Bust before the boom? Macroeconomic responses to oil discoveries

PRELIMINARY DRAFT

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October 18, 2019

Abstract

Positive wealth shocks, such as giant oil discoveries, lead to immediate investment and consumption responses in anticipation of future oil revenues (Arezki et al., 2016). By utilizing an event study methodology, this paper uncovers differences in public and private sector responses depending on political institutions. While democracies increase the size of the private sector as share of GDP, less democratic countries increase the size of the public sector as share of GDP. Our findings suggest that political institutions are key to understand differences across countries in macroeconomic responses to wealth shocks, also in the short run.

Keywords: resource curse, debt, institutions, oil, investment, consumption, public sector, private sector, democracy, autocracy.


*This work was supported by the Natural Resource Governance Institute, the Office of the Chief Economist, Africa Region at the World Bank and NHH - Norwegian School of Economics. We would like to acknowledge the valuable comments received from workshop participants at Oxcarre - WB workshop on Africa’s resource future. All errors as well as all views expressed in this paper are those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank, the Natural Resource Governance Institute, IMF, NHH or any affiliated organizations.

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1 Introduction

In countries with an abundance of natural resources, political institutions influence whether the natural resources become a curse or a blessing (Mehlum et al., 2006). Political institutions affect economic incentives among firms and citizens, which in turn affect investments and countries’ long-run growth performance (Acemoglu and Johnson, 2005; Acemoglu et al., 2005, 2019). However, political incentives will affect governments’ responses to a wealth shock in the shorter run, as the value of staying in power is changed (Robinson et al., 2006), incumbent regimes may have incentives to deteriorate institutional quality (Caselli and Tesei, 2016), and certain spending choices are effective in buying political support (Robinson and Torvik, 2005). Yet, little is known about how the short-run macroeconomic responses to wealth shocks differ across countries with different political institutions.

In this paper, we use giant oil discoveries to estimate how macroeconomic responses to news about wealth shocks vary across countries with different political institutions. Arezki et al. (2016) showed that such shocks, on average, lead to macroeconomic adjustments in terms of changing current accounts, saving rates, investments, and employment. These responses typically start before revenue from the new wealth arrives. We move beyond their analysis by unpacking heterogeneity across countries and focus on the relative size of the private versus the public sector.

We find that the short-run macroeconomic responses to news about oil discoveries depend crucially on the degree of democracy. We follow the literature and use the Polity2 from the Polity IV database as our baseline measure of political institutions (Caselli and Tesei, 2016), splitting the sample into countries with strong democratic institutions in 1970 (polity2 $> 5$) versus the rest of the countries, which then have more autocratic political institutions in 1970 (polity2 $< 6$ or Polity2 missing).

Public expenditures (public investments and consumption) relative to GDP increases with about 10 percentage points over the 10 years following the discovery in the less democratic countries. There is a corresponding contraction in the private sector (private investments and household consumption) relative to GDP. In stark contrast, we find in the sample of initially democratic countries a reduction in the relative size of GDP of about 20 percentage points after ten years and strong increase in the size of the private sector as share of GDP.

These results suggest that political institutions are of first order importance for predicting how governments react to the news of a giant oil discovery. Governments in countries with less democratic institutions choose expansion of the public, the opposite of their counterparts in more democratic countries.

Our results emphasize the central role of the government for the macroeconomic adjustments to an oil discovery, in particular for investment. In line with Van der Ploeg and Venables (2011) and Collier et al. (2010), the current IMF stance on macroeconomic adjustments to natural resource wealth is that countries should invest some of the resource revenues at home instead of parking the receipts in a sovereign wealth fund abroad. Collier et al. (2010) argue that public investments such as in education, health, and infrastructure, can have high returns in capital deprived economies.
Impacts of giant oil discoveries have been studied by several papers in the literature. Smith (2015) looks at long-run growth trajectory of countries after discovery. Harding et al. (2016) examine the impact on the real exchange rate, Toews et al. (2016) on FDI inflows and Lei and Michaels (2014) on conflict. Arezki et al. (2016) evaluate impacts on macroeconomic variables such as employment, savings, investment and the current account, but they do not explore heterogeneity in terms of political institutions. Cust and Mihalyi (2017) point to a ‘presource curse’ where oil discoveries may trigger growth disappointments in countries with weaker democratic institutions before production even begins.

