Economics Bulletin

Volume 37, Issue 1

A Reappraisal of the Resource Curse

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Abstract

We here provide some evidence that the growth regression models used to test the resource curse should correctly account for heterogeneities between countries. We reproduce the results in a well-known article by Brunnschweiler and Bulte (2008) and then test their robustness. We show that the impact of resource dependence on growth strongly depends on the way in which we model heterogeneity. We find evidence of the resource curse in low-income countries.

This paper has been partly funded by the labex Voltaire (ANR-10-LABX-100-01).
Citation: Nicolas Clootens and Djamel Kirat, (2017) "A Reappraisal of the Resource Curse", *Economics Bulletin*, Volume 37, Issue 1, pages 12-18
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Submitted: October 12, 2016. **Published:** January 13, 2017.

1 Introduction

Following the seminal work of Sachs and Warner (1995), a huge literature has developed on the so-called resource curse. This curse refers to the paradox that resource-abundant countries experience lower long run economic growth than do resource-poor countries.

Economists have identified at least five major transmission channels to explain the resource curse. The most popular is the "Dutch disease", which has been widely documented in the literature (see for example Corden, 1984; Krugman, 1987; Bruno and Sachs, 1982; Torvik, 2001; Matsen and Torvik, 2005). This refers to the deterioration in the terms of trade that results from the real exchange-rate appreciation following a resource boom. This shift in the terms of trade has a negative impact on non-resource sectors.

A second channel is the potential negative effect of natural resources on education. Following Gylfason (2001) and Sachs and Warner (1999), the abundance of natural resources increases the agent's opportunity cost of human-capital investment.

The third channel refers to institutional quality. Resources may produce rent-seeking behavior, which reduces institutional quality (a major determinant of economic growth) through corruption or armed conflict (see Jensen and Wantchekon, 2004; Robinson et al., 2006; Marchi Adani and Ricciuti, 2014).

Natural resources may also crowd out physical-capital investment (Sachs and Warner, 1995). A resource boom implies a shift in the distribution of production factors, from the secondary and tertiary sectors to the primary sector. As the manufacturing and tertiary sectors are more likely to exhibit increasing returns to scale and positive externalities than the primary sector, this shift will reduce productivity and the profitability of investment.

Last, the volatility in resource prices could increase macroeconomic instability, which in turn inhibits growth (Van der Ploeg and Poelhekke, 2009).

Alongside this literature on the transmission channels of the resource curse, there is great debate over the evidence for the resource curse. Growth regressions are often used here, but these come with two major problems, as highlighted by Brunnschweiler and Bulte (2008): *i*) natural-resource exports over GDP are typically used as a proxy for resource abundance, although they better measure resource dependence; and *ii*) this variable is potentially endogenous when used in growth regressions. Brunnschweiler and Bulte (2008) distinguish resource dependence from resource abundance in their growth regressions and use instrumental variables to correct for endogeneity bias. They conclude that resource abundance has a positive effect on economic growth while resource dependence has no effect: the resource curse may then be a red herring.

In this note, we use the database in Brunnschweiler and Bulte (2008) to show that their regression results are misleading without modelling the right form of heterogeneity. We first reproduce the work in Brunnschweiler and Bulte (2008) and test the robustness of their results when we do not include their geographical dummies. We then run the same instrumental-variable procedure on a similar model that differs only in the way in which we introduce heterogeneity. We find that the resource curse applies in low-income countries.

2 Resource dependence: a curse for low income countries

Brunnschweiler and Bulte (2008) argue that natural resource exports over GDP capture resource dependence more than resource abundance, and their use as a proxy for

resource abundance may lead to the misinterpretation of the regression results. They also claim that introducing resource dependence and institutional variables in growth regressions may produce endogeneity biases: *i*) resource dependence depends on economic choices that simultaneously affect growth; and *ii*) natural resources may reduce institutional quality (as in the third channel above), which in turn affects resource dependence through the economic policies that depend on institutions. This endogeneity is addressed via Three Stage Least Squares (3SLS) regressions using historical openness and the presidential regime in 1970 as instruments for resource dependence, while institutional quality is instrumented by latitude.[1] The following regressions are estimated:

