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THE DYNAMICS OF INDONESIA'S ANIMAL FEED INDUSTRY: AN SCP FRAMEWORK USING PANEL DATA ANALYSIS

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Abstract

To support the livestock sector in meeting the growing demand for animal protein in Indonesia, the animal feed sub-sector faces various structural challenges, including volatility in imported raw material prices, high market concentration, and competitive imbalance leading to margin pressure. This study aims to analyze the Structure–Conduct–Performance (SCP) of the animal feed industry listed on the Indonesia Stock Exchange for the period 2023–2024. The SCP framework is employed to assess the industry's market structure, firm conduct, and performance. Furthermore, panel data regression is used to examine the influence of market share (MS), market concentration (CR4), and internal efficiency (X-EFF) on return on assets (ROA). The findings reveal that the industry exhibits characteristics of an oligopolistic market dominated by a few large firms. Panel data analysis shows that the three independent variables jointly have a significant effect on ROA. Individually, market share (MS) has a positive but statistically insignificant effect, while both CR4 and X-EFF demonstrate significant positive effects on ROA.

Keywords: Animal feed, SCP, Panel Data, Market Share, ROA

Introduction

In the current era, Indonesian people are increasingly aware of the nutritional needs that humans need every day, one of which is animal protein derived from beef and buffalo. Beef and buffalo meat is one of the foods with animal protein sources that have an important role in fulfilling community nutrition. The consumption level of beef and buffalo meat is increasing as the population of Indonesia increases. In 2024, with a population of 281.603.80 (thousand people), the total consumption of beef and buffalo meat in Indonesia will reach 759,668 tons (Badan Pusat Statistik Indonesia, 2024)

Table 1 Beef and Buffalo Supply-Demand by Province (tons), 2024

Island	Total Supply/ Meat Availability	Total Demand/ Meat Requirements	Surplus / Deficit
Sumatera	105.943	99.682	6.261
Jawa	310.400	542.324	-231.923
Bali & Nusa Tenggara	23.723	43.438	-19.715
Kalimantan	18.176	32.992	-14.815
Sulawesi	32.164	32.272	-108
Maluku & Papua	5.840	8.961	-3.121
Indonesia	**496.246**	**759.669**	**-263.421**

Source *: Badan Pusat Statistika Indonesia, 2024*

By looking at the data in Table 1, it is known that the Supply-Demand of beef and buffalo meat in 2024 will experience a large deficit. This must be considered because it will have an impact on public consumption of animal protein, especially children who will one day become the successors of this nation. Without realizing it, animal husbandry has a role in shaping the character of the nation's smart children with its livestock products, such as beef, buffalo and chicken which are sources of animal protein and its derivative products such as cheese and yogurt. Therefore, animal husbandry must have the right regulations for everything related to future production, such as animal feed which is the foundation of quality animals.

The rapid development of the livestock industry in Indonesia is inseparable from other major supporting industries such as the animal feed industry.Thus, the domestic animal feed industry will play a significant role in supporting the livestock industry in providing the availability of chicken meat consumption and its derivative products for the community as an additional source of protein.The animal feed industry was born along with the development of the poultry industry in 1980, now the animal feed industry has grown rapidly.According to Desianto Budi Utomo, chairman of GPMT (Association of Animal Food Entrepreneurs) at the 2024 National Feed Industry Panel Discussion, in 2023 the animal feed industry grew 1-3% while in 2024 the national feed industry is expected to grow around 5% from 2023 or around 19 million tons (Ramdan, 2025).

Until now, the national animal feed industry is still dominated by foreign companies such as Charoen Pokphand Indonesia Tbk, Japfa Comfeed, Sierad Produce, Cheil Jedang Feed, Malindo Feedmill, Gold Coin, and Sentra Profeed.The need for animal feed continues to increase every year, but is not matched by domestic feed production so that these large producers still depend on raw material needs through imports, especially corn from America and Brazil. In addition, it is estimated that the use of raw materials, especially corn, will continue to increase over the next 20 years and is very likely to affect the increase in feed prices nationally.

The high price of imported raw materials can be a major problem in the livestock industry, especially the feed industry, which will directly result in the price of animal feed in the domestic market will continue to soar.Therefore, the government as a policy maker in Indonesia in the short term will encourage animal feed factories that have been using imported raw materials as a mixture, to use local raw materials to reduce the price of animal feed in the country.In accordance with these problems, the objective to be achieved from this study is to analyze the behavioral structure of the performance of the animal feed sub industry in Indonesia listed on the Indonesian stock exchange in the period 2023-2024 or 7 quarters. while analyzing the relationship using econometric analysis.

