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A Survey of Literature on the Resource Curse: Critical Analysis of the Main Explanations, Empirical Tests and Resource Proxies

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ABSTRACT

This paper presents a survey of literature on the 'resource curse', a puzzling empirical result that associates natural resource riches with lower economic growth. We show the main theories that attempt to explain the curse – ranging from the structuralist theses of the 1950s to recent and more consensual institutional causes –, and present a critical review of results in view of theory, estimation procedures and used resource proxies.

Keywords: Resource curse, Natural resources; Economic growth; Institutions; Survey.

JEL classification: N50, O13, O40, O50

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1. Introduction

The 'curse of natural resources' is a surprising empirical result that depicts a negative relationship between countries' natural-resource abundance and dependence and their economic growth after controlling for other relevant variables.[1] This finding was confirmed by a large number of cross-section studies initiated by Sachs and Warner (1995, 1997a,b,c, 1999a,b, 2001), considering different country samples and extended periods, and thus became a stylized fact (e.g., Auty and Mikesell, 1998; Sachs and Warner, 1999a).[2]

The purpose of Sachs and Warner's (1995) initial work was to investigate what the authors called a 'conceptual puzzle' and 'oddity', the negative relationship between natural resource intensity and subsequent economic growth already suggested by the case studies of Gelb (1988), Auty (1990, 1991, 1993, 1994a,b), among others, together with initial cross-section empirical analyses by Wheeler (1984) and Auty and Evans (1994). The oil crisis in the 1970s and 1980s reversed the benign view of resource-based growth that predominated in the early 1900s, namely due to the enthusiasm with Canada's favourable growth trajectory (Keay, 2007).

Several theories have been proposed to explain the curse result without much consensus, although recent institutional theses have received wider acceptance. The main

[1] Bleaney and Nishiyama (2002), for example, show those findings are robust to the inclusion of explanatory variables from growth models.

[2] Outside the resource curse literature, natural resources are seen by many authors as not crucial to long-run growth (*e.g.*, Nordhaus, 1992; Meier and Rauch, 2000), considering the important growth records achieved by several resource-poor countries, such as Japan. The argument is that scarcity of resources, along with pollution, can be overcome through technological progress, forces of substitution and structural change when natural resources have market prices (Meier and Rauch, 2000); if there is open access to those resources, then adequate policies and institutions should force economic agents to consider their social value. This is disputed namely by ecological economists. In fact, environmental effects related to climate change are much more difficult to reverse, posing tremendous immediate challenges in order to avoid aggravated future economic costs (*e.g.*, Stern, 2008). However, this kind of analysis relies on the social discount rate, and climate changes are difficult to predict despite science advances.

explanations are presented in Section 2. More recent analyses with different resource proxies or using panel data are presented in Section 3, where a summary Table is shown for panel studies. Finally, Section 4 presents some concluding remarks.

2. Main explanations of the resource curse

2.1. Structuralist and Dutch Disease theses

The first explanations of the resource curse were based on the structuralist theses of the 1950s, focusing on the decline in the terms of exchange between primary and manufactured products (Prebisch, 1950), the volatility of primary product prices, or the limited linkages between the natural-resource sector and the rest of the economy (Hirschman, 1958).[3] However, none of these explanations was unequivocally confirmed by empirical tests (*e.g.*, Moran, 1983; Behrman, 1987; Cuddington, 1992; Lutz, 1994; Dawe, 1996; Fosu, 1996).

The related Dutch Disease thesis sustains that natural resource booms hinder the industrial sector, assumed as the main driving force of the economy, either through real exchange rate appreciation or the absorption of production factors (Neary and van Wijnbergen, 1986). Thus, the expansion of the natural-resource sector is not enough to offset the negative effect of deindustrialization on economic growth. In addition, there is a change in composition of exports in favour of raw materials, or even a drop in total exports, thus reducing economic growth (Gylfason, 2001a). The empirical evidence does not provide great support for the Dutch Disease as an explanation of the resource curse (*e.g.*, Leite and Weidmann, 2002; Sala-i-Martin and Subramanian, 2003). The case study led by Auty (2001a) also dismisses this thesis by showing the complexity and diversity of cases among natural-resource abundant countries, including several exceptions to the curse such as Norway, which has seized its oil abundance to become a rich country.

[3] The concern goes even further back to Adam Smith (1776), as he considered mining to be a bad use of labor and capital.

Other explanations for the resource curse, often presented autonomously, can also be partly considered as symptoms of the Dutch Disease. These arguments include the disincentive for entrepreneurship (Sachs and Warner, 2001),[4] the decrease in savings and physical investment (*e.g.*, Gylfason, 2001a; Papyrakis and Gerlagh, 2007) and lower investment in education and human capital (e.g., Gylfason, 2001b; Birdsall *et al*., 2001; Bravo-Ortega and Gregorio, 2007).

