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Local natural resource curse?☆

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ABSTRACT

Utilizing an output based efficiency measure we investigate whether higher public revenues harm efficiency in the production of local public goods. Much variation in revenues among Norwegian local governments can be explained by revenues collected from hydropower production. This revenue variation, combined with good data availability, can be used to address a main concern in the resource curse literature; that public sector revenue, and in particular the revenue from natural resources, is endogenous. We obtain an exogenous measure of local revenue by instrumenting the variation in hydropower revenue, and thus total revenue, by topology, average precipitation and meters of river in steep terrain. We find support for what we term the Paradox of Plenty hypothesis—that higher local government revenue reduces the efficiency in production of public goods. We do not find support for what we term the Rentier State hypothesis—that revenue derived from natural resources should harm efficiency more than revenue derived from other sources such as taxation.

1. Introduction

A number of studies within the so-called 'resource curse' literature argue that high public revenue derived from natural resources has perverse effects for economic efficiency. Several theories have been put forward to explain why this could be the case, and a large number of empirical papers investigate the potential mapping from resource abundance to poor economic performance. In this paper we aim to extend this literature in three directions. First, in contrast to much of the previous literature which investigates how the large public revenues affect economic growth, we investigate the effect on public sector efficiency directly. The availability of an output based efficiency measure for local governments in Norway, combined with the large differences in their available economic resources, allows us to investigate what we term the "*Paradox of Plenty*" hypothesis; that high public revenues retard economic efficiency. Second, we address a main unresolved concern in the resource curse literature; that public sector revenue, and in particular the revenue from natural resources, is endogenous. By using data for revenue from hydropower plants in Norwegian local governments, and by using geographical characteristics such as meters of river, steepness of terrain, and average precipitation as instruments, we arrive at a measure of public revenue which is exogenous. Third, we investigate what we term the "*Rentier State*" hypothesis; that the efficiency effect of natural resource abundance is *different* from the efficiency effect of other types of public revenue such as taxation. We find strong support for the claim that higher revenue retards efficiency. This holds also when we use the exogenous variation in public sector revenue from hydropower plants. But we do not find support for the claim that natural resource revenue damages efficiency more than revenue derived from other sources. Thus, while our study lends support to the "*Paradox of Plenty*" hypothesis, it does not lend support to the "*Rentier State*" hypothesis.

The Paradox of Plenty hypothesis is a claim about effects of large public revenues, while the Rentier State hypothesis is a claim about effects of the composition of public revenues. A substantial theoretical literature studies how high public sector revenues may produce rent-seeking, lobbying, crowd out production with positive externalities, or weaken the incentives to undertake efficiency improving reforms. In

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light of this, the theoretical justifications for the Paradox of Plenty hypothesis may be argued to be well developed. It seems fair to say that the same does not hold for the Rentier State hypothesis. Despite its popularity, its theoretical foundations are weak or non-existent. The term 'Rentier State' was first used by Mahdavy (1979), and the Rentier State hypothesis asserts that when resource abundance makes public revenue less dependent on taxation, citizens monitoring of politicians becomes weaker, and policies worse. This is not entirely convincing, however, as it begs the question of why a dollar of wasted resource revenue is worse than a dollar of wasted tax revenue. Nevertheless, given that the hypothesis is often used in the more case-study oriented literature, and have survived despite its lacking theoretical foundation, it could have some interest to see if it receives empirical backing. We do not find that the hypothesis receives support in data. However, as we discuss below, the empirical strategy employed in the investigation of the Rentier State hypothesis is less convincing than the one we employ in the analysis of the Paradox of Plenty hypothesis. Thus, although our study can be seen as a first step in systematically investigating a variant of the Rentier State hypothesis, it can surely not be claimed to be the final step.

The empirical literature on the resource curse is an area of intense debate. Since its change in focus from case-studies such as Gelb (1988) and Karl (1997) to multi country growth regressions following Sachs and Warner (1995), the main challenges have been the possibility of omitted variables as well as the endogeneity of measures of resource abundance. To address the omitted variables problem a number of papers, such as Aslaksen (2010) and Collier and Goderis (2012), have employed panel data that allows for country or local government fixed effects. The problem of endogeneity of the resource abundance measure has been more challenging. The initial literature such as Sachs and Warner (1995) and Mehlum et al. (2006) used flow measures such as share of natural resources in exports or in GDP. As pointed out by many, such a measure is endogenous, and likely to overestimate the negative effects of resource abundance. The reason for this is that countries are measured as more resource abundant when they experience a reduction in alternative exports, a lower degree of industrialization, or a reduction in physical or human capital. In short, resource intensive production may be the result of poor economic performance for reasons other than resource abundance.