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Vol. 2/EC-ISCEBE (2025)

Research Methods

Type, Data Source And Analysis Method

The type of data used in this study is secondary data, which is obtained from data that already exists and is collected either by a body or agency. According to Sugiyono in 2016 in research (Tabina, 2024) states that secondary data is a source of data that is not directly received by data collectors, either through other people or through documents. The main data source comes from the quarterly reports of industrial companies in the animal feed sub-sector listed on the Indonesia Stock Exchange. The data used is panel data which according to sihombing in 2018 is a combination of cross section and time series data (Rifkhan, 2023). Time series data refers to the period 2023-2024 in Quarterly and cross section data refers to 5 animal feed companies listed on the Indonesia Stock Exchange, namely Charoen Pokphand Indonesia Tbk (CPIN), Central Proteina Prima Tbk (CPRO), Japfa Comfeed Indonesia Tbk (JPFA), Malindo Feedmill Tbk (MAIN) and Sreeya Sewu Indonesia Tbk (SIPD). The objects observed in this study are Market Share (MS), Concentration Ratio (CR4) and Internal Efficiency (XEF) as dependent variables and Return On Asset (ROA) as an independent variable. Data processing is done with the help of Microsoft Office Excel and EViews 12 software.

The data analysis method used in the research is quantitative descriptive method.According to (Nurul Aziza, 2023) the quantitative descriptive data analysis method is a method that helps describe, show or summarize data in a constructive way that refers to a statistical description that helps understand the details of the data by summarizing and finding patterns from a particular data sample.Descriptive methods are used to analyze the behavior of the animal feed sub-sector industry in Indonesia, while quantitative methods are used to analyze the structure and performance of the animal feed sub-sector industry with the Structure Conduct Performance (SCP) approach and also to analyze what factors affect the performance of the animal feed sub-sector industry in Indonesia in the period 2023-2024 in Quarterly using an econometric approach, namely panel data regression.

Analysis Technique

Industry Structure Analysis

In calculating the industrial structure, there are two analytical tools used in this study. The first one used is Market Share approach/theory. Market Share theory is a theory that explains the amount of market share control owned by a company in an industry. Market Share has a function to explain the position of a company in the industry (Shafira Ayu Amalia, 2021). The market share of a company is measured by dividing the company's output by the total output of companies in similar industries and the results are expressed in units of percent. This market share approach is described in the following formula:

$$MS_i = \frac{Outout_i}{Output_{tot}} x100\%$$

The second analytical tool used is the concentration ratio, this approach is used to measure the form of market competition by looking at the number and size of companies operating in a market. According to Shepherd (1990) in research (Florentina & Susilo, 2012) it can be determined if an industry meets the following requirements:

Table 2 Market Concentration Classification

CR4 Value/ Category	Market Structure
CR4=0 (Minimum)	Perfect Competition Market
0 < CR4 < 40 (low)	Monopolistic
40 < CR4 < 60 (lower middle)	Loose oligopoly
60 < CR4 < 90 (upper middle)	Tight oligopoly
90 < CR4 < 100 (high)	Dominant firm
CR4 = 100	Monopolistic

Source : Shepherd (1990) in research (Florentina & Susilo, 2012)

One indicator is CR4 (Concentration Ratio 4), which is calculated by summing the market shares of the four largest companies in the industry. The calculation is done using the following formula:

$$CR4 = \sum_{i=1}^{n} S_i$$

There is another analytical tool that can be a refinement or strengthening of the concentration ratio, namely the Herfiendahl Hirseman Index (IHH). IHH is the sum of the squares of the market shares of companies in a market/industry. This IHH can be described in the following formula:

$$IHH = \sum_{i=1}^{n} S_i^2$$

In the IHH approach quoted from Economics Of Strategy in research (Rizkyanti, 2006) there are criteria that are a condition for entering a market, as follows:

Table 3 Market Structure Criteria with IHH approach

CR4 Value/ Category	Market Structure
0	Perfect Competition Market
0 < IHH < 0,2	Monopolistic
0,2 < IHH < 0,6	Oligopoly
>= 0,6	Monopoly

In addition to using concentration and IHH measures, industry structure can also be identified through its market entry barriers. The analytical tool used in this case is Minimum Efficiency Scale (MES). The MES value is obtained from the division between

the output of the largest company and the total output of the industry. According to (Marfuah Zuher dkk., 2022) the analysis is used to see how big the barriers are for new marketing institutions to enter and compete for market share. MES can be described in the following formula:

$$MES = \frac{Output\ of\ the\ Largest\ Company}{Total\ Output} x100\%$$

Industry Behavior Analysis

The analysis of industry behavior is carried out using a descriptive approach, this can occur because the variables that reflect behavior are qualitative in nature which are difficult to quantify. According to (Dwiputra, 2021) market behavior consists of policies in price competition and product characteristics set by companies. Market behavior also describes how actions taken by companies as a result of the market structure they face, so market behavior includes patterns of responses and adjustments of companies in an industry to achieve their goals and to face competition in order to sell their products. Industry behavior is analyzed descriptively with the aim of obtaining information about the behavior of companies in an industry.

