

# The Paradox of Plenty: A Meta-Analysis

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**Summary.** — Since Sachs and Warner’s seminal article in 1995, numerous studies have addressed the link between natural resources and economic growth. Although the “resource curse” effect was commonly accepted at first, many articles have challenged its existence, and the results found in the literature are ambiguous. In this paper, we aim to quantitatively review this literature in order to (i) identify the sources of heterogeneity and (ii) assess the impact of natural resources on economic growth. A meta-analysis is performed on 69 empirical studies on the resource curse, totaling 1,419 estimates. Our findings show that (i) only developing countries suffer from the resource curse although it is soft; (ii) the way natural resources are taken into account is crucial to understand the heterogeneity found in the literature; (iii) the negative impact of the volatility of the terms-of-trade on growth should be qualified. An additional MRA performed on indirect effects size also indicate that when institutions are at their best level, the resource curse disappears and may be turned into a blessing.

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## 1. INTRODUCTION

Countries endowed with a rich bounty of natural resources have often failed to benefit from them and sometimes have performed worse than countries with fewer resources. This conventional wisdom of the paradox of plenty has spread through the academic literature since the mid-1990s (Barro, 1991; Gelb, 1988; De Long & Summers, 1993; Gelb, 1988; King & Levine, 1993). One recurring example is Nigeria’s poor performance despite its substantial oil wealth compared to diamond-rich Botswana, which has managed to escape that pattern and improve economically. Since Sachs and Warner’s famous paper in 1995, extensive literature, both theoretical and empirical, has emerged addressing the resource curse. The great heterogeneity of development paths followed by resource-rich countries demonstrates that the resource curse has not always been inevitable and that there exist ways to make the most of one’s natural wealth (van der Ploeg, 2011).

The detrimental effects of natural resources on the economy have been highlighted through two perspectives: a market-based viewpoint focusing on macroeconomic mechanisms and a political economy approach stressing the role of institutions (Deacon, 2011; Deacon & Rode, 2015) that has gained importance in the last decade.<sup>1</sup>

The market case is well identified by the Dutch disease which may be defined simply as a contraction of the non-resource tradable sector.<sup>2</sup> Another illustration of the resource curse relates to over-expanding public sectors sometimes financed by excessive borrowing that causes “debt-overhangs” (Manzano & Rigobon, 2001). The non reinvestment of the rents from natural capital in physical and human capital induces negative savings yet still strive to foster growth (Atkinson & Hamilton, 2003; Gylfason, 2001) while facing credit constraints (Beck, 2011). According to van der Ploeg and Poelhekke (2009), high volatility of commodity prices “seems to be the quintessence of the resource curse” since it generates large real exchange rate fluctuations and less investment, especially in countries where financial development is lagging (Aghion, Bacchetta, Ranciere, & Rogoff, 2009), consequently translating into lower productivity growth. All these

factors may ultimately hamper growth, especially in developing countries where terms-of-trade fluctuations are twice as large as in developed countries (Baxter & Kouparitsas, 2006).

The cornerstone of the political economy approach is that natural resources may be growth deterring because they foster rent-seeking behavior. Institutions are at the heart of this relation, but thus far, the role they play is not clear-cut because it seems to be an issue of endogeneity. On the one hand, the main strand of the literature supports the theory that poor institutions are primarily the group fostering the rent-seeking behavior in a natural resource bonanza context. Lane and Tornell (1996) and Tornell and Lane (1999) pin down the voracity effect—a particular form of rent-seeking in which powerful groups have the ability to hijack and seize natural resources for their benefit—that occurs within a poor “legal-political institutional framework” (altered property rights and market imperfection) and in the presence of fractionalization. Torvik (2002), or Mehlum, Moene, and Torvik (2006), put forward an entrepreneurship diversion effect in which institutions determine the behavior of an entrepreneur. When institutions are weak, profits retrieved from resource appropriation tend to be higher than from pure production. Hence, entrepreneurs are incentivized to become resource-grabbers rather than wealth-producers, hampering growth. On the other hand, some research takes the position that a low-quality institutional framework is instead considered as a result of rent-seeking (Karl, 1997; Ross, 2001). When resource-rich countries are fractionalized, competition between groups for resource appropriation leads to damaged

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institutions, which in turn negatively affect growth through the lens of property-rights corrosion (Hodler, 2006). Issues other than property-rights may also be at work, such as corruption, as documented in Brazil by Caselli and Michaels (2013), or rigged elections in which both voters (Acemoglu & Robinson, 2008) and political challengers have been bribed (Acemoglu, Robinson, & Verdier, 2004). On the whole, democracy seems to be harmed, as highlighted by Ahmadov (2014), whose meta-analysis demonstrates a strong negative relationship between democracy and oil-wealth.

Regarding the empirical literature dealing with the outcome of natural resources on growth, results are mixed: “either outcome [curse or blessing] is possible” (van der Ploeg, 2011) since structural factors, such as the quality of institutions, the financial development, the type of resources considered but also research patterns (mainly the way resources are measured) can drive the results in a way or another. In this article we take stock from this empirical literature in order to assess the direction and the intensity of the link between natural resources and growth. Our contribution to the field is threefold.