2.2. Rent-seeking behaviour

Another thesis stresses the negative effect on growth caused by rent-seeking activities associated with natural-resource abundance (*e.g.*, Torvik, 2002; Robinson *et al*., 2006; Sandbu, 2006). For example, Torvik (2002) presents a model with rent seeking where a greater amount of natural resources increases the number of entrepreneurs engaged in rent seeking and reduces the number of entrepreneurs running productive firms. With a demand externality, it is shown that the resulting drop in income is higher than the increase in income from the natural resource. Therefore, more natural resources lead to lower welfare.

Since natural-resource abundance only penalises economic growth in some countries, this thesis alone has very little explanatory power (Bulte *et al*., 2005), which led to the development of models where results depend on initial conditions (*e.g.*, Acemoglu, 1995; Baland and François, 2000). Moreover, Lederman and Maloney (2008) stress that the concern is not specific to natural resources, but applies to other sources of rents such as foreign aid and monopoly rents.

2.3. Institutions and policies, namely fiscal

[4] According to the Sachs and Warner (2001), the general crowding-out logic of Dutch Disease can be extended to entrepreneurship: if wages in the natural resources sector pays well enough to attract potential innovators and entrepreneurs (in a limited number), this will reduce business talent in the manufacturing industry.

There is now a growing consensus about the importance of institutions in explaining the resource curse,[5] as stressed by a recent World Bank publication (Hartford and Klein, 2005). Mehlum *et al.* (2006a, b), for example, conclude that better institutions can avoid the resource curse,[6] but they stress the possibility that natural resources affect institutional quality.[7]

That possibility is recognised by explanations based on endogenous institutions, where the type of natural resource affects the institutional context, in which the form of government and the quality of policies are the main aspects (*e.g.*, Auty, 2001a,b; Ross, 2001; Atkinson and Hamilton, 2003). Leite and Weidmann (2002), for example, found no direct impact of natural-resource abundance on economic growth from 1970 to 1990, but they showed an important indirect effect through the impact of those resources on corruption, which, in turn, negatively affects growth (*e.g.*, Mauro, 1995).

Later on, the result was confirmed by Isham *et al.* (2005) and Sala-i-Martin and Subramanian (2003), who examined the influence of natural resources on broader indicators of institutional quality and policies. They confirmed that, for a given level of institutional quality, natural-resource abundance has no direct impact on growth. Rather, this abundance penalises growth indirectly, through institutional quality, but only when resources are geographically concentrated (these agglomerations of resources are also known as "resource

[5] The high importance of institutions and policies to economic growth is stressed by a vast number of empirical studies (*e.g.*, Acemoglu and Robinson, 2006; Acemoglu *et al*., 2005).

[6] They use a rent-seeking model but make the distinction between producer friendly institutions (where rent-seeking and production are complementary activities), and grabber friendly institutions (where rent-seeking and production are competing activities), which can be particularly bad for growth when resource abundance attracts scarce entrepreneurial resources out of production and into unproductive activities. With producer friendly institutions, however, rich resources attract entrepreneurs into production, implying higher growth.

[7] Lane and Tornell (1996) also argue that existing institutional quality determines whether resources are a blessing or a curse.

points"), such as oil.[8] That is, these recent studies explain the resource curse through the negative effect of geographically concentrated resources on the quality of institutions.[9]

Humphreys *et al*. (2007) emphasise the use of policies to constrain the choices of public and private actors who may otherwise undermine social welfare goals in oil producing states, especially where institutions are not strong.

Several studies focus more specifically on the challenges of fiscal policy in dealing with the high volatility of natural resources (*e.g.*, Davis, 2001, 2003; Atkinson and Hamilton, 2003; Bleaney and Halland, 2009).[10] For example, Atkinson and Hamilton (2003) offer evidence that the curse may be a manifestation of the inability of governments to manage large resource revenues sustainably. They stress the cases where the combination of natural resources, macroeconomic and public expenditure policies has led to a low rate of genuine saving. Davis (2001) shows the importance of stabilisation funds for non-renewable resources in dealing with the challenges of high volatility and uncertainty of revenue streams. Norway, an example of good public management of natural resource revenues, saves part of those proceeds and distributes them between generations through a public fund.

The distinction between policies and institutions is also important. Brunnshweiler and Bulte (2008) use two approaches to assess institutions:[11] one that sees institutions as "deep and durable" features of societies, traditionally used in resource curse studies, and another

[8] In turn, diffuse resources, such as agricultural and forest products, were not correlated with institutional quality.

[9] Boschini *et al* (2007) show the negative effect is larger in the case of diamonds and precious metals for countries with low institutional quality.

[10] Fatás and Mihov (2003, 2005) challenge the claim of Acemoglu *et al*. (2003) that macroeconomic policy is just a transmission mechanism for institutions, by showing that fiscal policy volatility hinders growth after controlling for institutional variables. Bleaney and Halland (2009) find that this negative effect is explained by changes in natural-resource export shares (the curse result is reduced and affects both diffuse and concentrated resources) as institutional variables become insignificant.