One strand of recent literature, in particular Brunnschweiler and Bulte (2008a,b) and Alexeev and Conrad (2009), has on the basis of this employed the value of subsoil assets as a measure of resource abundance, arguing that such a stock measure is more exogenous than flow measures. This is not fully satisfactory, however, and may bias the result in the opposite direction from the initial literature. Countries that have long been industrialized may have discovered more of their subsoil assets, leading such successful countries to be measured as resource abundant. For instance, Collier (2010) compares the value of known subsoil assets per square kilometer in countries with high GDP to those with low GDP. In the former countries the value of known subsoil assets is four times the value in the latter. He argues that the rich and developed countries simply have had more time to discover their resources, and thus even if more has been extracted, their measured resource wealth is higher.

Partly on this background, researchers have recently increased their attention towards finding more exogenous measures of resource abundance. Tsui (2011) use initial oil endowments to instrument for oil discoveries. Monteiro and Ferraz (October, 2010) use a geographic rule that determines the share of oil revenues that accrue to different Brazilian local governments. Caselli and Michaels (2013) use municipal oil output to instrument for municipal revenues in Brazil.

We complement these studies by extending the resource curse literature to estimate a causal effect of revenues or resource abundance on local government efficiency. Several econometric challenges must be handled to isolate the causal effect. The main challenges are reverse causality, division bias and omitted variables. Both reverse causality and division bias are likely to lead to overestimation of the negative effect of resource abundance. We handle these challenges by including local government fixed effects and time variant controls and by developing an instrument for hydropower revenue. Norway has the highest per capita production of hydropower in the world, and about 98% of total electricity use is hydropower. Hydropower revenue is a also an important source of variation in revenue across local governments, and a close mapping from geographical characteristics to these revenues, should be a promising candidate in the search for true exogenous variation in total revenues and resource abundance. By utilizing variation in topology, average precipitation and meters of river in steep terrain, the instrument is not affected by local government decisions. Thus like the initial literature we use a flow measure of resource abundance, but we avoid the potential problems related to the endogeneity of the measure.

Our paper is also related to the growing literature that uses geographical characteristics in economic analyses. Although this literature does not investigate the resource curse, it shares with us the use of geography in constructing instruments. Duflo and Pande (2007) use the river gradient as instrumental variable to study the productivity and distributional effects of large irrigation dams in India, and investigate how dams affect welfare in nearby districts. Another study by Lipscomb et al. (2013) studies development effects of electrification between 1960 and 2000 using geological placement of hydropower plants in Brazil. Electrification is most probably correlated with unobservable effects like political decisions and other demand side concerns. They address this potential problem by isolating the portion of variation in electricity grid expansions attributed to "exogenous" engineering cost considerations. Hydropower plant placement is predicted based on geological characteristics like river gradient, water flow, and distance to the Amazon. Rural electrification has also been studied by Dinkelman (2011). She estimates the impacts of electrification on employment growth in South Africa. To identify the causal effect of electrification, land gradient is used as instrumental variable for project placement, generating exogenous variation in electricity project allocation. Andersen et al. (2014) investigate the causal effect of election stakes on turnout via an instrumental variable approach. Their empirical design exploit that topography determines hydropower income by using variables capturing variations in altitude across local governments.

We have not found that previous literature that study the effect of revenue on local government efficiency develop a similar instrument such as ours or distinguish between the Paradox of Plenty hypothesis and the Rentier State hypothesis.

The rest of the paper is organized as follows. In Section 2 we discuss relevant institutional characteristics of the Norwegian local governments and hydropower revenue, while in Section 3 there is a short description of the efficiency measure. Section 4 discusses the empirical specification and the identification strategy for our investigation of the Paradox of Plenty hypothesis. The results and robustness checks are summarized in Subsections 4.1 and 4.2. The Rentier State hypothesis is discussed in Section 5. Concluding remarks are offered in Section 6. Appendix A through Appendix E contains more detailed information that are referred to in the main text.

2. The Norwegian local governments

2.1. Financing and responsibilities

In Norway, as in the other Scandinavian countries, local governments are important providers of welfare services. The local governments are responsible for child care, primary and lower secondary education (1st to 10th grade), care for the elderly (nursing homes and home based care), primary health care (general practitioners, health centers, and emergency ward), and social services (mainly social