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Diploma Thesis
Oil and Energy Production Analysis
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1 Introduction

Nowadays, oil policies are considered strategic plans in every government due to the importance that this commodity has gained. Public administrators are attempting to incorporate their oil policies into their social, political, and most importantly, their economic objectives (Rabin, 2003). This applies to oil-exporting and importing countries; countries that export want stable high prices and importing countries don't mind volatility as long as prices are dragged every while downwards. By definition, public administration is the implementation of government policy, and from that regard, the implementation of national oil policy falls within the field of public administration (Carey, 2015). But nowadays, many industries rely on oil in the form of raw oil for energy production or for petrochemicals, which are an essential raw material for producing a lot of consumer goods, heavy manufacturing products, and industries. Thus the importance of oil has become high on the government's agendas that both oil-exporting and importing countries are developing oil policies to control the present and create a sustainable outlook for the future.

OPEC is a powerful organization that was created in 1960 in Baghdad, Iraq, to function as an intergovernmental organization to deal with the interest of oil-exporting countries and preserve their economic and political importance. The organization has 14 members with Iran, Saudi Arabia, Nigeria, and Venezuela being the leading players and highest producers among the members (Castree et al., 2013). The International Energy Agency is another international energy organization that was built as a reaction to OPEC, and it includes countries only from the OECD, countries such as the UK, US, France and Japan. Moreover, some countries are observer countries that are not in OPEC and not in IEA, such as Russia, China, and Brazil.

2 Methodology and Objectives

The primary objective of this research paper is to assess the OPEC, IEA and non-OPEC, non-IEA states. The researcher will seek to determine the impact of OPEC on the pricing of oil in the international market. I will evaluate the reliance of IEA organization and non-IEA countries on OPEC to make production cuts. Then, I will try to discover how much does OPEC's production cuts impact prices, and the behavior of OPEC – Cartel or competitive – and build a framework for finding out the practice of competitor organizations. Furthermore, the paper will describe the policies of OPEC, IEA, and remaining countries and recommend further improvements for their systems and will analyse the following questions:

- 1) What is the relationship between OPEC production and IEA (OECD) production?
- 2) What is the relationship between OPEC production and non-OPEC (and non-OECD) countries (such as China, Russia, and Brazil)?
- 3) What is the relationship between change in production and oil prices? Is OPEC a cartel?

There are several other sources that presented the same theory, which seems to be the tradition or the general policy adopted. Hence as seen the theory is already performed and the need to generalize from the general to specific is needed, and therefore the deductive approach was chosen in order to analyse the oil policies of these organizations.

The strategy of this thesis is regarding the choice of the tool of data collection as well as the method in which the research will be conducted (Saunders et al., 2009). There are several strategies such as experiment, case study, ethnography, survey, interview, focus groups, grounded theory, and desk research (document review) (McNabb, 2002). In this paper, the research strategy is desk research or document review because the researcher will analyse existing data of OPEC and non-OPEC oil producers in order to assess their oil policies.

In this paper the researcher will work on and analyse three question which written below:

- 1) What is the relationship between OPEC production and IEA (OECD) production?**

This is the first research question and it is regarding the analysis of the relationship between OPEC total annual average daily analysis and total OECD countries production.

The variables (Appendix 1 contains the data used for this research question):

- The independent variable (X) in the linear regression is OPEC average daily output per year since 1965 to 2017
- The Dependent variable (Y) in the linear regression is IEA countries average daily production per year since 1965 to 2017

The data for the IEA member states have been retrieved from BP statistics and they are counted as the OECD total production (BP Annual Statistical Review, 2018).

The reason OPEC's production is considered as the dependent variable is that the researcher is interested in knowing if non-OPEC countries behave differently when OPEC change their production. That means if non-OPEC countries, IEA organization members, act differently then the correlation must be negative and that means that IEA countries do not rely on OPEC to make cuts. On the other hand, a positive correlation would mean that IEA countries wait keep on producing regardless of OPEC's production and thus there is reliance by IEA countries.

2) What is the relationship between OPEC production and non-OPEC (and non-OECD) countries (such as China, Russia, and Brazil)?

This research paper separates non-OPEC countries into the IEA organization which is mainly contains OECD members and the second non-OECD countries which are not in the IEA organization such as China, India, Russia and Brazil (mainly BRICS). These are countries that are also mainly importers but some are also large exporters such as Russia.

The variables for this question are:

- The X variable in the linear regression is OPEC average daily output per year since 1965 to 2017
- The Y variable in the linear regression is non-OPEC and non-OECD countries average daily production per year since 1965 to 2017; these are calculated by subtracting the total OECD production from the total non-OPEC production and the remainder must be the countries that are non-OPEC and at the same time non OECD.

3) What is the relationship between change in production and oil prices? Is OPEC a cartel?

The importance of research question is that it will give the reader an ability to know if the reliance of non OPEC non IEA countries such as Russia and Brazil are correct in relying on OPEC to make production cuts. In other words, is it worth it to rely on OPEC to make production cuts? This question is important because if OPEC has no ability to influence prices –

to go up – then relying on OPEC is useless. Moreover, if OPEC is behaving like a cartel and it is realized the IEA countries (OECD) are not in a head to head competition with OPEC, on the contrary they make cuts at the same time and in a similar rate; then can this lead to the conclusion that the IEA is also a cartel but for developing countries which are interested in average prices and stable prices?