[11] See also, for example, Rodrik *et al*. (2004).

that looks at institutions as reflecting a flux of policy outcomes. We agree that both interpretations are potentially relevant for the resource curse analysis as discussed later on.

In a different line, Papyrakis and Gerlagh (2007) find evidence of a resource curse within regions of the United States. They find that resource abundance (as measured by the primary sector share in Gross State Product) fosters corruption (correlated to poor institutions), reduces investment, schooling, and R&D.

2.4. Resource drag and possible endogeneity of initial income term

Other recent set of cross-section studies dispute the resource curse result considering a more statistical than theoretical approach to the theme.

A few studies suggest the resource curse result derives from weaker growth in the resource sector. Davis' (2011) empirical study finds that the relatively slower growth in mineral and energy economies may simply reflect a resource drag whereby optimally managed per capita resource production does not grow substantially over time and hence introduces a drag on the measured growth of per capita economic output, which would have implications for trade and industrial policies implemented on the presumption that there are growth-reducing market failures associated with mineral and energy production.

Previous studies also mentioned the possibility of a resource drag, but Davis (2011) was the first to test the hypothesis. Sachs and Warner (1995) only mention the resource drag hypothesis in passing. Alexeev and Conrad (2009) suggest that whilst resource based economies do not appear to have grown more slowly in the long-run, they may well grow more slowly in the short run due to static or declining mineral production.

While the above argument of a resource drag is plausible, it does not explain why resource rich and developed countries, such as Norway, are not also dragged by eventual below average resource growth, thus implying that other factors must also be at play.

Moreover, as we show below, different resource proxies and statistical issues may also play a part in explaining the resource curse result.

Alexeev and Conrad (2009) also address the possible endogeneity of the initial income term included in cross-section resource curse regressions, an issue raised by Herb (2005) as well. Alexeev and Conrad (2009) and Herb (2005) argue that natural resource exports depend on domestic consumption, and both consumption and income may be correlated with democracy. Thus, the inclusion of the initial level of income introduces endogeneity if it is measured after oil discovery. The authors remove the oil component from the initial income level, and find that the oil curse disappears. However, Tsui (2011) stresses that fuel is a noisy measure of natural resources and, as a flow variable, it also understates the oil wealth of the swing producers who produce below their full capacity. In addition, other statistical issues must also be addressed as mentioned in section 3.

3. Studies with different resource proxies and panel data

3.1 Choice of resource proxies

There is a debate about which resource proxies to use in studies on the resource curse. The share of natural resources in exports (or in GDP) has been the most used measure of resource abundance since Sachs and Warner (1995).[12] However, as a flow, it is only an imperfect proxy of a country's real stock of natural resources (Bulte *et al*., 2005), the most precise measure of abundance – in turn, stock measures have other limitations: they are difficult to measure, and the possible effects through which the curse takes place cannot be expected to happen until the resources are extracted.

[12] Although both measures are used, the share of natural resources in exports proved more robust than the weight in GDP in cross-section analyses on the resource curse (Lederman and Maloney, 2008). Other measures also commonly used include resource rents in GDP and primary production in GDP. Data for the stock of natural resources is only available for few years, which limits the type of analysis, but it is also used in several studies as showed later on.

Resource shares in exports (or in GDP), which more accurately express resource dependence and intensity (and thus can suffer from endogeneity as argued by Brunnschweiler and Bulte, 2008),[13] are also an imperfect proxy of abundance due to the possibility of re-exportation. Sachs and Warner (1995) adjust the effect in Singapore (where re-exportation is crucial) by considering resource net exports, but using the usual measure for other countries will overestimate resource abundance.

Other studies, which explore the impact of more direct measures of mining production, reserves or the stock of natural resources dismiss the negative impact of geographically-concentrated resources found with export shares (*e.g.*, Sala-i-Martin and Subramanian, 2003; Isham *et al.*, 2005), as pointed by Lederman and Maloney (2008). For example, Stijns (2005) found no correlation of fuel and mineral reserves on growth during 1970-1989, while Davis (1995) showed that countries with a high share of minerals in exports and GDP performed relatively well in the same period. In fact, the mining share in GDP belongs to the set of variables positively associated with growth across the several million regressions in Sala-i-Martin *et al* (2004). Recently, Nunn (2008) found a positive effect of *per capita* gold, oil, and diamonds production growth between 1970 and 2000 on *per capita* GDP in 1970.

Brunnschweiler (2008) and Brunnschweiler and Bulte (2008), using 1994 World Bank resource stocks data, show that export dependence does not affect growth and find a positive impact of *per capita* subsoil wealth on growth, but van der Ploeg and Poelhekke (2010) claim this impact is not significant after dealing with several statistical issues (however, they stress that ignoring the volatility channel may lead to erroneously conclude that there is no effect of resources on growth).

