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Structure – Conduct – Performance of Oil and Gas Industry in Indonesia: Approach to Path Analysis

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ABSTRACT: *With an oil lifting capacity of 800 thousand BPD, Indonesia still needs to import crude oil to meet the needs of 1.5 million BPD. Foreign companies currently control the oil industry sector in Indonesia.This study aims to describe the behavior of the oil industry and analyze the structure and performance of the Indonesian oil industry through the Path Analysis approach. The variables used are Concentration Ratio (CR4), Market Obstacles (MES), Lending Interest Rate (LIR), and Indonesia Crude Oil Price as a behavior proxy and PCM (Price Cost Margin) as a performance proxy.Based on the analysis, the market structure of the Indonesian oil and gas industry is a tight oligopoly with high market barriers. The results of the path analysis showed CR4 and ICP had a positive effect on PCM, while LIR and MES had a negative impact. The direct impact of MES on PCM through ICP and LIR causes the magnitude of the total MES effect on PCM, but this is not the case for CR4 on the PCM of the oil and gas industry in Indonesia.*

KEY WORD*: Structure, Conduct, Performance, Oil Industry, CR4, MES, LIR, ICP, PCM*

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I. INTRODUCTION

The oil and gas industry is one of the non-renewable resources. In recent years Indonesia's crude oil production has continued to decline, while its needs have increased. A policy is needed so that economic actors or companies, both domestic and foreign, get a conducive climate, so they want to invest in the oil and gas business because this business is high risk and requires substantial capital.

Many foreign investors are reluctant to invest in Indonesia. They are more interested in exploring in other countries because of simpler processes and systems and supported by legal certainty. Other inhibiting factors are corruption, financial, and monetary systems, which are not in line with contracts and regulations in the Oil and Gas Law. As a result, in the last ten years, almost no new reserves and oil fields have been discovered. When world oil prices reached more than US $ 100 / barrel, at that time oil production was very low at only around 900,000 barrels/day, far below the 2011 State Budget target of 970,000 barrels/day.

In 2018, there were four biggest oil producers, contributing 67 percent of national oil lifting with a total of 803 thousand BPD, as follows:

Tabel 1. Oil Lifting of Indonesia in 2018

No.	Produsen	BPD	Market Share (%)
1	Chevron Pacific Indonesia	209.000	26,03
2	Exxon Mobil Cepu	208.000	25,90
3	PT. Pertamina EP	79.000	9,84
4	PT. PHM	42.000	5,23

From the data table above, it appears that foreign companies occupy the highest production for oil in Indonesia. Likewise, for 2017, foreign producers still employ the highest output with a market share of 28%. Additional state revenues from oil production (due to rising world oil prices) will not be enough to cover extra fuel subsidies. The company, which has the highest oil production in Indonesia in 2005, is still occupied by Chevron, an American company with 476 MBPD (Million Barrel Per Day) oil production. Furthermore, in the second and third positions are employed by Pertamina with an output of 135.6 MBPD and Conoco Philip Ltd with a production of 70.9 MBPD. It can be seen that the production gap is quite far between Chevron's production and Pertamina as a domestic company amounting to 340.4 MBPD.

Another problem is the Oil and Gas Law No. 22 of 2001 concerning oil and gas, which in essence, has made the process of oil and gas investment in Indonesia complicated. The Oil and Gas Law has not been able to meet the adequacy of domestic gas demand. Based on the background and description above, it is essential to study and study how the structure, behavior, and performance of the oil and gas industry in Indonesia and the factors that influence the structure, behavior, and production of oil and gas.

II. LITERATURE REVIEW

In industrial organization theory, there is a theory called SCP (structure, conduct, performance), where this theory explains that the performance of an industry is strongly influenced by market structure. The market structure will affect the behavior and strategy of companies in a trade, and practice will affect performance. The aspects emphasized in the industrial economy are quite extensive. Still, in these industrial organizations, the emphasis is more on the structure of the monopoly market, competition, and oligopoly and its relation to company behavior and performance (Shepherd, 1992).

Structure

The market structure shows characteristics market, such as elements of the number of buyers and sellers, the state of the product, the state of knowledge of the seller and buyer, and the state of the market obstacle (Teguh, 2013). Furthermore, Salvatore (2012) revealed that market structure refers to the competitive environment in which buyers and sellers of products interact. The concentration ratio of the four largest companies in an industry (CR4) is the concentration ratio most often used in measurements.Measurement of the ratio of concentrations from industry (CR4) with the following formula:

$$CR4 = \sum_{i=1}^{4} MSi \; ; MSi = \frac{0i}{0t} \qquad (1)$$

where MSi is the market share of the i company.