The rest of the paper is organised as follows. Next, we present the data in section 2 and the identification strategy in section 3. The main results are presented in section 4. In section 5, we present robustness checks with respect to different samples. Section 6 concludes.

2 Data

Our analysis is based on a global cross country panel from 1960 to 2012 and builds on three core datasets. The dataset of giant oil and natural gas fields, originally compiled by Horn (2012) and now updated by us, reports on fields of over 500 million barrel equivalent of ultimate recoverable reserves discovered between 1868 and 2018. The dataset provides information on the location and size of the field. In terms of measures of oil field size, we construct a dummy variable on reported discoveries as our main variable. We also create a variable measuring the net present value of the discovery as percentage of the country’s GDP following Arezki et al. (2016). Figure 1 present the distribution of the log of the NPV of the giant discoveries. In our main specifications below, we use NPV as share of GDP as our explanatory variable of interest.

We use data on investment, consumption, and expenditures - distinguishing between the public sector and private sector components of each. Here data is drawn from the IMF and the World Bank’s WDI.

Institutional quality measures are taken from the Polity IV database. Our preferred measure of political institutions is the Polity2 variable which ranges between 10 (strong democracies) to -10 (strong autocracies. We split the sample at 4, roughly the median value on the Polity2. Countries with a polity value above 4, we refer to as strong democracies or more democratic countries. We refer to the group of countries with polity2 values between -10 and 4 as weak democracies and autocracies, or simply less democratic countries.

As our variables do not have full coverage across countries over time, we use the following sample restrictions. First, we limit the sample to countries with at least 10 observations on the variables measuring the share of the public and private sector as share of GDP (public and private investment and consumption as well as GDP). We start our baseline sample in 1980, but show robustness check with starting in 1970, 1975, 1985, 1990 and 1995. We then require that the country has data for the public share in the start year. Table 1 presents the number of countries (C) and the number of observations (N) for the different samples.

1 We refer to oil and gas discoveries as oil hereafter.
Figure 1: Distribution of the NPV of Giant discoveries

Table 1: Samples

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3 Identification strategy

Following Harding et al. (2016), we use the following panel specification with lags and leads of discoveries and country and year fixed effects:

\[ y_{i,t} = \sum_{k=-5}^{k=10} \beta_k D_{i,t} + \nu_i + \mu_t + \epsilon_{i,t} \]  

where \( y_{i,t} \) are the dependent macroeconomic variables such as the central government debt, the private sector debt, the external debt (total, long-term and short-term). All macroeconomic variables are measured in the log of real term. \( D_{i,t} \) is a dummy variable that takes value 1 if country \( i \) experiences a giant discovery at year \( t \). The country and the year fixed-effect are captured by \( \nu_i \) and \( \mu_t \).

The \( \beta_k \) represent the effects of a giant discovery episode on one of our macroeconomic variables \( k \) years after the discovery. In this paper, we are interested in the cumulative effects of a giant discoveries after a number of year \( p \), i.e., \( \sum_{k=0}^{k=p} \beta_k \). For example the cumulative effect after 6 years is \( \sum_{k=0}^{k=6} \beta_k \). The standard error of these estimates are computed using the \textit{lincom} command of Stata.

Our empirical strategy relies upon two main elements. On the one hand, the timing of giant discoveries are argued to be exogenous once we account for cross-country time-invariant heterogeneity. Here we follow earlier work including Arezki et al. (2016) and Harding et al. (2016). Indeed, the randomness of giant discoveries allows us to mitigate endogeneity issues due to possible reverse causality. On the other hand, the country and year fixed effects reduce the omitted variables bias of time and country invariant characteristics. In all cases we cluster our standard errors at the country level.

For our analysis of heterogeneity by political institutions, we split the sample based on the polity2 score in 1970. Countries with a score above 5 are classified as democratic, and the rest as undemocratic (including those with missing values on polity2 in 1970).

