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Market behavior of OPEC countries: An Application of Panel data Models

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1. Overview

The strategic importance of oil as a primary energy source has provided many groundwork to analyze the behaviour of oil producing countries, particularly OPEC countries. Since the first oil shock, OPEC has been at the centre of attention and considered as the main responsible for the several increases in oil prices. The organisation controls more than 45% of world oil production and about 55% of the world oil trade in addition, OPEC members are characterized by relatively low extraction costs among all oil producing countries around the world. In this situation OPEC members have the ability to influence the world oil price. Regarding this issue, there has been a considerable interest in studying OPEC's behaviour and its role in the international oil market.

Many empirical studies have been conducted to examine the structure of world oil market and analyze the behavior of the OPEC countries. Despite the large number of studies, the nature of OPEC and its power to influence the oil markets remain inconclusive and still there is no fundamental agreement among economists. The conflicting interpretations of OPEC and its influence on the world oil market were built from various hypotheses such as competitive and collusive behavior. From an empirical standpoint, it is generally difficult to distinguish these hypotheses by means of the observed price and production data (Smith 2005). Therefore in this study, rather than aiming at identifying which one of the alternatives hypothesizes can better explain the observed behavior, we focus on collusive behavior with a perfect cartel behavior as a comparison basis. Collusive behavior can be used to throw some lights on how and in what aspects the OPEC behavior deviates from a completely effective cartel. This study follows the Griffin's (1985) approach in identifying cartel and collusive behaviour. Griffin (1985) characterizes a perfect cartel

by the fact that the production quantities of each member country are decided based upon the entire cartel's production rather than market prices.

The main goal of this study is to make a contribution in the empirical literature on the OPEC's behavior especially collusive behavior. Different modifications on Griffin's market sharing strategy (collusion) are tested using a panel data set for 10 OPEC members (excluded Iraq) from 1983-2005. We aim to answer the questions of "how and in what aspects the OPEC behaviour deviates from a completely effective cartel model" and then to investigate "how the rate of crude oil production by individual OPEC states is affected by different variables such as production capacity, proven reserves and individual prices instead of official prices".

2. Empirical Methodology

The study is conducted in two stages. In the first stage, after a brief review of the methodological difficulties in testing of production (or supply) behavior of oil producer countries, two panel data approaches, random coefficients by Swamy (1970) and random effect models, have been reviewed. Several previous studies (e.g. Griffin, 1985; Jones, 1990; Ramcharran, 2002 and Kaufman, 2008) examined the structure of world oil market and analyze the behaviour of the OPEC countries on time-series data using high-frequency observations with separate analyses for individual countries. However to our knowledge there is no reported empirical application of these methods in identifying OPEC behaviour and its influences on the world oil market.

In the next stage empirical analysis is used to explore the questions mentioned above. This part consists of an econometric analysis of the OPEC members operating from 1983 to 2005. Griffin's (1985) production function along with three different modifications and several econometric specifications are used. These models are based on the implications of the theories on the production behavior of the oil exporting countries in response to changes in the price of oil (official and individual prices in real term) and response to other member's reaction. The real term of price has been estimated by combination of inflation and dollar depreciation, based on Broad Currency Basket (BCB) which includes most trading partners of OPEC member countries and almost all OPEC trading partners. This basket, on average, covers more than 80% until 1990 and recently more than 70% of OPEC's imports (Mazraati, 2005). In order to identify OPEC behaviour as a real cartel production capacity reflecting the ability of members to quickly increase their production and proven

reserves, known as deposits that could have been tapped to expand capacity are added to model. For the comparison proposes the Griffin model have been estimated with time series along with all the modifications.

3. Results

The main findings of this study can be divided to 4 parts. First, there is greater support for the partial market sharing hypothesis (effective collusion) than the others in identifying OPEC behaviour with official price. However none of the OPEC members follow constant market sharing behavior.

Second, the results show that when individual price at real term, is considered a better coordination strategy among member is presented. But hypothesis test results in general favour partial market sharing (less effective collusion) behavior among OPEC members.

Thirds, based on the results adding new variables (production capacity and proven reserves) have led the members to show their actual behavior based on their actual capacity and total remaining reserves and the hypothesis test results confirm partial market sharing behavior among OPEC members. A common and notable result can be seen by the behavior of typical OPEC member which deviate from perfect cartel model and effective collusive behaviour in all the modification to Griffin.

Forth, comparison between two estimation methods, time series and panel data; show that for time series approaches one cannot reject the hypothesis of effective collusion which is consistent with Griffin's study. But the results obtained by panel data set favor more reality and indicate that the evidence against effective cartel behaviour is stronger than collusive behaviour. For this reason, OPEC can be viewed as a cohesive whole or as a collection of individual producers with some degree of common interest.

4. Summary and Conclusion

The discussion of the alternative theories, in general, suggests that none of the OPEC members follow constant market sharing (effective cartel). In fact constant market sharing variant of cartel hypothesis is an extreme issue because it implies that production share is fixed and defined independently of the price level. In addition there is no absolute support for effective collusion among OPEC member.

However, the evidence against effective cartel is stronger than collusion. Thus, viewing the oil market containing OPEC as a cartel may be misleading and the behavior of oil OPEC countries are probably best represented as cooperative organization.

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