In addition to using market share measures, industry structures can also be identified through barriers to market entry. Barriers to entry (barrier to entry) are anything that allows a decline, opportunity, or speed of entry of new competitors (Jaya, 2008). Or by other means, barriers to market entry are things that prevent a company from building a new company in a market. The analytical tool used to measure the obstacles to market entry is the Minimum Efficiency Scale (MES), which is the ratio between the output of the largest company and total output. According to Hasibuan (1993), the MES value, which reaches 10 percent, describes that the barriers to market entry in the industry are high.

Conduct

Behavior (conduct) refers to the practice of companies in determining prices, production levels, products, advertisements, and how to deal with competing companies. The main focus of corporate behavior is how the company reacts to market structure conditions and interactions with competitors. According to Kuncoro (2007), market behavior is defined as a pattern of responses by companies to achieve their objectives within the scope of industrial competition. The reaction between one company to another implemented in the form of selling prices (pricing strategies) and product promotion strategies. The company's behavior, which reflected the determination and implementation of a competitive plan to continue to exist in a market, is expected to improve the performance of the company. The decision of oil and gas price policy in Indonesia is determined based on government regulations. Pertamina is the only oil and gas company under the auspices of the government. International oil prices influence the strategy for determining oil prices in Indonesia. ICP (Indonesia Crude Oil Price) is the basis of oil prices used in the calculation and preparation of the APBN.

Promotion strategies in the oil and gas industry can be in the form of advertising behavior towards oil and gas products. The main target in this promotion is for investors, both foreign and domestic, so they want to invest their capital in the oil and gas industry. Lending Interest Rate (LIR) affects investment in the industrial sector, which will encourage production. Meanwhile, the exchange rate affects the price (products and production inputs). Interest rates and exchange rates are monetary policy instruments that significantly affect trade in industrial products, both domestic and international, while the size of the interest rate largely determines investment.

Performance

Performance is the result of work that is influenced by the structure and behavior of the industry where the results are usually seen from the amount of market dominance or the size of a company's profits in a trade. Performance in one sector can be observed through value-added, productivity, and efficiency. Value added is the difference between the input value and the output value. Productivity is the result achieved per labor or factor unit of production within a specified period.

PCM is the percentage of profits from excess revenues over direct costs. The higher the added value, the efficiency of industrial performance increases so that the benefits will be even more significant (Muslim and Wardhani, 2008). Determination of PCM values can use the following equation:

$$PCM = \frac{\text{Value added} - \text{total wages}}{\text{Value of goods produced}} \times 100\% \quad (2)$$

III. RESEARCH METHODS

Research Framework.

The development of the structure-behavior-performance relationship of the oil and gas industry explains how companies will behave in the face of specific market structures in an industry where certain behaviors will create a performance. The relationship is illustrated in the following picture:

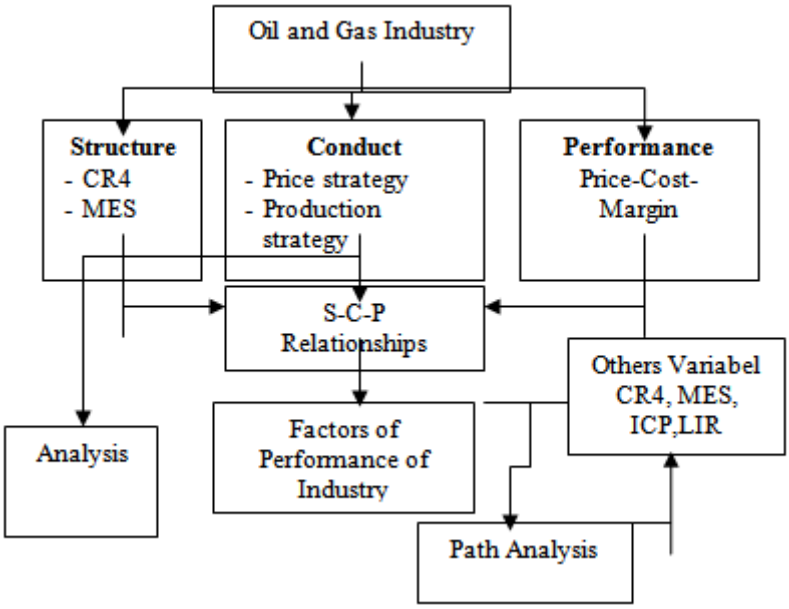

Figure 1
Relationships of the oil and gas industry SCP

Model and Method of Analysis

This study analyzes the structure, behavior, and performance of the oil and natural gas industry using the SCP (Structure-Conduct-Performance) approach. The analysis model in looking at the performance of the oil and gas industry based on the development of the SCP relationship above is done with the path of the oil and gas industry SCP analysis, as follows:

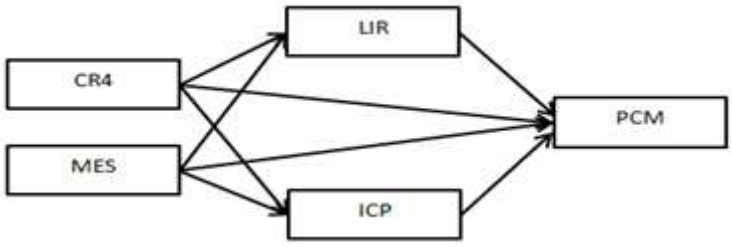

Figure 2. Path Analysis of oil and gas industry SCP

The method used in this research is descriptive and quantitative methods. The descriptive method is used to analyze the structure of the industrial market, industrial behavior, and performance of the oil and gas industry in Indonesia using the SCP approach. Meanwhile, quantitative methods using path analysis are used to examine the direct and indirect effects of industrial market structure on industrial behavior and the impact of industrial market structure and industrial behavior on industrial performance. The data used in this study are secondary data with populations, including oil and gas companies in Indonesia during the period 2008 - 2018. Data used include CR4, MES, ICP, LIR, and PCM taken from BI, BPS, the Ministry of Energy and Mineral Resources, the Ministry of Finance of the Republic of Indonesia, and the World. Bank.

Based on SCP theory and framework of thinking, the oil and gas industry PCM estimation equation formulated as follows:

$$ICP = b0+b1\ CR4+ b2\ MES + e1 \quad (3)$$

$$LIR = a0+a1\ CR4+ a2\ MES + e2 \quad (4)$$

$$PCM = c0+c1\ CR4+c2\ MES+c3\ LIR +c4\ ICP +e3 \quad (5)$$

IV. RESULTS

Some research conducted in industrial economics discusses the structure, behavior, and performance of an industry. Solomon (2013) examined the market structure of the banking industry in Kenya. By using the market concentration proxied by CR4 and the Herfindahl-Hirschman Index, while proxied market share with efficiency, it was found that market efficiencies influence and maximized the profitability of commercial banks in Kenya.

In similar industries, Rossazana (2015) tested the relationship of financial SCP in the banking industry in Malaysia using the least-squares method. The two variables are namely market structure and bank efficiency and other explanatory variables, namely market share, operating costs, loan ratios, and bank size, are regressed on the dependent variable. The dependent variable is namely the bank's financial performance, which is proxied by return on assets (ROA), return on equity (ROE), and net interest margin (NIMTA). It was found that market concentration and banking efficiency determined the profitability of commercial banks in Malaysia.

Sayyed (2017), in the oil and gas industry, found that a focused organizational structure can influence integration strategies, supply chains in improving the operational performance of oil and gas companies in Malaysia. It was also found that the role of internal mediation, customers, integration of suppliers with the internet, the level of centralization, formalization, hierarchical relationships, and operational performance.

Erlinda (2008) also structured performance policies in the palm oil industry in Indonesia. The results showed the market structure of government policy to stabilize the price of palm cooking oil is still ineffective. The company has the power to control the market with a CR4 value of 0.4 and a PCM for the palm oil industry of 0.2 - 0.35.

V. DISCUSSION

Data Description

CR4 calculation results during 2014 - 2018 are as follows:

Table 3. CR4 Value and Market Structure of the oil and gas industry in Indonesia

Year	MS1	MS2	MS3	MS4	CR4	Market Structure
2014	38,42	14,09	8,30	4,59	65,40	Tight Oligopoly
2015	36,00	13,00	9,00	8,97	66,97	Tight Oligopoly
2016	31,35	21,31	10,42	7,96	71,05	Tight Oligopoly
2017	28,21	24,88	9,81	6,86	69,76	Tight Oligopoly
2018	26,03	25,90	9,84	5,23	67,00	Tight Oligopoly
Mean	32,00	15,57	9,47	6,72	68,04	Tight Oligopoly

The CR4 calculation above explains that from 2014 to 2018, the market structure of the oil and gas industry in Indonesia took the form of a tight oligopoly, where the CR4 value was 68.04%. Based on the Gwin classification in Arsyad (2014), CR4 values ranging from 60% to 90% are classified as tight oligopoly market structures. However, in 2004, the CR4 value of 30.53%, which means the market conditions of the oil and gas industry in Indonesia, was of a progressive or monopolistic nature. Pertamina is an oil and gas company managed by the Indonesian government. It is one of the state-owned companies that have a significant role in meeting domestic oil and gas supply. But in fact, this is mostly done by product sharing contract holder companies.