[13] Brunnschweiler and Bulte (2008) argue that the most commonly used measure of abundance (resource-exports weight in GDP) is more usefully interpreted as dependence and is endogenous to underlying structural factors. They attempt to address endogeneity inside their model and combine resource dependence and abundance measures. However, they recognize that even their resource-abundance proxy (assessed by stock estimates for 1994) may suffer from endogeneity.

Wright and Czelusta (2004) and Ding and Field (2005) also distinguish between export dependence and endowments. Wright and Czelusta (2004) discuss various cases demonstrating that mineral extraction is knowledge based and high tech, arguing that there is no curse. Ding and Field (2005) find a curse for export dependence but not for abundance (endowments measured with the natural capital stock World Bank estimates) in a single equation model. They then estimate a recursive model and show that the negative effects of export dependence and endowments disappear. The authors find a negative association between human capital and export dependence and argue that the curse may be due to a high level of resource dependence that is due to poor development of human capital.

3.2. Use of panel data

We also point out that the above mentioned studies and most empirical results on the resource curse are cross-section analyses (where countries' economic growth in a single extended period is regressed to a series of explanatory variables, including natural resources; other studies investigate measures of economic development at a point in time), which do not control for unobserved fixed-country effects, found by a rare panel study by Manzano and Rigobon (2006). Using panels with two or four time series and Sachs and Warner's (1995) data, the authors show that the curse result disappears allowing for fixed effects, thus implying that estimates of cross-section studies may be inconsistent. They do not find the curse result established by Sachs and Warner (1995) to be explained by the level of development or the quality of institutions,[14] but their proxy for institutions does not change over time, and thus fixed effects estimation is not possible in that assessment (in addition, their results may depend on the chosen period aggregation).

[14] They point, instead, to the debt overhang in resource-rich countries due to the rise and fall in commodity prices in the 70's and 80's, respectively. Tsui (2011) contradicts their findings by showing that oil hinders democracy using Polity decade averages before and after discovery, and controlling for decade effects. This author stresses, however, that hope for democracy in those countries is not lost as shown by Norway's example.

Prior to Manzano and Rigobon, only Birdsall and Hamoudi (2002) and Lederman and Maloney (2003) use panel data in their estimates, and find different results concerning the existence of a resource curse.

Birdsall and Hamoudi (2002) argue that Dollar and Kraay's (2001) finding that openness promotes growth is due, at least in part, to commodity dependent countries.[15] The collapse of commodity prices in the 1980s forced many commodity exporters to diminish imports and trade deficits, thus reducing openness measures. When the authors control for commodity dependent countries, the openness growth-effect decreases by at least half. The authors conclude that the resource curse has little to do with trade policy.

Lederman and Maloney (2003) find that resource abundance measured by resource exports *per* worker and in proportion of GDP positively affect growth, but resource concentration (and also export dependence) has a negative effect, which is due to reduced accumulation of physical and human capital and deterioration of the terms of trade. However, they do not control for institutions in their estimations.

A more recent panel study by Butkievicz and Yanikkaya (2010) finds a mineral resource curse for developing countries explained by weak institutions, consistent with their hypothesis that owners of mineral resources use weak institutions and openness to trade to stifle the development of human capital, to the detriment of grow in other sectors of the economy. Manufacturing imports substitute for the development of domestic production, so openness to trade correlates with lower growth in mineral dependent economies. The "Dutch disease" and debt overhang explanations of the resource curse are not supported. However, the statistical treatment of resource proxies and estimation method differ from previous

[15] Prior work by Matsuyama (1992) also addresses the relation between trade and natural resources. The authors use a two-sector model of endogenous growth that predicts a positive link between agricultural productivity and economic growth, while, for the small open economy case, it predicts a negative link. The authors conclude that the openness of an economy should be an important factor when planning development strategy and predicting growth performance.

studies. Butkievicz and Yanikkaya (2010) use deflated resource exports divided by deflated GDP and assess terms of trade separately, following the recommendations of Dollar and Kraay (2001) and Birdsall and Hamoudi (2002), but this differs from most studies and may alter results. Moreover, they use a different estimation technique (Seemingly Unrelated Regression, SUR), and results may also depend on period aggregation (in decades).

Other recent (and rare) panel studies by Cotet and Tsui (2010) and Michaels (2011) dismiss the curse, but they use rather unique resource proxies, which hamper the comparison with previous studies. Cotet and Tsui (2010) use a unique panel dataset describing worldwide oil discoveries and extractions, while Michaels (2011) focuses on geological variation in oil abundance in the Southern USA counties. Both studies highlight the positive correlation between oil abundance and population growth, which increases GDP growth in absolute terms but not in *per capita* terms.

An even more recent panel study, by Torres *et al*. (forthcoming) shows that higher oil abundance (measured by oil production) does not hinder crude producers' growth from 1980 to 2003 in a single-panel estimation with random effects. This panel controls for specificities of oil economies, but the usual cross-section 'curse' result is found – it disappears allowing for unobserved effects. Their model controls for a potential (but unconfirmed) oil curse working through institutions (assessed with usual indicators plus fiscal policy, which allows the assessment of state management of variable resource revenues in a single panel study),[16] and for other growth factors such as education, which is considered by deriving real wage growth as the dependent variable in a factor-efficiency growth-accounting model.