The first one is methodological: we rely on a meta-regression analysis (MRA hereafter), which is a quantitative review of literature that is specifically designed to integrate and evaluate econometric estimates. An MRA allows us to estimate the studied effect (here the resource curse) thanks to the meta-average, as well as identify, discuss, and quantify the sources of heterogeneity. Moreover, it addresses the question of research biases, especially the problem of publication bias. Finally, an MRA is also characterized by replicability, ensuring additional objectivity.

Our second contribution lies in the fact that we specifically address the role of institutions in the resource-growth nexus. To the best of our knowledge, only Havranek, Horvath, and Zeylanov (2016) have implemented an MRA on the paradox of plenty. However, our work strongly departs from them in two ways. First, we emphasize the measurement of natural resources. We go further than the distinction between abundance and dependence, and we discriminate natural resources by type (point/diffuse). This allows us to cope with the fact that the effects of resources on growth can be different depending on the type of resources. From there the question of “appropriability” is crucial and introduces the role played by institutions. Indeed, the quality of institutions is often told to be a factor that can mitigate the curse, or even turn it into a blessing. Accordingly, we study the indirect effect of resources on growth when it is conditioned by institutions in a separate meta-regression. Moreover, we encompass a wider dataset (69 studies totaling 1,419 estimates vs. 33 studies with 620 estimates).

Finally, our last contribution is that such a synthesis provides policy-makers/advisors with a means to promote economic development. Since the early 2000s, international institutions have implemented programs to beat the curse and to allow less developed countries to plainly benefit from their resources. In particular, the World Bank has promoted the Extractive Industry Transparency Initiative (EITI) and signed specific bilateral agreements, such as that of the oil pipeline in Chad in 2005.<sup>3</sup> By statistically identifying the channels through which the curse or blessing operates and their extent, our MRA can be used as a preliminary tool for decision-making support.

Our results show that while there is a soft curse in developing countries, natural resources do not harm growth in developed ones. Moreover, the way natural resources are measured, as well as their “appropriability” do explain part of the hetero-

geneity of the results found in the literature. Finally, the quality of institutions is crucial in mitigating the resource curse.

The remainder of the paper is as follows. In Section 2, we review the articles used in our MRA. Some descriptive statistics are provided and we discuss the different *parti-pris* of authors. In Section 3, we introduce the dataset and the econometric issues. We explain the way in which we code variables, the different categories therein and principal features. We also propose solutions to the main econometric pitfalls and present the estimators. Section 4 is devoted to the results and their interpretation. We go deeper into the role of institutions in Section 5 by performing a specific meta-analysis. Finally, we compare our results to previous literature and draw conclusions in the last section.

## 2. PRIMARY STUDIES

### (a) *Data set description*

A comprehensive search of the literature via the software Publish or Perish revealed a large number of articles responding to the following keywords: “resource curse”, “economic growth”, and “natural resources”.<sup>4</sup> We choose 1995 (Sachs and Warner’s seminal paper) as the starting year of the search for studies and end our search in 2016, totaling 21 years of academic research. Of these 184 studies, 69 papers met our requirements, which consisted of (i) an empirical assessment of the link between natural resources and economic growth; (ii) an investigation into the existence of the resource curse with a natural resource variable that is continuous and the dependent variable defined in growth terms; and finally, (iii) the use of an econometric framework that is linear in its parameters.

This leaves us with 69 studies that aim to assess whether the resource curse exists and if so, what its transmission channels are. The entire database is available upon request to the authors, and all the papers that are used here may be found in Section A.

In Figure 1, we report all the effect sizes found in our dataset with the studies depicted on the vertical axis and the corresponding estimated effect sizes therein on the horizontal axis. All estimates are not directly comparable, which is the reason we depicted the partial correlation coefficients (PCC). Roughly speaking, the dots that lie on the left of the vertical line in 0 (horizontal axis) tend to offer evidence of a resource curse, while it is the opposite on the right. In other words, the closer the dot is to  $-1$  (or  $1$ ), the stronger the resource curse (or blessing). The visual insight we gain from this plot is that correlations are quite dispersed among the  $[-1; 1]$  interval; they range from  $-0.80$  to  $0.70$  (Table 2). Moreover, dispersion is present not only between the 69 studies but also on a within-study basis.

Figure 2 depicts a funnel plot—a scatter plot of the effect sizes estimated from individual studies (horizontal axis) against a measure of study size (vertical axis), which here is the standard error of the effect sizes (this is also known as the FAT-PEESE test).<sup>5</sup> The diagonal lines represent the “pseudo” 95% confidence limits around the summary effect size for each standard error on the vertical axis. In the absence of heterogeneity (or publication bias), 95% of the studies should lie within the funnel defined by the straight lines. Here, a high number of points stand outside of the diagonals, especially on the left-hand side of the vertical line at 0. This second visual insight confirms the high heterogeneity present in our

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