$$\begin{cases} g7000 = \beta_0 + \beta_1 \times RD + \beta_2 \times RA + \beta_3 \times inst + \beta_4 \times gdp_{70} + \sum_{i=1}^{5} \beta_{i,5} \times region_i + \epsilon \\ RD = \psi_0 + \psi_1 \times pres_{70} + \psi_2 \times RA + \psi_3 \times inst + \psi_4 \times open + \sum_{i=1}^{5} \psi_{i,5} \times region_i + \mu \\ inst = \phi_0 + \phi_1 \times latitude + \phi_2 \times RA + \sum_{i=1}^{5} \phi_{i,3} \times region_i + v \end{cases} \tag{1}$$

where $g7000$ represents growth over the 1970-2000 period, RD resource dependence, RA resource abundance, $inst$ institutional quality, and gdp_{70} initial GDP. The regional dummies $region_i$, $i = 1, ..., 5$, split the world into five areas. In the second equation, $pres_{70}$ is a dummy variable for the governance regime and *open* represents country trade openness.[2]

We replicate the main results in Brunnschweiler and Bulte (2008) in the first column of Table I. These suggest that natural resources may be a blessing when we separate resource dependence and resource abundance. Resource abundance positively affects growth, while the impact of resource dependence is negative but statistically insignificant. Our aim here is to evaluate the robustness of this result.

Brunnschweiler and Bulte (2008) introduce regional dummies to pick up the differences in average economic growth across regions, conditional on the other explanatory variables. However, this choice of regions needs to be discussed and justified, as countries in the same region are very heterogeneous regarding climate and geology, culture, politics and economics. This is confirmed in the results in Table I. The second column of Table I presents the estimation results in the model in Brunnschweiler and Bulte (2008) when we omit the regional dummies. These reveal a strong significant negative impact of resource dependence on growth. They show also that resource abundance positively affects economic growth and institutional quality. The result in Brunnschweiler and Bulte (2008) is thus not robust to the omission of regional dummies. Moreover, the estimated parameters on the regional dummies in column 1 are insignificant in the top panel, except for African and Middle-Eastern countries: these countries then behave differently from the rest of the world. A dummy variable for African and Middle-Eastern countries against

[1] Other popular instruments are also used in robustness regressions. The results are mainly unchanged.

[2] The resource-dependence variable (RD) used here is the average GDP share of total mineral exports over 1970-1989. RA is the log of subsoil assets in 1994 (in US$ per capita). The institutional variable comes from Kaufmann et al. (2009) and measures the quality of contracts and the likelihood of crime and violence, amongst others. gdp_{70} is the log of real GDP per capita in 1970. The regional dummies divide the world into five geographical areas: Africa and the Middle East ($afme$), Central and South America ($csam$), North America (nam), Europe and Central Asia ($eurca$), and Asia and Oceania (aoc). We use Central and South America as the omitted category. $pres_{70}$ is a dummy for the country having a presidential regime at the beginning of the 1970s. *open* is the sum of past imports and exports over GDP, averaged over 1950-1969. and *latitude* is the distance to the equator normalized to lie between 0 and 1.

Table I: 3SLS regressions with and without dummy variables

	With dummies	Without dummies
Economic growth: g7000		
RD	-4.625 (3.129)	-9.996*** (3.603)
RA	0.345*** (0.126)	0.503*** (0.134)
inst	1.666* (0.917)	1.595*** (0.497)
gdp_{70}	-2.073*** (0.804)	-1.806*** (0.510)
cons	18.566*** (5.929)	15.298*** (3.237)
afme	-1.672*** (0.645)	
eurca	0.132 (1.142)	
aoc	-0.204 (1.156)	
nam	-0.432 (1.366)	
R^2	0.576	0.396
Mineral dependence: RD		
$pres_{70}$	0.035 (0.022)	0.017 (0.021)
RA	0.015*** (0.005)	0.016*** (0.004)
inst	-0.027 (0.016)	-0.027** (0.011)
open	0.259*** (0.039)	0.222*** (0.034)
cons	-0.162*** (0.046)	-0.130*** (0.031)
afme	-0.011 (0.024)	
eurca	0.021 (0.039)	
aoc	0.034 (0.030)	
nam	0.030 (0.055)	
R^2	0.605	0.582
Institutions: inst		
latitude	2.920*** (0.585)	4.335*** (0.365)
RA	0.104*** (0.039)	0.089** (0.039)
cons	-1.517*** (0.310)	-1.444*** (0.254)
afme	0.105 (0.201)	
eurca	0.870*** (0.302)	
aoc	0.591*** (0.214)	
nam	0.973** (0.438)	
R^2	0.774	0.723
Observations	58	58

Notes: Standard errors in parentheses. *, ** and *** refer respectiviely to the 10%, 5% and 1% significance levels.

the rest of the world would thus be more appropriate and allow us to estimate a more parsimonious econometric model. In addition, the way in which Brunnschweiler and Bulte (2008) take into account regional heterogeneities constrains the model parameters (apart from the constant) to be the same across regions.