Torres *et al*. (forthcoming) measure the oil growth-effects through labor and capital efficiency, and as a factor of production. They are all insignificant for oil production, but rig

[16] Gradstein (2008) stresses that institutional indicators are highly correlated, and Stein *et al.* (2005) associate the quality of legislative capabilities in general to the quality of policies, namely fiscal. Therefore, the quality of different policies is also correlated.

productivity benefits growth through capital efficiency. However, oil concentration only fosters growth (by reducing the capital necessary to oil exploration) significantly if there is fiscal responsibility, and in developing countries, where institutions are weaker and there is a broader scope for factor-efficiency and technological improvements arising from the oil sector. The authors do not find evidence of a curse in their panel estimations (only in the cross-section plot, which appears to be explained by random effects), but they do not dismiss that possibility in a larger sample that also includes resource-poor countries.

Table 1 – Summary table of recent panel studies and their most significant results

Reference	Panels	Resource proxy	Resource curse/blessing	Institutions estimated	Policies considered	Fiscal Policy considered
Torres *et al*. (forthcoming)	Single panel 1980-2003	Oil production; rig productivity	Blessing (rig productivity) in developing countries	yes	yes	Yes (public deficit)
Butkievicz and Yanikkaya (2010)	Decade panels 1970s, 80s, 90s	Deflated measures of resource export dependence	Curse in developing countries (explained by weak institutions)	yes	yes	Yes (public debt)
Michaels (2011)	Decades 1940-90	geological variation in oil abundance in the Southern USA counties	Blessing (on population growth)	No	No	No
Cotet and Tsui (2010)	Single panel 1930-2003	worldwide oil discoveries and extractions	Blessing (on population growth)	Yes	No	No
Manzano and Rigobon (2006)	2 or 4 panels 1970-1980	Primary exports/GNP	No curse controlling for fixed effects	No	No	No
Lederman and Maloney (2003)	5-year panels (1980-99)	Resource exports per worker or in GDP; export share and concentration	Blessing (Resource exports per worker or in GDP); curse (export concentration and share)	No	No	No
Birdsall and Hamoudi (2002)	Two panels (1980s and 90s)	Commodity dummy introduced in Dollar and Kraay's (2001) results	Curse (commodity dependence reduces the impact of trade on growth)	No	No	No

Table 1 above presents a summary of recent panel studies (which control for unobserved effects and thus ensure consistency of estimates) on the resource curse and their main features.

4. Conclusions

This survey suggests that the resource curse literature has been progressing, especially in the estimation methods (by controlling for unobserved effects with panel data), and thus is closer to provide a more comprehensive and accurate answer to the curse paradox. The variety of results that arises from using different resource proxies and empirical approaches (*e.g.*, cross-section versus panel analyses) provides several clues to address the paradox, but, at the same time, makes comparison more difficult in finding a unified answer. Overall, the quality of institutions and policies, namely fiscal, appears to be the most credible explanation to the curse result that is generally found using resource dependence measures.

In cross-section studies, analyses with resource stock measures (*e.g.*, Van der Ploeg and Poelhekke, 2010)[17] or measures of mineral production (*e.g.*, Sala-i-Martin *et al.*, 2004; Nunn, 2008) dismiss the mineral resource curse found with export shares (*e.g.*, Sala-i-Martin and Subramanian, 2003; Isham *et al.*, 2005), which appears to be related to weak institutions.

Panel-data analyses are few and show more contrasting results, but also because they are more difficult to compare. Manzano and Rigobon (2006) dismiss the curse using Sachs and Warner's (1995) data and controlling for fixed effects, but they cannot estimate institutions in that assessment. Lederman and Maloney find different results (resource curse or blessing) depending on the chosen proxy, but they do not control for institutions.

[17] Gylfason (2001a) is an exception. This author uses the share of natural capital in countries' wealth for 1994 and finds the usual curse result, but more recent and sophisticated studies with similar data, such as Van der Ploeg and Poelhekke (2010), come to different conclusions as previously mentioned.

Butkievicz and Yanikkaya (2011) panel study shows a resource curse explained by weak institutions in developing countries, but the statistical treatment of resource proxies (following Birdsall and Hamoudi, 2002) and the different estimation approach differ from previous work, which also happens with studies using rather unique resource proxies (Cotet and Tsui, 2010; Michaels, 2011). Torres *et al*. (forthcoming) study is also not comparable with the other panel studies, by using a different proxy (oil production) and a single-panel estimation approach of a growth-accounting framework with factor efficiency (using wage growth as the dependent variable) that adds fiscal policy as a measure of institutional quality in the assessment of adequate state management of variable oil revenues.

