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Natural Resources and Economic Growth: A Meta-Analysis

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Summary. — An important question in development studies is how natural resources richness affects long-term economic growth. No consensus answer, however, has yet emerged, with approximately 40% of empirical papers finding a negative effect, 40% finding no effect, and 20% finding a positive effect. Does the literature taken together imply the existence of the so-called natural resource curse? In a quantitative survey of 605 estimates reported in 43 studies, we find that overall support for the resource curse hypothesis is weak when potential publication bias and method heterogeneity are taken into account. Our results also suggest that four aspects of study design are especially effective in explaining the differences in results across studies: (1) controlling for institutional quality, (2) controlling for the level of investment activity, (3) distinguishing between different types of natural resources, and (4) differentiating between resource dependence and abundance.

Key words — natural resources, economic growth, institutions, publication selection bias, meta-analysis

1. INTRODUCTION

Little consensus exists on the effect of natural resource richness on economic growth and the mechanism underlying the effect. An influential article by Sachs and Warner (1995) argues that the impact of natural resources on growth is negative, and the finding has been labeled the "natural resource curse." More specifically, this stream of literature asserts that point-source non-renewable resources, such as minerals and fuels, can hamper growth. [1] Mehlum, Moene, and Torvik (2006) put forward that the natural resource curse only occurs in countries with low institutional quality and that with sufficient quality of institutions natural resources can foster long-term development. Other researchers emphasize that the natural resource curse is more likely to occur for certain types of natural resources (Isham, Woolcock, Pritchett, & Busby, 2005), because point natural resources such as oil are, for economic and technical reasons, more prone to rent-seeking and conflicts (Boschini, Pettersson, & Roine, 2007).

Atkinson and Hamilton (2003) and Gylfason and Zoega (2006) propose a different transmission channel and stress the role of investment. They find that natural resources crowd out physical capital and consequently have a negative effect on economic growth. Brunnschweiler and Bulte (2008) show that the quality of institutions is endogenous to natural resource richness and discriminate between natural resource dependence (flows) and natural resource abundance (stocks). They conclude that while resource dependence does not affect growth, resource abundance is growth-enhancing. Alexeev and Conrad (2009) and Cotet and Tsui (2013) also find very little evidence in support of the natural resource curse. On the contrary, examining countries with large oil endowments, they find that these countries exhibit higher income growth. In addition, Smith (2015) examines the impact of major natural resource discoveries since 1950 on GDP per capita and, applying various quasi-experimental methods such as the synthetic control method, he finds that these discoveries are associated with high growth in the long run.

According to the data we collect in this paper, the last two decades of empirical research on the effect of natural resources on economic growth have produced 43 econometric studies reporting 605 regression estimates of the effect. Approximately 40% of these estimates are negative and statistically significant, 40% are insignificant, and approximately 20% are positive and statistically significant (based on the conventional 5% significance level). Given this heterogeneity in the results, our ambition is to conduct a meta-analysis of the literature in order to shed light on two key questions: Does the natural resource curse exist in general? Can we explain why different studies come to such different conclusions? The use of meta-analysis is vital here because the method provides rigorous quantitative survey techniques and is able to disentangle the different factors driving the estimated effect (Stanley, 2001). While meta-analysis methods have been applied within economics in numerous fields, such as labor economics (Card & Krueger, 1995; Card, Kluve, & Weber, 2010; Chetty, Guren, Manoli, & Weber, 2011), development economics (Askarov & Doucouliagos, 2015; Benos & Zotou, 2014; Doucouliagos & Paldam, 2010), and international economics (Bumann, Hermes, & Lensink, 2013; Havranek & Irsova, 2011; Irsova & Havranek, 2013; Iwasaki & Tokunaga, 2014), there has been no meta-analysis examining the effect of natural resources on economic growth.

The paper is organized as follows. Section 2 discusses the primary studies on the resource-growth nexus. Section 3 describes the meta-regression framework. Section 4 describes

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the data set that we collect for this paper. Section 5 presents the empirical results on potential publication bias, while Section 6 focuses on explaining the differences in the results across studies. We provide concluding remarks in Section 7. Robustness checks and a list of the studies included in the meta-analysis are available in the Appendix.

2. RELATED LITERATURE

In this section we briefly discuss the relevant literature that focuses on the relation between natural resources and economic growth. For more comprehensive narrative surveys we refer the interested reader to Frankel (2012) and van der Ploeg (2011).

Sachs and Warner (1995) examine the effect of natural resources on long-term economic growth and find that resource-rich countries tend to grow more slowly than resource-scarce countries. This has become known as the natural resource curse. The literature published after Sachs and Warner (1995) primarily investigates different transmission mechanisms of how natural resources affect growth, assessing whether it is possible to avoid the natural resource curse by improving the quality of institutions, or whether the existence of the natural resource curse depends on the means of measurement and the type of natural resources.

