

OIL INVESTMENT VOLATILITY AND INSTITUTIONS

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Overview

There are important differences between what appears to be as a smooth aggregate response of investment oil rigs to oil price and what seems a volatile response by country. An analysis of the time series properties of investment in oil rigs by country show important differences across them. We try to explain the role played by tax institutions on these differences. In particular it seems that what are considered as better tax institutions for the oil sector tend to increase its response to oil prices. Alternatively, a better “business environment” reduces it. Then, we present some evidence of the welfare effects of this volatility. We find that compared to other sources of economic volatility, like fiscal or exchange rate policy, as well as terms of trade volatility, oil investment volatility might have an effect. In particular, small countries where the oil sector could be big, oil investment volatility might cause higher economic activity volatility.

Methods

This paper tries to explore one possible explanation for these facts. The paper starts with an analysis of the time series properties of investment in oil rigs by country show important differences across them. We estimated using OLS the model that better fix the equation displayed below according to two out of three of these following selection criteria: AIC, BIC and F-Statistic.

$$dl(invest)_t = c + \sum_{d=0}^i drgby_{t-d} + \sum_{e=0}^j dlrop_{t-e} + \sum_{f=0}^k d(desvest_reer)_{t-f} + \sum_{g=0}^l dlstock_{t-g} + \sum_{h=1}^m dlinvest_{t-h}$$

Where:

- $dl(invest)_t$ represents the percentage variation of active rigs¹ used in the oil industry on each country. The data are provided by Baker Hughes Inc.², and it acts as an indicator of capital investment in the oil sector³.
- $drgby_t$ is the variation of the 3Years US treasury bond yield deflated by the oil price. It was used as a proxy variable of the opportunity cost of investment in the oil sector.
- $dlrop_t$ is the percentage variation of real oil price (average crude price) where the deflator used was the consumer price index of the industrialized countries.
- $dlstock_t$ is the percentage variation of the petroleum stocks owned by the OECD countries.
- $d(desvest_reer)_t$ is the quarterly average of the standard deviation of the real exchange rate variation. It was used to measure what we called a “volatility risk prime” that allow us allowing to incorporate not only potential institutional problems but also the volatility on investment returns.

¹ According to Baker Hughes, to be counted as active, an international rig must be drilling at least 15 days during the month. A rig is considered drilling if it is turning to the right (i.e. the well is underway but has not reached the target depth).

² <http://www.bakerhughes.com>

³ It reflects the demand for products used in drilling, completing, producing and processing hydrocarbons.

Then, based on the tests suggested by Andrews & Ploberger (1994) and Bai & Perron (1998) we identify and correct (if any) potential parameter instability that may concern the model suggested.

In the second part, we try to explain the role played by tax institutions on these differences. For it, we use multivariate analysis to differentiate oil producing countries.⁴

Results

We found important differences in price elasticities of oil investment between different countries. Consequently, in the second part, we were interested in see what can explain the differences in elasticities. There could be different factors. In this regard we use production per active well, as a measure of sector productivity, an index of tax institution and to control for other type of institutions, an index of rule of law. We found that what are considered as better tax institutions for the oil sector tend to increase its response to oil prices. On the other hand, a better “business environment” reduces it. However, countries with good institutions seems to be those where productivity is lower and the converse is also true. This might explain why even though prices are up, drilling activity has not responded as in the past. Oil is located in places where tax institutions are worse for investors.

Finally, we present some evidence of the welfare effects of this volatility. We find that compared to other sources of economic volatility, like fiscal or exchange rate policy, as well as terms of trade volatility, oil investment volatility might have an effect. In particular, small countries where the oil sector could be big, oil investment volatility might cause higher economic activity volatility.

Conclusions

This paper has reviewed the role of institutions on oil investment. The evidence presented suggests that tax institutions and what might be called “the business environment” affect oil investment. In particular it seems that what are considered as better tax institutions for the oil sector tend to increase its response to oil prices. Alternatively, a better “business environment” reduces it. This is relevant, because in theory, oil investment should not respond, or respond in a limited way to temporary oil price shocks. Given that oil prices are volatile, a higher response implies a higher volatility. In this regard, we also look at the possible welfare implications for this. Controlling for other shocks, we found that oil investment volatility seems to have an impact on economic volatility for oil producing countries. Therefore, developing countries, that are restructuring their energy sector, have to take into consideration, the attraction of investment vs. the possibility of higher volatility and chose the appropriate mix of instruments between the tax system and the general business environment.

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⁴ For the interested reader in the paper we present the linear regressions equivalent to the cluster analysis. It is clear that these variables interact in non-linear ways. Additionally, given that for most of this variables we do not have long time series that allow us to construct a panel, the multivariate approach at least can give us a better assessment of correlations.