In addition to its market share and concentration ratio, the market structure of the oil and gas industry in Indonesia can also be seen from barriers to entry as measured by the Minimum Efficiency Scale (MES) as shown in the table below:

Table 4. MES value of the oil and gas industry in Indonesia

Year	Largest Company Output	Output Total	MES
2014	308.523	803.827	38
2015	281.073	814.235	35
2016	251.817	831.058	30
2017	226.500	808.800	28
2018	209.000	803.000	26
Mean			31

Based on the results obtained, the average value of MES is 31%, which indicates that barriers to market entry in the industry are high. Conditions in the Indonesian oil and gas industry can be said to have high restrictions so that new companies will find it difficult to enter the Indonesian oil and gas industry. This is due to enter the oil and gas industry requires high costs compared to other sectors.

Some obstacles faced by the Indonesian oil and gas industry, in addition to high investment costs and poor infrastructure are the low ability of human resources to absorb technology, market acceptance of renewable energy is still limited, the availability of raw materials still lacks and obstacles in coordination between agencies.

The determination of oil and gas price policy in Indonesia is determined based on government regulations. Pertamina is the only oil and gas company under the auspices of the government. International oil prices influence the strategy for determining oil prices in Indonesia (ICP). But in Indonesia, domestic oil prices are still subsidized by the government. This subsidy aims to enable lower middle-class households to reach the presence of the oil.

In terms of product strategy, currently, the problem is the difficulty of local entrepreneurs to develop their products in the country due to the entry of various foreign products in the form of final products. In general, Indonesia only sells raw materials abroad. Without prior processing. However, after the raw material is processed overseas, Indonesia will repurchase it at a price much higher than when it was exported. At present, the local content for domestic oil and gas products still reaches 25 percent. This indicates that the domestic oil and gas sector still imports local materials from abroad.

In this study, the level of profit is known through PCM (Price Cost Margin). The average profit level of the oil and gas industry is 55.57 percent. From these results, it can be seen that the oil and gas industry has a large profit margin compared to other industrial sectors. However, every industry that has a high return must have a high risk as well. This is due to the more significant capital required, the better the technology used, and the need for more competent experts to increase industrial profits. That is why to enter this industry has a high barrier to entry. This is what distinguishes it from other sectors where the barrier to entry is low, and the risk is smaller, so the profit margins are more modest.

A. Path Analysis using AMOS software

Normality test

Assessment of normality (Group number 1)

Variable	min	max	skew	c.r.	kurtosis	c.r.
MES	26,030	91,660	1,794	2,429	2,743	1,857
CR4	65,400	94,720	,789	1,068	-,708	-,479
ICP	40,130	116,600	-,172	-,233	-1,208	-,818
LIR	10,530	14,490	,247	,335	-,552	-,374
PCM	42,350	77,520	-,781	-1,058	,493	,334
Multivariate					,667	,132

The normality test results obtained multivariate cr values <2.58, indicating that the assumption of normality is met.

Squared Multiple Correlation and Estimated Values(Direct dan Indirect Effects)
Squared Multiple Correlations:

	Estimate
ICP	,168
LIR	,548
PCM	,847

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
LIR	<---	CR4	,069	,052	1,343	,179	par_1
ICP	<---	MES	1,093	,849	1,288	,198	par_2
ICP	<---	CR4	-1,318	1,576	-,837	,403	par_7
LIR	<---	MES	,010	,028	,370	,711	par_8
PCM	<---	LIR	3,218	1,616	1,991	,046	par_3
PCM	<---	ICP	,216	,053	4,090	***	par_4
PCM	<---	CR4	-,526	,295	-1,784	,074	par_5
PCM	<---	MES	-,364	,154	-2,362	,018	par_6

Standardized Regression Weights:

			Estimate
LIR	<---	CR4	,593
ICP	<---	MES	,770
ICP	<---	CR4	-,500
LIR	<---	MES	,163
PCM	<---	LIR	,367
PCM	<---	ICP	,555
PCM	<---	CR4	-,512
PCM	<---	MES	-,659