We relax this assumption and allow all estimated parameters to vary by region. We split the sample into two distinct regions, Northern and Southern countries.[3] As this split is subjective, we also investigate OECD versus non-OECD countries. The results respectively appear in Tables II and III.

The results are in line with those of Brunnschweiler and Bulte (2008) except for the impact of resource dependence on economic growth, which is now strongly and significantly negative in Southern (or non-OECD) countries. This is not the case for Northern (or OECD) countries. Resource dependence then does seem to be a curse for Southern

[3]This split is carried out using the areas in Brunnschweiler and Bulte (2008). Northern countries include North-American, European and Central-Asian countries. We do not investigate African and Middle Eastern countries versus the rest of the world separately as the subsample of African and Middle Eastern countries contains too few observations.

countries but not for Northern countries.

Table II: Regression by subgroups: North vs South

	3SLS Southern	3SLS Northern
Economic growth: g7000		
RD	-10.724*** (4.073)	6.784 (8.549)
RA	0.739*** (0.181)	0.054 (0.087)
inst	1.479** (0.723)	0.313 (0.660)
gdp_{70}	-2.049*** (0.600)	-1.545** (0.674)
cons	12.207*** (2.548)	17.519*** (3.325)
R^2	0.445	0.271
Mineral dependence: RD		
$pres_{70}$	0.024 (0.029)	-0.002 (0.011)
RA	0.019*** (0.006)	0.006** (0.003)
inst	-0.029 (0.023)	0.002 (0.012)
open	0.265*** (0.046)	0.082*** (0.024)
cons	-0.096 (0.079)	-0.056*** (0.041)
R^2	0.605	0.620
Institutions: rule		
latitude	3.476*** (0.734)	3.814*** (0.952)
RA	0.100** (0.049)	0.036 (0.054)
cons	1.115*** (0.343)	1.774*** (0.527)
R^2	0.380	0.537
Observations	41	17

Notes: Standard errors in parentheses. *, ** and *** refer respectiviely to the 10%, 5% and 1% significance levels.

Table III: Regression by subgroups: OECD vs non-OECD Countries

	3SLS non-OECD	3SLS OECD
Economic growth: g7000		
RD	-10.529*** (3.528)	-3.207 (10.908)
RA	0.939*** (0.185)	0.025 (0.108)
inst	1.129 (0.955)	1.303* (0.716)
gdp_{70}	-2.149*** (0.501)	-2.623*** (0.753)
cons	15.298*** (3.237)	25.545*** (4.796)
R^2	0.552	0.674
Mineral dependence: RD		
$pres_{70}$	0.025 (0.036)	-0.005 (0.010)
RA	0.024*** (0.007)	0.007*** (0.002)
inst	-0.070 (0.056)	-0.006 (0.010)
open	0.265*** (0.049)	0.081*** (0.021)
cons	-0.212*** (0.047)	-0.037** (0.016)
R^2	0.558	0.629
Institutions: inst		
latitude	1.503**(0.660)	3.257*** (0.830)
RA	0.058 (0.042)	0.056 (0.054)
cons	-0.892 (0.292)	-0.488 (0.532)
R^2	0.166	0.437
Observations	36	22

Notes: Standard errors in parentheses. *, ** and *** refer respectiviely to the 10%, 5% and 1% significance levels.

3 Conclusion

This note shows that, while resource abundance is a blessing, resource dependence may be seen as a curse, even when using a proper instrumental method. We identify groups of countries that react differently to resource dependence. Our sample split looks as if it is linked to the income level, although it is conducted in an arbitrary manner. This suggests that non-linearity may matter, and calls for a more robust sample splitting methodology.