In our view, future research on the resource curse theme should follow the recent trend of panel data analysis (in order to control for unobserved effects, which can lead to inconsistent estimates) and estimate at the same time the effects of resource dependence proxies, in which the curse appears to originate, and the impact of the natural capital stock and/or resource production as more precise measures of resource abundance.

In line with Brunnshweiler and Bulte (2008), traditional measures for institutions (interpreted as deep and durable" features of societies) should be complemented with measures for the quality of policies (interpreted as a reflection of institutions), as both interpretations are potentially relevant for the resource curse analysis. For example, policy measures provide more variability than traditional measures for institutions (which are stable over time, by definition) to include in single panel studies that preserve short term volatility of resource proxies (as in Torres *et al*., forthcoming). Measures for fiscal policy, in particular, should be considered in the analysis, as several studies show that public management of variable resource revenues may be central in avoiding the curse result (e.g., Davis, 2001; Atkinson and Hamilton, 2003).

References

Acemoglu, D., (1995). Reward Structures and the Allocation of Talent. *European Economic Review* 39(1), 17-33.

Acemoglu, D., Johnson, S., Robinson, J. and Thaicharoen, Y. (2003). 'Institutional causes, macroeconomic symptoms: volatility, crises and growth', *Journal of Monetary Economics,* 50**(**1), 49-123.

Acemoglu, D., and Robinson, J.A., (2006). Economic backwardness in political perspective. *American Political Science Review* 100(1), 115-131.

Acemoglu, D., Johnson, S. and Robinson, J. (2005). 'Institutions as the fundamental cause of long-run growth', in P. Aghion. and S. Durlauf (eds.), *Handbook of economic growth: Vol.* 1*A* (Amsterdam: Elsevier), 385-472.

Alexeev, M. and Conrad, R. (2009). 'The elusive curse of oil', *Review of Economics and Statistics*, 91(3), 586-598.

Atkinson, G. and Hamilton, K. (2003). 'Savings, growth and the resource curse hypothesis', *World Development,* 31(11), 1793–1807.

Auty R.M. (1990). Resource-based industrialization: sowing the oil in eight developing countries. Clarendon, Oxford.

Auty R.M. (1991). Managing mineral dependence: Papua New Guinea 1972–89. *Natural Resources Forum*, 90–99.

Auty R.M. (1993). Sustaining development in mineral economies: the resource curse thesis. Routledge, London.

Auty R.M. (1994a). Industrial policy reform in six large newly industrialized countries: the resource curse thesis. *World Development,* 12, 11–26.

Auty R.M. (1994b). Patterns of development: resources, policy, and economic growth. Edward Arnold, London.

Auty, R.M. (2001a). *Resource Abundance and Economic Development* (Oxford: Oxford University Press).

Auty, R.M. (2001b). 'The Political Economy of Resource-driven Growth', *European Economic Review,* 45(4), 839-846.

Auty R.M. and Evans D. (1994). Trade and industrial policy for sustainable resource-based development: policy issues, achievements and prospects. Report GE94-50979 prepared for UNCTAD. UNCTAD, Geneva, 8 March.

Auty, R.M., and Mikesell, R.F. (1998). Sustainable Development in Mineral Economies. Oxford: Clarendon Press.

Baland J.M., Francois, P. (2000). Rent Seeking and Resource Booms. *Journal of Development Economics* 61(2), 527-42.

Behrman, J., (1987). Commodity price instability and economic goal attainment in developing countries. *World Development,* 15(5), 559–573.

Birdsall, N., Hamoudi, A., (2002). ''Commodity Dependence, Trade, and Growth: When ''Openness'' Is Not Enough.'' Center for Global Development Working Paper 7. Washington, DC: Center for Global Development.

Birdsall, N., Pinckney, T., Sabot, R., (2001). ''Natural Resources, Human Capital, and Growth.'' In Resource Abundance and Economic Development, ed. Richard M. Auty. Oxford: Oxford University Press.

Bleaney, M., Halland, H. (2009). 'The resource curse and fiscal policy volatility', CREDIT Research Paper No. 9.

Bleaney, M., Nishiyama, A., (2002). 'Explaining growth: a contest between models', *Journal of Economic Growth,* **7(**1), 43-56.

Boschini, A., Petersson, J., Roine, J. (2007). 'Resource curse or not: a question of appropriability', *Scandinavian Journal of Economics*, 109(3), 593-617.

Bravo-Ortega, C., Gregorio, J., 2007. The relative richness of the poor? Natural resources, human capital and economic growth. In: Lederman, D., Maloney, W. (Eds.), *Resources, Neither Curse nor Destiny*. Stanford University Press, Washington, DC, Chapter 4, pp. 71-99.

Brunnschweiler, C. (2008). 'Cursing the blessings? Natural resource abundance, institutions, and economic growth', *World Development*, 36(3), 399-419.

Brunnschweiler, C., Bulte, E. (2008). 'The resource curse revisited and revised: a tale of paradoxes and red herrings', *Journal of Environmental Economics and Management*, 55(3), 248-264.