4 Results

Figure 2 shows that less democratic countries expands their public sector and shrinks their private sector, relative to GDP. The opposite pattern is found in the sample of more democratic countries. The less democratic countries dominate the full-sample result.

Figure 3 indicate that the less democratic countries strengthen their fiscal revenues over the 10 years following the discovery, although the estimates are quite noisy. The fiscal balance first deteriorates then ends around zero after 10 years. The more democratic countries, on the other hand, show a relatively stable fiscal revenues and fiscal balances in the years after the discovery.

The result on the expansion of public sector in the less democratic countries seems to stand in contrast to
Figure 2: Cumulative effect of giant discovery on share of public and private sector

Note: The above plot presents the cumulative effects in the years following a giant oil discovery (impulse response) on the dependent variables as indicated above the charts along with their 90% confidence intervals. Dummies in the 5 years before included to test differences across treatment and control group. The dependent variables are measured in share of GDP. The discoveries are measured in their NPV as share of GDP. Effects estimated by OLS according to Eq.(1). We use the `lincom` command in Stata to compute the standard errors of cumulative effect estimates.

Arezki et al. (2016), who find that the private sector responses dominate.
Figure 3: Cumulative effect of giant discovery on government revenues and fiscal balance

All countries

Fiscal revenues as share of GDP

Fiscal balance as share of GDP

Non-democratic countries

Fiscal revenues as share of GDP

Fiscal balance as share of GDP

Democratic countries

Fiscal revenues as share of GDP

Fiscal balance as share of GDP

Note: The above plot presents the cumulative effects in the years following a giant oil discovery (impulse response) on the dependent variables as indicated above the charts along with their 90% confidence intervals. Dummies in the 5 years before included to test differences across treatment and control group. The dependent variables are measured in share of GDP. The discoveries are measured in their NPV as share of GDP. Effects estimated by OLS according to Eq.(1). We use the lincom command in Stata to compute the standard errors of cumulative effect estimates.
Figure 4: Cumulative effect of giant discovery on governments’ responses

**All countries**

Public expenditures as share of GDP

Private expenditures as share of GDP

**Non-democratic countries**

Public expenditures as share of GDP

Private expenditures as share of GDP

**Democratic countries**

Public expenditures as share of GDP

Private expenditures as share of GDP

Note: The above plot presents the cumulative effects in the years following a giant oil discovery (impulse response) on the dependent variables as indicated above the charts along with their 90% confidence intervals. Dummies in the 5 years before included to test differences across treatment and control group. The dependent variables are measured in share of GDP. The discoveries are measured in their NPV as share of GDP. Effects estimated by OLS according to Eq.(1). We use the *lincom* command in Stata to compute the standard errors of cumulative effect estimates.

5 Robustness

Figure 4 and figure 5 present the results in figure 2 and figure 3 for the different samples. The results are qualitatively the same for most variables in both samples, although the 1995 sample for the public share in
Figure 5: NEW: Cumulative effect of giant discovery on governments’ responses

**All countries**

- Fiscal revenues as share of GDP
- Fiscal balance as share of GDP

**Non-democratic countries**

- Fiscal revenues as share of GDP
- Fiscal balance as share of GDP

**Democratic countries**

- Fiscal revenues as share of GDP
- Fiscal balance as share of GDP

Note: The above plot presents the cumulative effects in the years following a giant oil discovery (impulse response) on the dependent variables as indicated above the charts along with their 90% confidence intervals. Dummies in the 5 years before included to test differences across treatment and control group. The dependent variables are measured in share of GDP. The discoveries are measured in their NPV as share of GDP. Effects estimated by OLS according to Eq.(1). We use the lincom command in Stata to compute the standard errors of cumulative effect estimates.

the less democratic countries show a flat development.
6 Conclusion

We studied the effects of giant oil discoveries on short run macroeconomic responses. We found that the effects varied with political institutions. Governments in less democratic countries seem to expand the public sector and shrink the private sector, relative to GDP. Governments operating under more democratic institutions seem to instead allow the private sector to expand. Our results highlight the importance of taking political institutions and governments’ behaviour into account to understand macro economic responses to giant oil discoveries.
References


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