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A List of Country

The sample includes the following countries:

Argentina	Australia	Austria	Bangladesh
Belgium	Benin	Bolivia	Brazil
Cameroon	Canada	China	Colombia
Republic of Congo	Ivory Coast	Denmark	Dominican Republic
Ecuador	Egypt	Finland	France
Ghana	Greece	Guatemala	Honduras
India	Indonesia	Ireland	Italy
Jamaica	Japan	Jordan	Korea
Malaysia	Mexico	Morocco	Nepal
Netherlands	New Zealand	Norway	Pakistan
Peru	Philippines	Portugal	Senegal
Sierra Leone	South Africa	Spain	Sweden
Thailand	Togo	Trinidad and Tobago	Tunisia
Turkey	United Kingdom	United States	Venezuela
Zambia	Zimbabwe		

B Robustness check

We check the robustness of our results estimating regressions removing the top and bottom 10% of the distribution of mineral dependence. The results confirm those in Section 2.

Table IV: Regression without the 10% most-dependent countries

	3SLS Southern	3SLS Northern	3SLS Non-OECD	3SLS OECD
Economic growth: g7000				
RD	-37.584* (15.752)	6.784 (8.549)	-31.053** (11.551)	-3.207 (10.908)
RA	0.762*** (0.229)	0.054 (0.087)	0.911*** (0.222)	0.025 (0.108)
inst	1.023 (0.820)	0.313 (0.660)	0.679 (1.115)	1.303 (0.716)
gdp_{70}	-1.780** (0.615)	-1.585* (0.674)	-1.733*** (0.473)	-2.623*** (0.753)
cons	14.684*** (3.983)	18.303*** (4.568)	13.185*** (3.139)	25.545*** (4.795)
Mineral dependence: RD				
$pres_{70}$	0.002 (0.010)	-0.002 (0.011)	0.002 (0.013)	-0.005 (0.010)
RA	0.010*** (0.003)	0.006* (0.003)	0.014*** (0.004)	0.007*** (0.002)
inst	-0.024** (0.009)	0.002 (0.012)	-0.064* (0.027)	-0.006 (0.010)
open	0.085*** (0.023)	0.082*** (0.024)	0.093*** (0.025)	0.082*** (0.021)
cons	-0.056** (0.018)	-0.049** (0.018)	-0.088*** (0.025)	-0.037* (0.016)
Institutions: inst				
latitude	3.074*** (0.792)	3.814*** (0.952)	0.899 (0.639)	3.257*** (0.830)
RA	0.122* (0.058)	0.036 (0.054)	0.080 (0.050)	0.056 (0.054)
cons	-1.375*** (0.365)	-0.726 (0.527)	-0.848** (0.302)	-0.488 (0.532)
Observations	35	17	30	22

Notes: Standard errors in parentheses. *, ** and *** refer respectively to the 10%, 5% and 1% significance levels.

Table V: Regression without the 10% least-dependent countries

	3SLS Southern	3SLS Northern	3SLS Non-OECD	3SLS OECD
Economic growth: g7000				
RD	-9.588* (3.858)	6.784 (8.549)	-9.646** (3.512)	-2.347 (11.100)
RA	0.844*** (0.206)	0.054 (0.087)	0.995*** (0.204)	0.029 (0.112)
inst	1.360* (0.678)	0.313 (0.660)	1.152 (0.813)	1.345 (0.720)
gdp_{70}	-2.443*** (0.601)	-1.585* (0.674)	-2.272*** (0.528)	-2.646*** (0.762)
cons	17.761*** (3.842)	18.303*** (4.568)	15.619*** (3.488)	25.596*** (4.839)
Mineral dependence: RD				
$pres_{70}$	0.051 (0.039)	-0.002 (0.011)	0.057 (0.048)	-0.004 (0.010)
RA	0.027*** (0.007)	0.006* (0.003)	0.030*** (0.008)	0.007*** (0.002)
inst	-0.035 (0.028)	0.002 (0.012)	-0.042 (0.053)	-0.006 (0.010)
open	0.293*** (0.052)	0.082*** (0.024)	0.296*** (0.055)	0.085*** (0.022)
cons	-0.260*** (0.062)	-0.049** (0.018)	-0.287*** (0.067)	-0.040* (0.017)
Institutions: inst				
latitude	3.408*** (0.748)	3.814*** (0.952)	1.881** (0.711)	3.465*** (0.828)
RA	0.120* (0.056)	0.036 (0.054)	0.063 (0.051)	0.077 (0.055)
cons	-1.496*** (0.384)	-0.726 (0.527)	-0.971** (0.351)	-0.750 (0.558)
Observations	35	17	31	21

Notes: Standard errors in parentheses. *, ** and *** refer respectively to the 5%, 1% and 0.1% significance levels.