

INTERACTION BETWEEN EXPLORATION INVESTMENT, OIL PRICE, OIL PRODUCTION, RESERVES REPLACEMENT AND OILFIELD DEPLETION RATES: EVIDENCE FROM OPEC COUNTRIES

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Overview

Recent studies on global energy demand-supply nexus by international agencies and oil companies have generally pointed to trend of increasing energy demand mainly driven by rising demographics of developing economies and accelerated economic growth rates. Mark F. (2012) asserted that non-OECD consumption constitutes 47% of global oil consumption which is higher than 25% in the 1970 and OECD consumption has reduced by 7% (3.6million barrels per day) since 2005. oil will in this regards continue to be the dominant source to meet this demand growth for at least the next 4 decades. However, its share in the global supply landscape is expected to decline due to inter fuel competition and emerging government policies geared towards enhancing energy efficiency standards and renewable development. On the supply side, OPEC member countries holds more than two-thirds of the world's known oil reserves (70% of global proved reserves) Kevin K. Tsui (2006) and Mark Fisher (2012). Hence, the role of these countries in the supply of oil to fuel global economy is strategic medium to long terms despite growth in non-OPEC supply in Russia, Central Asia, deep waters of U.S Gulf of Mexico, West and East Africa, Brazil, oil sands of Alberta and shale resources development in the U.S. Evidently, timely investment in exploration, development and production in OPEC member countries is critical to finding new reserves that will augment the depleting ones, increase the recovery factors of aging producing fields in decline phase to maintain demand and supply balance.

Despite the strategic importance of OPEC members in the global oil supply landscape, there is paucity of studies that empirically investigated the determinants of investment within this producer group in the light of economic and technical challenges. Iwayemi and Skriner (1986) opined that the decline in oil investment in OPEC countries despite having more than half of global proven reserves and low supply cost have been influenced by the geopolitics of oil and state of the oil market. They further argued that this inefficient resource allocation due to concentration of investments in areas with greater reduction of return to oil search effort have the capacity to impact negatively on global welfare and economic growth which can leads to global demand/supply imbalance by the turn of the century. In this paper, we presents empirical evidence on the drivers of exploration investment in OPEC countries to bridge this gap and contribute to the existing literature on determinants of investment behavior for petroleum exploration and development. In particular, we examined the role of international oil price, oil production, reserves replacement and oilfield depletion rates

Methods

Due to limited availability of OPEC NOC's data in public domain, we used major oil companies's capital and exploration expenditure and OPEC reference basket sourced from OPEC statistical bulletin as proxies for exploration investment and international oil price respectively. We sourced annual production data from US Energy Information Administration database and proven reserves data from BP statistical review. To check the validity of the variables for the experiment, we performed correlation analysis and found no evidence of significant correlation between any pairs of the variables (coefficients range from -0.0320 to 0.6255). The summary statistics computed revealed the structure of the data. we specified and estimated fixed and random effects model on long panel that spans 1980 -2011 in order to understand the within and between effect across the countries. But hausman test confirmed the suitability of fixed effect model for the analysis based on the structure of the data. To validate the results, Breusch-Pagan LM test for cross-sectional dependence in macro panel with long time series (over 20-30 years), test for heteroskedasticity and auto correlation test were performed. All the tests proved positive.

Results

the fixed effect model used to test our hypothesis on drivers of exploration investment in the upstream oil industry shows encouraging and robust statistical relationship between the dependant variable and the explanatory variables. The R^2 value of 0.58 was considered sufficient in explaining the explanatory power of the regressors on the dependant variable. International oil price and oil production were found to have strong positive influence on exploration investment with 1% significance levels respectively and p-values of <0.05 . The degree to which oil producers add or replace reserves was found to have positive influence in driving exploration investment though with less magnitude (5% significance level) than oil price and production. The results also showed significant negative influence of depletion rate on exploration investment. Generally, the results confirmed our hypotheses that all the variables have significant influence in driving exploration investment influx with the exception of reserves replacement rate. Our result is consistent with that of Drollas (1986) and Barry (1989).

Conclusions

The empirical model on the drivers of exploration investment behavior within OPEC countries showed results that were consistent with. The result confirmed our hypothesis that international oil price, oil production and reserves replacement rate exerts significant influence on the flow of exploration investment within OPEC members. Higher sustained oil prices and production were found to exert much stronger positive influence than replacement rate.

Higher oil price can stimulate exploration investment in the short term but in the long run it may reduce consumption and negatively impact on demand and consequently future oil supply. OPEC's policies should focus on sustaining stability of oil prices at a level to match rising finding and development costs of the industry by maintaining spare capacity enough to ensure oil demand and balance and market development policies should focus on reducing demand uncertainties. OPEC's policies should focus on sustaining stability of oil prices at a level to match rising finding and development costs of the industry by maintaining spare capacity enough to ensure oil demand and balance and market development policies should focus on reducing demand uncertainties. Current production control policies have the capacity to retard exploration investment influx and petroleum reserves growth. Reserves growth policies should emphasize performance based economic incentives for enhanced oil recovery projects and infill drilling to augment depletion reserves and arrest oilfields pressure decline. Policies of OPEC members should also focus on increasing reserves replacement rate

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