Bulte, E., Damania, R. and Deacon, T. (2005), 'Resource Intensity, Institutions, and Development', *World Development*, 33(7), 1029–1044.

Butkiewicz J.L., Yanikkaya H. (2010). Minerals, institutions, openness, and growth: an empirical analysis. *Land Economy*, 86(2), 313–328.

Cotet, A., Tsui, K. (2010). 'Resource curse or Malthusian trap? Evidence from oil discoveries and extractions', Ball University Economic Paper Nº 201001.

Cuddington, J. T. (1992). Long run trends in 26 primary commodity prices: A disaggregated look at the Prebisch-Singer hypothesis. *Journal of Development Economics*, 39(2), 207–27.

Davis, G. (1995). Learning to love the Dutch disease: evidence from the mineral economies. *World Development* 23(10), 1765-79.

Davis, G.A. (2011). The resource drag. *International Economics and Economic Policy* 8, 155–176.

Davis, J. (2001). *Stabilization and savings funds for non-renewable resources: experience and fiscal policy implications* (Washington D.C.: International Monetary Fund).

Davis, J. (2003). *Fiscal policy formulation and implementation in oil-producing countries* (Washington D.C.: International Monetary Fund).

Dawe, D. (1996). ‘A new look at the growth in developing countries’, *World Development*, 24(12), 1905-1914.

Ding, N., Field, B.C. (2005). ‘‘Natural Resource Abundance and Economic Growth.’’ *Land Economics*, 81(4): 496–502.

Dollar, D., Kraay, A., (2001). ‘‘Trade, Growth, and Poverty.’’ Policy Research Working Paper Series 2615. Washington, DC: World Bank.

Fatás, A., Mihov, I. (2003). ‘The case for restricting fiscal policy discretion’, *Quarterly Journal of Economics*, 118**(**4), 1419-1447.

Fatás, A., Mihov, I. (2005). ‘Policy volatility, institutions and economic growth’, CEPR Discussion Paper No. 5388.

Fosu, A. (1996). Primary exports and economic growth in developing countries. *World Economy*, 19(4), 465–475.

Gelb A.H. (1988). Oil windfalls: blessing or curse? Oxford University Press, New York.

Gradstein, M. (2008), ’Institutional traps and economic growth’, *International Economic Review*, 49(3), 1043-66.

Gylfason, T. (2001a). Natural resources and economic growth; what is the connection’, CESifo Working Paper No. 50.

Gylfason, T. (2001b). ‘Natural resources, education and economic development’, *European Economic Review*, 45(4), 847-859.

Hartford, T., Klein, M. (2005). ‘Aid and the resource curse’, The World Bank Group, Private Sector Development Presidency Note No. 291 (Washington, DC: World Bank).

Herb, M., (2005). ‘No representation without taxation? Rents, development and democracy’, *Comparative Politics*, 37(3), 297-317.

Hirschman, A., (1958). *The strategy of economic development*. Yale University Press, New Haven.

Humphreys, M., Sachs, J., Stiglitz, J. (2007). *Escaping the resource curse* (New York: Columbia University Press).

Isham, J., Woodcock, M., Pritchett, L.,Busby, G. (2005). 'The varieties of resource experience: natural resource export structures and the political economy of economic growth', *World Bank Economic Review*, 19(2), 141-174.

Keay I. (2007). 'The engine or the caboose? Resource industries and twentieth-century Canadian economic performance,' *Journal of Economic History*, 67(1), 1–32.

Lane, P.R., Tornell, A., (1996). ''Power, Growth, and the Voracity Effect.'' *Journal of Economic Growth*, 1(2), 213–41.

Lederman, D., Maloney, W., (2003). ''Trade Structure and Growth.'' Policy Research Paper 3025. Washington, DC: World Bank.

Lederman, D., Maloney, W. (2008), 'In search of the missing resource curse', World Bank Policy Research paper No. 4766 (Washington DC: World Bank).

Leite, C., Weidmann, J. (2002), 'Does mother nature corrupt? Natural resources, corruption and economic growth', in G. Abed and S. Gupta (eds.), *Governance, corruption, and economic performance* (Washington DC: International Monetary Fund), 156–69.

Lutz, M., (1994). 'The effects of volatility in the terms of trade on output growth: New evidence,' *World Development*, 22(12), 1959–1975.

Manzano, O., Rigobon, R. (2006), 'Resource curse or debt overhang?', in D. Lederman and W. Maloney (eds.), *Resources, neither curse nor destiny* (Washington DC: Stanford University Press), 71-99.

Matsuyama, K. (1992), 'Agricultural Productivity, Comparative Advantage and Economic Growth', *Journal of Economic Theory*, 58(2), 317-334.

Mauro, P. (1995), 'Corruption and Growth', *Quarterly Journal of Economics*, 110(3), 681-712.