Standardized Total Effects

	MES	CR4	ICP	LIR
ICP	,770	-,500	,000	,000
LIR	,163	,593	,000	,000
PCM	-,171	-,573	,555	,367

Standardized Direct Effects

	MES	CR4	ICP	LIR
ICP	,770	-,500	,000	,000
LIR	,163	,593	,000	,000
PCM	-,659	-,512	,555	,367

Standardized Indirect Effects

	MES	CR4	ICP	LIR
ICP	,000	,000	,000	,000
LIR	,000	,000	,000	,000
PCM	,488	-,061	,000	,000

From the results of the path analysis, it was found that the variable loan interest rate (LIR), Indonesian crude oil prices (ICP), market concentration (CR4) and market barriers (MES) significantly affected profitability (PCM), with the amount of standardized regression respectively is 0.367; 0.555, 0.512 and 0.659. The estimated R2 model value is 84.7%, meaning that the variable interest rates on loans can explain the diversity of PCM in the oil and gas industry, the price of Indonesian crude oil, market concentration and market constraints of 84.7%. The CR4 variable is significant to the increase in PCM with a negative coefficient of -0.512. This is thought to be caused by companies entering the industry experiencing fluctuations.

When the number of companies that come, the higher will reduce the concentration of industry, and when the number of companies decreases will increase strength. However, it can be seen that although the number of companies increases, it will not necessarily reduce CR4 because the products produced by new companies are still lower than the four largest companies. This has an impact on diminishing corporate profits so that the benefits derived will be increasingly reduced, and CR4 hurts profits and improving the performance of the oil and gas industry. Besides, the oil and gas industry is different from other industries where

management is difficult and riskier. To enter this industry is not easy because it requires excellent infrastructure, expertise, significant capital, high technology, and high-risk. The management of oil and gas is also different, like other natural resources such as mining, banking, and property industries. To ensure that there is oil in the bowels of the earth or not, geological surveys are needed to explore and exploit. After it is believed to contain the contents, then drilling will take place. This problem is thought to cause a decline in the profits of the oil and gas industry, even though oil and gas prices continue to rise.

The minimum Efficiency Scale (MES) is significant for the oil and gas industry PCM. The oil and gas industry is slightly different from other industries in terms of barriers to market entry. Besides being difficult to enter the industry, the risk is high, the capital spent must also be substantial. To limit the entry of new companies in an industry can be done by increasing the total production capacity and through product differentiation. The higher the barriers to entry, the smaller the profits obtained by the company. This is due to the increasingly high market concentration making it difficult for other companies to enter the industry.

Crude oil price (ICP) has a significant effect on PCM with a standardized coefficient of +0.555. This condition informs that the higher the crude oil will provide an increase in the profits of the oil and gas industry. This is a government intervention in monetary policy to control oil and gas lifting and production as well as huge profits. The loan interest rate (LIR) has a significant effect on PCM with a standardized coefficient of +0.376. This is an entry point for the government in making monetary policy to control the performance of the oil and gas industry. There is an indirect effect of market concentration (CR4) and market barriers (MES) on market performance (PCM) through monetary variables LIR and ICP, respectively 0.061 and 0.488. With the LIR and ICP behavioral variables causing the total influence of CR4 on the performance of the oil and gas industry by 0.573 and the overall effect of MES on the performance of the oil and gas industry by 0.171

VI. CONCLUSION

The performance of the oil and gas industry in Indonesia shows a relatively high level of profitability. However, the growth rate for specific years is negative. Variable loan interest rates (LIR), Indonesian crude oil prices (ICP), market concentration (CR4), and market barriers (MES) significantly influence profitability (PCM). Structural and behavioral interventions in the oil and gas industry through controlling lending rates (LIR) and crude oil prices (ICP) have an impact on the performance of the oil and gas industry in Indonesia. The indirect effect of market concentration on the performance of the oil and gas industry through oil price behavior and lending interest rate causes the more significant effect of total market concentration on industrial production. However, this is not the case with market barriers to the performance of the oil and gas industry, where the behavior of oil prices and lending interest rates does not lead to a more significant effect of the market concentration on the performance of the oil and gas industry.

The oil and gas industry in Indonesia in the period 2008 - 2018 has a form of a tight oligopoly market structure, and the average MES value of the oil and gas industry is worth above 10%, indicating that barriers to market entry are relatively high. The largest market share is still owned by foreign oil and gas industry companies, while the stock of domestic companies fluctuates, but has not been able to become the largest industry in oil lifting suppliers in Indonesia.

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