Industry Performance Analysis

In this study, the industry performance analysis used Return on Asset (ROA) and X-efficiency (XEFF) with the following formula:

$$ROA = \frac{Operating\ Profit}{Total\ Assets} x100\%$$

$$XEFF = \frac{Value\ Added}{Input\ Value} x100\%$$

Return on Asset (ROA) is an analytical tool used to determine how much profit the company gets with all its assets. According to (Ikhwal, 2016) Return on Asset (ROA) is one form of profitability ratio to measure the company's ability to generate profits using existing total assets and after capital costs (costs used to fund assets) are removed from the analysis. Meanwhile, internal efficiency (X-eff) is used to show the ability of companies in an industry to reduce production costs. Internal efficiency (X-eff) illustrates if the company is well managed (Ikhwal, 2016). In general, the value of internal efficiency is between 0-100 percent. However, there are some cases that cause efficiency to reach a number above 100 percent. This is due to several factors such as the nature of the industry itself.

Analysis of the Effect of MS, CR4 and Efficiency on ROA of the Animal Feed Sub-Sector Industry in Indonesia through Panel Data Analysis

In determining which panel data method approach to be used in research, the best model selection is used. There are 3 model selection tests in statistical calculations including:

1) Chow Test is a method used to select the best model between the Common Effect Model and the Fixed Effect Model. By using a significant level of 5%, the hypothesis used in this study is
   H0 = Common Effect Model (CEM)
   H1 = Fixed Effect Model (FEM)
   If the probability value is smaller than the significant level, then H0 is rejected, and vice versa.
2) The Hausman Test is a method used to select the best model between the Fixed Effect Model and the Random Effect Model. By using a significant level of 5%, the hypothesis used in this study is
   H0 = Random Effect Model (REM)
   H1 = Fixed Effect Model (FEM)
   If the probability value is smaller than the significant level, then H0 is rejected, and vice versa.
3) Langrange Multiplier Test is a method used in choosing the best model between the Common Effect Model and the Random Effect Model. By using a significant level of 5%, the hypothesis used in this study is
   H0 = Common Effect Model (CEM)
   H1 = Random Effect Model (REM)
   If the probability value is smaller than the significant level, then H0 is rejected, and vice versa.

If in the Chow Test and Hausman Test the same model is the Fixed Effect Model with a probability <5%, then the selected model is the Fixed Effect Model and is not required for the Langrange Multiplier Test. However, if the Chow Test and Hausman Test selected models are different, the Langrange Multiplier Test will be continued.

In this study, regression analysis using panel data regression was used to analyze the relationship of factors affecting performance in the animal feed sub-sector industry both partially and simultaneously. The variables in this study consist of dependent variables (ROA) and independent variables (Market Share, CR2 and Efficiency). The model can be written in the following equation:

$$ROA_t = \beta_0 + \beta_2 MS_{it} + \beta_2 CR4_{it} + \beta_3 XEFF_{it} + U_{it}$$

Description:
ROA : Return on Asset (%)
MS : Company market share (%)
CR4 : concentration ratio of the four largest companies (%)
XEFF : X-efficiency (%)
Uit : individual error to i period to t

Results And Discussion

Analysis Of The Industry Structure Of The Animal Feed Subsector

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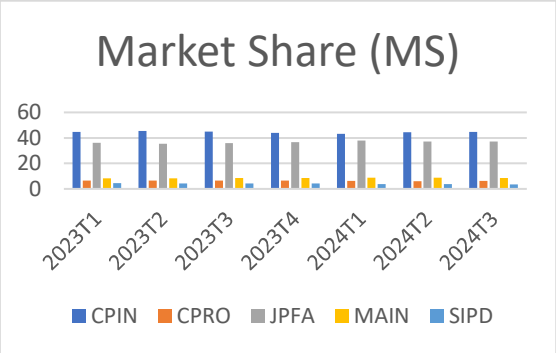
In this study, the market structure analysis of the animal feed industry sub-sector using the Structure-Conduct-Performance paradigm can be determined by examining market share, the concentration ratio of the four largest companies (CR4), the Herfindahl-Hirschman Index, and the level of market entry barriers. The following are the results of the market share analysis for the animal feed industry sub-sector in Indonesia for the 2023-2024 fiscal year, broken down by quarter:

Figure 1
Market Share Analysis Results



The market share of the five companies in the animal feed sub-sector varies. These results show that the ranking of each company tends to be stable every quarter. From the first quarter of 2023 to the third quarter of 2024, CPIN held a market share of 44.44%, nearly half of the entire market, as this company is the main player in the animal feed market. According to (Kontan.co.id, 2025), BRI Danareksa noted that CPIN's market share increased to 37.5% in 2024 compared to 35.6% in 2023. Conversely, the market share of other companies such as Malindo Feedmill and Cibadak Indah Sari Farm decreased.

The market structure analysis of the animal feed sub-sector industry can also be determined by examining the concentration ratio of the four largest companies (CR4), the Herfindahl-Hirschman Index (HHI), and the level of market entry barriers (MES). The following are the results of the CR4, HHI, and MES analysis calculations for the animal feed sub-sector industry in Indonesia for the 2023-2024 quarter:

Table 4 Data results from CR4, IHH, and MES analysis

Company	CR4	IHH	MES
2023T1	95,48	0,34	44,66
2023T2	95,67	0,34	45,39
2023T3	95,62	0,34	44,79
2023T4	95,81	0,34	44,02
2024T1	96,16	0,34	43,26
2024T2	96,35	0,35	44,36
2024T3	96,41	0,35	44,67
Average	95,93	0,34	44,45

Source : data processed, 2025

Analysis of Industry Concentration in the Animal Feed Subsector in Indonesia Based on the research results in Table 4, the average ratio of the four largest companies (CR4) in the animal feed subsector during the period from Quarter 1 2023 to Quarter 3 2024 was 95.93 percent, indicating a dominant market position.

The CR4 calculation was obtained by dividing the total output of the four largest companies—Charoen Pokphand Indonesia Tbk (CPIN), Japfa Comfeed Indonesia Tbk (JPFA), Malindo Feedmill Tbk (MAIN), and Central Proteina Prima Tbk (CPRO)—by the total industry output, From the first quarter of 2023 to the third quarter of 2024, the market structure of the animal feed sub-sector showed stable values with an average of 95.93%, where the value 90<CR4<100 indicates a market structure with dominant companies. With such a structure, according to the Structure–Conduct–Performance (SCP) framework, market power tends to be dominated by major players. Such a structure directly influences company behavior (conduct), particularly in marketing strategies.

In this study's IHH analysis, the sum of the squared market shares of companies in the animal feed sub-sector industry was used. Based on the calculations, the IHH value in the six quarters studied was consistently above 34%, indicating that this industry falls into an oligopoly market dominated by a few large companies with significant market shares, such as Charoen Pokphand Indonesia Tbk (CPIN) and Japfa Comfeed Indonesia Tbk (JPFA).

With an oligopoly structure consisting of large companies that control market share, these companies tend to have market power to influence prices, distribution, and even regulations. This encourages strategic behavior such as pricing, quality, and product innovation, which are typically carried out by dominant players. In the long term, such a market structure affects the aggregate performance of the industry, where profit margins, production efficiency, and growth can be determined by imbalanced market power.

Analysis of Entry Barriers in the Animal Feed Sub-sector Industry in Indonesia To assess how entry barriers can be proxied using Minimum Efficiency of Scale (MES). The MES value is obtained from the percentage of the largest company's output relative to the total output of the animal feed sub-sector industry. According to (Nurhasanah & Karimata, 2019), a high MES can act as a barrier for new competitors to enter an industry's market. Based on the research results in Table 4, the average MES value in the animal feed sub-sector industry in Indonesia from the first quarter of 2023 to the third quarter of 2024 was 44.45 percent. This indicates that only companies with large-scale operations can operate efficiently in this industry. In other words, small companies will face difficulties competing because they must achieve very high production volumes to reduce unit production costs.

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Analysis Of The Behavior Of The Animal Feed Subsector Industry

The animal feed industry is an integral part of the livestock sector, playing a crucial role in providing additional nutrition for livestock, which directly impacts public consumption of animal protein required daily. The behavior of this industry is influenced by various external and internal factors, including market dynamics, consumer needs, government policies, and economic conditions.