Mehlum, H. Moene, K., Torvik, R. (2006a), 'Cursed by resources or institutions?', *The World Economy*, 29(8), 1117-31.

Mehlum, H., Moene, K., Torvik, R. (2006b), 'Institutions and the resource curse', *Economic Journal*, 116(508), 1-20.

Meier, G., Rauch, J. (2000), *Leading Issues in Economic Development* (Oxford: Oxford University Press).

Michaels, G., (2011). 'The Long Term Consequences of Resource-Based Specialization', *Economic Journal*, 121(551), 31-57.

Moran, C., (1983). Export fluctuations and economic growth. *Journal of Development Economics* 12(1), 195-218.

Neary, P., van Wijnberger, S. (1986). *Natural resources and the macroeconomy* (Cambridge: Cambridge University Press).

Nordhaus, W.D. (1992), 'Lethal model 2: the limits to growth revisited', *Brookings Papers on Economic Activity*, 2(1), 1-43.

Nunn, N. (2008). 'The long-run effects of Africa´s slave trades', *Quarterly Journal of Economics*, 123(1), 139-176.

Papyrakis, E., Gerlagh, R. (2004). The resource curse hypothesis and its transmission channels. *Journal of Comparative Economics* 32(1), 181-193.

Prebisch, R. (1950), *The economic development of Latin America and its principal problems* (New York: United Nations).

Rodrik, D., Subramanian, F., Trebbi, F. (2004), 'Institutions rule: the primacy of institutions over geography and integration in economic development', *Journal of Economic Growth*, 9(2), 131-65.

Ross, M. L. (2001), 'Does oil hinder democracy?', *World Politics*, 53(3), 325–361.

Robinson, James A., Ragnar Torvik, and Thierry Verdier. 2006. ‘‘Political Foundations of the Resource Curse.’’ *Journal of Development Economics* 79(2), 447–68.

Sachs, J., Warner, A. (1995). ‘Natural Resource Abundance and Economic Growth’, NBER Working Paper No. 5398.

Sachs J., Warner A. (1997a). Natural resource abundance and economic growth. HIID Working Paper, November.

Sachs J., Warner A. (1997b). Sources of slow growth in African economies. *Journal of African Economies*. 6(3), 335–376.

Sachs J., Warner A. (1997c). Fundamental sources of long-run growth. *American Economic Review*, 87(2), 184–188.

Sachs, J.,, Warner, A. (1999a). ‘The big push, natural resource booms and growth’, *Journal of Development Economics*, 59(1), 43-76.

Sachs J., Warner A. (1999b) Natural resource intensity and economic growth. In: Chambers B, Farooq A, Mayer J (eds) *Development policies in natural resource economies*. Edward Elgar, Cheltenham, 13–38.

Sachs, J., Warner, A. (2001), ‘The curse of natural resources’, *European Economic Review*, 45(4), 827-38.

Sala-i-Martin, X., Doppelhofer, G., Miller, R. (2004). ‘Determinants of long-term growth: a bayesian averaging of classical estimates (BACE) approach’, *American Economic Review*, 94(4), 813-35.

Sala-i-Martin, X., Subramanian, A. (2003). ‘Addressing the natural resource curse: an illustration from Nigeria’, NBER Working Paper No. 9804.

Sandbu, Martin E. (2006). ‘‘Natural Wealth Accounts: A Proposal for Alleviating the Natural Resource Curse.’’ *World Development*, 34(7), 1153–70.

Smith, A., [1776]1976. *An Inquiry into the Nature and Causes of the Wealth of Nations*. Campbell, R.H., Skinner, A.S., Todd, W.B. (Eds.). Clarendon Press, Oxford.

Stein, E., Tommasi, M., Echebarría, K, Lora, E., Payne, M. (2005), *The politics of policies: economic and social progress in Latin America* (Washington DC: IDB).

Torres, N., Afonso, O., Soares, I. (forthcoming). Oil abundance and Economic Growth – A Panel Data Analysis. *Forthcoming in Energy Journal*.

Stern, N. (2008). 'The economics of climate change', *American Economic Review*, 98(2), 1-37.

Stijns, J. (2005). Natural resource abundance and economic growth revisited. *Resources policy*, 30(2), 107-30.

Torvik, R. (2002). 'Natural resource rent seeking and welfare', *Journal of Development Economics*, 67(2), 455-70.

Tsui, K. (2011), 'More oil, less democracy: evidence from worldwide crude oil discoveries', *Economic Journal*, 121(551), 89-115.

Van der Ploeg, F., and Poelhekke, S. (2010), 'The pungent smell of 'red herrings': subsoil assets, rents, volatility and the resource curse', *Journal of Environmental Economics and Management*, 60(1), 44-55.

Wheeler D. (1984). Sources of stagnation in sub-Saharan Africa. *World Development*, 12(1), 1–23.

Wright, G., Czelusta, J. (2004). ''The Myth of the Resource Curse.'' *Challenge*, 47(2), 6–38.