedad*, 55, 1-56, Primer Semestre

Robinson, James, Ragnar Torvik and Thierry Verdier (2006), Political foundations of the resource curse, *Journal of Development Economics*, 79, 447– 468

Røgeberg, Ole and Nordberg, Morten (2005), A defence of absurd theories in economics, *Journal of Economic Methodology*, 12:4, 543 – 562

Rosser, Andrew (2006), The Political Economy of the Resource Curse: A Literature Survey, *IDS Working Paper*, 268, Institute of Development Studies, University of Sussex

Sachs, Jeffrey D. and Andrew M. Warner (1995), Natural resource abundance and economic growth, *National Bureau of Economic Research Working Paper,* 5398, Cambridge, MA.

Sachs, Jeffrey D. and Andrew M. Warner (2001), Natural Resources and Economic Development: The curse of natural resources, *European Economic Review*, 45, 827-838

Saine, A. (2008), The Gambia's "Elected Autocrat Poverty, Peripherality, and Political Instability," 1994–2006: A Political Economy Assessment, *Armed Forces & Society*, 34: 3, 450-473

Sala-i-Martin, Xavier and Arvind Subramanian (2003), Addressing the Natural Resource Curse: an Illustration from Nigeria, *IMF Working Paper*, no. WP/03/139, International Monetary Fund

Salanti, Andrea (1987), Falsificationism and Fallibilism as Epistemic Foundations of Economics: A Critical View, *Kyklos*, 40: 3, 368-392

Sandbu, Martin E. (2004), Taxable Resource Revenue Distributions: A Proposal for Alleviating the Natural Resource Curse, Unpublished manuscript, Center on Globlization and Sustainable Development, Columbia University Earth Institute

Schedler, Andreas (1999), Conceptualizing Accountability, in Andreas Schedler, Larry Diamond, Marc F. Plattner (eds.), *The Self-Restraining State: Power and Accountability in New Democracies*. London: Lynne Rienner Publishers

Shaxson, Nicholas (2007), Oil, corruption and the resource curse, *International Affairs*, 83: 6, 1123-1140

Smelser, Neil J. (1992), The Rational Choice Perspective: A Theoretical Assessment, *Rationality and Society*, 4, 381-410

Stijns, Jean-Philippe C. (2005), Natural resource abundance and economic growth revisited, *Resources Policy*, 30, 107–130

Sutton, Robert I. and Barry M. Staw (1995), What Theory is Not, *Administrative Science Quarterly*, 40: 3, 371-384

Temple, J. (1999), The New Growth Evidence, *Journal of Economic Literature*, 37: 1, 112-156

Thomas, M.A. (2004), Factoring in Governance, Background paper for the evaluation of the World Bank Group's activities in the extractive industries, Operations and Evaluations Department, World Bank

Tukey, John W. (1980), We Need Both Exploratory and Confirmatory, *The American Statistician*, 34: 1, 23-25

UNCTAD (2007), Transnational Corporations, Extractive Industries and Development, *World Investment Report*, 2007, United Nations

van de Walle, Nicholas (2002), Elections without democracy: Africa's range of regimes, *Journal of Democracy*, 13:2, 66-80

Wacker, John G. (1998), A definition of theory: research guidelines for different theory-building research methods in operations management, *Journal of Operations Management*, 16, 361–385

Wenar, Leif (2008), Property Rights and the Resource Curse, *Philosophy & Public Affairs*, Winter 2008, forthcoming

Winer, Jonathon (2003), Globalizing transparency: Implementing a financial sector white list, *Fafo AIS Policy Brief*, 2003:07, Fafo

World Bank (2006a), Technical Annex for a Proposed Grant Of SDR 20.6 Million (US$30 Million equivalent) to the Islamic Republic of Afghanistan for a Sustainable Development of Natural Resources Project, Report No: T7673 – AF, World Bank, Washington DC

World Bank (2006b), *Where is the wealth of nations? Measuring Capital for the 21st Century*, The World Bank, Washington D.C.

World Bank (2006c), *World Development Indicators,* 2006, The World Bank, Washington D.C.

Wright, Gavin and Jesse Czelusta (2002), Exorcizing the Resource Curse: Minerals as a Knowledge Industry, Past and Present, Unpublished manuscript, Stanford University

Appendix A: Resource wealth measure

The resource wealth measure used in this paper is based on the energy and mineral commodities listed in Table A1. For energy commodities, estimates of total (extractable) reserves are taken from international statistics compiled by the US Energy Information Administration, available at: http://www.eia.doe.gov/emeu/international/. Where more than one non-zero estimate is provided for each country, the average is calculated. Data for mineral commodities employs production estimates for 2005 compiled by the US Geological Survey Mineral Resources Survey, available per commodity at: http://minerals.usgs.gov/minerals/pubs/mcs/. The sample of minerals is chosen to reflect a broad range of major global commodities, as well as specific commodities important in lower income countries (e.g., cobalt, diamonds). Data on production is used because information on reserves is not sufficiently detailed at the country level. Table A1 summarises the key commodities and price information used.

To estimate the expected cumulative net present value (NPV) of rents accruing to the public sector from natural resources, the NPV of the rent (*r*) associated with each commodity is calculated based on relevant volume (*v*) and price (*p*) information. For commodities where reserve volumes are available, the NPV of rents from commodity *i* are approximated by the simple formula:

$$r_i = 0.5\left(p_i \frac{v_i}{2}\right)$$

Note the volume of reserves enters with a 50% discount factor, reflecting the lower present value of future income. This is equivalent to assuming reserve depletion over approximately 20 years at a 3% discount rate. For commodities where production volume is available, the following approximation is used:

$$r_i = 0.5(20 \cdot v_i \cdot p_i)$$

The volume of production in 2005 is multiplied by 20 to reflect the discounted lifetime of the reserve. This can be interpreted as being equal to around 30 years of useful production discounted at a rate of 3% per annum. In all cases it also is assumed that only 50% of revenues accrue to the public sector in rents; and prices are held constant at their 2005 values. Total resource rents is the sum over all *i*.

Table A1: Summary of commodities and price information for resource wealth measure

Commodity	Unit price (US$)	Unit	Price information
Energy commodities:			
Crude oil	54.5	barrel	IMF pink sheets (Dec/2007)
Natural gas	6.3	mmbtu	IMF pink sheets (Dec/2007)
Bituminous coal	36.8	tonne	EIA historical prices (www.eia.doe.gov)
Coal (other)	12.1	tonne	EIA historical prices (www.eia.doe.gov)
Mineral commodities:			
Gold	14,300	kg	IMF pink sheets Dec/2007
Platinum	28,834	kg	www.kitco.com (29/2/2008)
Palladium	6,474	kg	www.kitco.com (29/2/2008)
Diamond	14.5	carat	US Geological Survey (minerals.usgs.gov)
Copper	3,679	tonne	IMF pink sheets (Dec/2007)
Iron	65.0	tonne	IMF pink sheets (Dec/2007)
Cobalt	35.1	kg	US Geological Survey (minerals.usgs.gov)
Tin	7,380	tonne	IMF pink sheets (Dec/2007)

Notes: all prices are 2005 annual averages; diamond prices are calculated as the average per carat value of imports into the USA; cobalt prices are taken as average spot price in USA; mmbtu stands for million British thermal units.