Several studies investigate the role of institutional quality and find that the natural resource curse can be avoided if institutional quality is sufficiently high (Arezki & van der Ploeg, 2007; Boschini *et al.*, 2007; Horvath & Zeynalov, 2014; Isham et al., 2005; Mehlum *et al.,* 2006; Kolstad & Wiig, 2009). Most researchers examine the role of economic institutions but some studies focus on political institutions (Al-Ubaydli, 2012). Brunnschweiler and Bulte (2008) make a distinction between resource dependence (the degree to which countries depend on natural resource exports) and resource abundance (a stock measure of resource wealth) and, unlike many other studies, they treat institutions as endogenous. While they fail to find a link between resource dependence and growth, they show that resource abundance is associated with better institutions and more growth. Similar evidence is also provided by Kropf (2010). As a consequence, these results do not provide support for the existence of the natural resource curse. Alexeev and Conrad (2009, 2011) also treat institutions as endogenous and show that previously found negative effects of natural resource wealth on the quality of institutions are likely to be spurious because of the positive link between GDP and natural resources. They propose to instrument initial GDP using geographical variables to address this issue.

Sala-i-Martin and Subramanian (2013) show that new oil discoveries tend to cause real exchange rate appreciation and harm other export sectors of the economy. Gylfason (2001) and Gylfason and Zoega (2006) examine a different channel and find that natural resource richness crowds out human and physical capital, causing slower growth in the long term. The study by van der Ploeg and Poelhekke (2010) emphasizes that the volatility of output growth should be accounted for in the estimation of the resource curse. Atkinson and Hamilton (2003) and Papyrakis and Gerlagh (2006) focus on the interactions of savings and the resource curse, Baggio and Papyrakis (2010) and Hodler (2006) on the interactions of ethnic heterogeneity and the resource curse, while Anshasy and Katsaiti (2013) emphasize the role of fiscal policy. Another stream of literature examines the impact of natural resources on variables other than economic growth. Natural resource richness might induce more corruption, increase political instability and the likelihood of conflicts, and hinder the functioning of democratic institutions (Barro, 1999; Collier & Hoeffler, 2005; Jensen & Wantchekon, 2004; Ross, 2001; Tella & Ades, 1999).

In our meta-analysis we examine not only real factors, such as the role of institutional quality in the occurrence of the natural resource curse, but also the role of study design in estimating the relationship. Researchers often employ cross-sectional data to investigate the long-term effect of natural resources on growth (Arezki & van der Ploeg, 2007; Boschini *et al.,* 2007; Brunnschweiler & Bulte, 2008; Bruckner, 2010; Brunnschweiler, 2008; Ding & Field, 2005; Gylfason, 1999; Kronenberg, 2004; Lederman & Maloney, 2003; Leite & Weidmann, 1999; Mehlum *et al.*, 2006; Papyrakis & Gerlagh, 2007; Sachs & Warner, 1995, 2001; Sala-i-Martin & Subramanian, 2013; Stijns, 2005; Tella & Ades, 1999). Nevertheless, van der Ploeg (2011) notes that the application of cross-sectional data in growth regressions suffers from the omitted variable bias because of the correlation between past income and the omitted initial level of productivity. Since these two variables are likely to be positively correlated, the coefficient estimate for the initial level of income is upward biased, which is associated with the overestimation of the speed of convergence in growth regressions.

Lederman and Maloney (2003) estimate cross-sectional as well as panel regressions and find that the results differ. Panel regressions provide a significantly positive effect of natural resources on economic growth, while cross-sectional regressions result in negative but insignificant estimates. Tella and Ades (1999) also use both cross-sectional and panel data and find that the impact of natural resources on economic growth becomes insignificant when using panel data. Panel data have also been applied by Jensen and Wantchekon (2004), Ilmi (2007), Zhang, Xing, Fan, and Luo (2008), Murshed and Serino (2011), Boschini, Pettersson, and Roine (2013), de V. Cavalcanti, Mohaddes, and Raissi, (2011), Horvath and Zeynalov (2014), Williams (2011). Some studies employ time series techniques (Rawashdeh & Maxwell, 2013; Ogunleye, 2008). In endogenous growth models, economic growth is determined within a model by factors such as economic institutions. Brunnschweiler and Bulte (2008) estimate a three-equation model in which endogeneity of resource dependence and institutions are controlled for. They find that resource abundance has a positive impact on institutional quality and resource dependence, and that institutional quality is negatively associated with resource dependence.

The primary studies also differ with respect to the measurement of natural resource richness and GDP growth. Sachs and Warner (1995) measure natural resource richness as the share of primary exports (agriculture, fuels, and minerals) in GDP. Boschini *et al.* (2007), Lederman and Maloney (2003), Isham et al. (2005), Brunnschweiler and Bulte (2008) also apply this measure. Sachs and Warner (1999), Leite and Weidmann (1999), and Mehlum *et al.* (2006) use the share of exports of primary products in GNP. Sala-i-Martin and Subramanian (2013) and Jensen and Wantchekon (2004) use the percentage share of fuel, mineral, and metal exports in merchandise exports. Collier and Hoeffler (2005) employ the sum of resource rents as a percentage of GDP. Papyrakis and Gerlagh (2004) use the share of mineral production in GDP, while Gylfason and Zoega (2006) employ natural resource capital as a percentage of total capital. Finally, Neumayer (2004) examines whether natural resource curse still exists if natural and other capital depreciation is excluded from the calculation of GDP.