The variables:

- The X variable is the change in production: daily average and annual. Note that the percentage change has been calculated by this formula: $\frac{1966 \text{ annual production} - 1965 \text{ annual production}}{1965 \text{ annual production}}$. It must be noted that for the purpose of getting accurate analysis the results of the change in production is multiplied by -1 because the production cuts here (which are calculated as negative numbers) actually have a positive influence. This has been proposed by Almugura (2007); Ratti and Vespagnani (2015).
- The Y variable is the Brent oil prices (in dollars) since 1965; the data is collected from two sources (Fred Economic Data; McMahon, 2015).

3 Conclusion

The results of the first research paper revealed that there is no relationship between the production of OPEC and the production of IEA countries (OECD countries such as US, UK and France). There was a positive weak correlation that was not supported by a low p-value which means that the null hypothesis is not rejected.

That means that IEA countries do not rely on OPEC to make production cuts. This is an interesting result that comes against several research papers such as COlgan (2003); Gulen (1996) and Almugeura (2007). As mentioned in the literature review the relationship between supply and demand is very important for the oil international market. In the case of the relationship between OPEC and IEA countries there is an extremely complex situation which Alhajji (2015) for example pointed out by saying that there is no relationship between these organizations in terms of production of oil.

This is clear by analysing the supply and demand relationship also, while OPEC is an organization with mainly Middle Eastern countries which have more than 50% of their GDP collected from oil exports, they have a clear objective: keeping oil prices high and stable. This is also supported by the OPEC Statute (OPEC Statute, 2016) which concentrates on making sure OPEC countries have high revenues from selling their oil. Thus it's clear that OPEC would want to have higher prices, yet at the same time it believes that it doesn't always have to shoulder the decrease in production and thus it can benefit from high prices and higher sales (high production). On the other hand, the IEA has a more complex situation because at low oil prices these countries cannot produce their national oil due to high costs, for example the cost of UK oil barrel is \$46 which means at prices below this, the North Sea oil is non-extractable. At the same time since most of the IEA countries are net importers they are also not interested in high prices because then they will have high budgets to run. This complex situation explains the energy policies by the IEA which is concentrating on alternative energy, energy efficiency and lower prices; except for Norway and Canada because they are net exporters.

The second research question considered the relationship between OPEC and other non-OPEC countries which are out of the OECD; these countries are like Russia, China and Brazil.

Separating the non-OPEC countries into IEA organization and Russia, China and Brazil (and others) is important because the research conducted before, and was studied in the literature review, considered non-OPEC countries as a whole yet these countries have huge differences in their energy policies. Russia's energy policy does not have a concentration on alternative energy and efficiency which is the core of Germany's and Sweden's energy policy.

Thus when the research treats all non-OPEC countries in one way then the results cannot be generalized. The results of the second research question came to support the literature review and confirmed that the other non-OPEC countries (Russia and Brazil) rely on OPEC organization when it comes to production cuts. This is supported by a strong positive strong correlation supported by a very low p-value which rejects the null hypothesis. That means that the observer countries which are not part of IEA and outside OPEC usually avoid making production cuts and wait for OPEC to make cuts so that they can increase their revenues on a national level.

Thirdly, the last research question the relationship between the change in production level of OPEC and the prices of Brent oil in the international market. The purpose of this research question is to find out if OPEC has the impact to change the prices on the international market and also to check if OPEC acts as a cartel. This research is important in order to know if the IEA organization and the other non-OPEC countries are accurate in relying on OPEC to decrease production; that means does OPEC have the ability to change prices and does the production cuts implemented by OPEC impact the prices or not?

By analysing the data from 1965 to 2014 it is clear that OPEC does not have an impact on prices; the correlation was weak at 0.2 and was not supported by the p-value. On the other hand, OPEC was seen to behave as a cartel with an extremely strong positive correlation at 0.9 between 1980 and 1989. That means only in that period was OPEC able to impact prices.

4 Recommendation

Non-OPEC (non IEA) countries must not concentrate on relying on OPEC to make production cuts because OPEC has no influence to impact prices at the moment; further research must be made in order to analyse the drivers of oil prices which are non-related to the supply and demand relationship.

OPEC must behave like a cartel in order to influence prices; that's because the cartel behaviour can influence other factor than the supply and demand such as the political factors; further research must be done in the area of competitiveness among the OPEC members which is causing conflict among its members which broke down the cartel behaviour of OPEC

Lastly, OPEC must understand the real policy of IEA countries because there is no clear indication about the behaviour of IEA; this paper was not able to conclusively find out the behaviour of IEA when it comes to prices; IEA might not be behaving against OPEC when it comes to production (similar cuts) but might be acting in another area to influences prices according to its interests.

The first limitation comes in the methodology; the researcher believes that there might be interactions among these organizations beyond the ability of the statistical research to find out. That means that qualitative research mixed with quantitative research might bring in further information regarding the political conflict among OPEC members and bring in answers to why the cartel behaviour is no longer existent.

The relationship regarding the reliance of non-OPEC organization such as IEA and non-OPEC is not very clear; non OPEC and non IEA countries rely on OPEC while IEA countries don't rely; this research only find the causality among the relationships but does not give an answer regarding the cause of this behaviour and further research is advised to find the causes, via Multivariate analysis research.