Based on an analysis of the structure of the animal feed industry sub-sector among companies listed on the Indonesia Stock Exchange in the 2023-2024 quarter, it was found that this industry operates within an oligopolistic market structure, characterized by the dominance of large companies and significant barriers to market entry. This situation gives rise to certain behaviors exhibited by companies within this industry. These behaviors include the following:

Pricing Strategy

Animal feed is a major component in livestock farming. If prices rise due to increases in feed raw material costs, each company will respond differently based on its strategies, which depend on feed management and formulation, as well as marketing strategies and pricing policies specific to each company.

As stated by the chairman of the Indonesian Animal Feed Association (GPMT) at a seminar, “the challenges facing the feed industry include the availability of local feed ingredients, particularly corn, whose production is projected to decline; rising prices of imported and local feed ingredients; the weakening of the rupiah exchange rate; and regulations regarding anti-dumping import duties and VAT.” He explained that the impact of El Niño in recent times, which led to a prolonged dry season in 2023, has caused corn harvests in Q1 2024 to be delayed and availability to extend into Q2 2024, resulting in a shortage of local corn. Regarding the increase in imported feed prices, this is due to global geopolitical conditions, as well as price fluctuations and harvest conditions in feed-producing and exporting countries (agropustaka.id, 2024).

As a result, the animal feed industry in Indonesia faces challenges in securing key raw materials such as corn. This makes domestic feed producers heavily reliant on imported feed raw materials, which is highly disadvantageous for domestic feed producers as they must follow the fluctuating yet generally rising international market prices each year. Therefore, the pricing strategies set by domestic feed producers are not only based on the balance of supply and demand in the market but also on raw material prices and other input costs.

An example of a pricing strategy is that of CPIN, which implements a flexible and adaptive pricing strategy to deal with fluctuations in the prices of animal feed raw materials, particularly corn and soybean meal. They maintain a cautious capital structure and utilize bank credit facilities to manage production costs when raw material prices rise without having to immediately raise selling prices drastically. According to Ong Mei Sian (Director of CPIN), the company's strategy in dealing with feed price volatility is to always be careful in maintaining its capital structure. In addition, CPIN also utilizes credit facilities from banks that can be withdrawn at any time (Rizqi Rajendra, 2024).

Product Strategy

Every company certainly has strategies and innovations in producing high-quality, attractive, and unique products that differentiate them from other companies, with the aim of generating profits. At Charoen Pokphand Indonesia Tbk, the animal feed products produced use the highest quality ingredients and undergo extensive research by the R&D department, ensuring that the products from PT. Charoen Pokphand Indonesia Tbk have superior quality and profitability compared to its competitors. To this day, PT. Charoen Pokphand remains the market leader and price leader. Charoen Pokphand Indonesia Tbk also has several main animal feed brands, including HI-Pro, HI-Pro-Vite, Bintang, Bonavite, Royal Feed, Turbo Feed, and Tiji.

In the sustainability report, it is explained that our animal feed products are favored by consumers because they are recognized for having formulations that can meet the optimal nutritional needs for each stage of chicken growth. Additionally, our animal feed is also recognized by farmers for its efficient feed conversion rate and disease resistance. These two factors are extremely important because animal feed constitutes the largest production component, accounting for approximately 60%-70% of the total maintenance costs for a single animal.

However, to date, companies that can sustain their product quality are still dominated by a few large feed producers, leading many small producers to close their businesses due to inability to compete, both in terms of product quality and lack of capital and available inputs.

Performance Analysis Of The Animal Feed Subsector Industry

The indicators used in this study to analyze the performance of the animal feed subsector industry are ROA and X-EFF. ROA reflects the income generated by a company relative to its assets, while X-EFF indicates the industry's efficiency in minimizing production costs.

Table 5 ROA analysis results data

Quadran	Company					
	CPIN	CPRO	JPFA	MAIN	SIPD	Average
2023T1	0,0059	0,0168	-0,0071	-0,0313	-0,0043	-0,0040
2023T2	0,0336	0,0332	0,0033	-0,0237	0,0002	0,0093
2023T3	0,0653	0,0469	0,0292	0,0083	0,0021	0,0303
2023T4	0,0566	0,0586	0,0277	0,0114	-0,0053	0,0298
2024T1	0,0163	0,0140	0,0200	0,0154	0,0019	0,0135
2024T2	0,0414	0,0256	0,0440	0,0525	0,0047	0,0337
2024T3	0,0556	0,0493	0,0632	0,0662	-0,0045	0,0460

Source : data processed, 2025

Based on Table 5, the ROA data for the animal feed sub-sector in Indonesia during the period from the first quarter of 2023 to the third quarter of 2024 is still considered low. This may be due to the fact that current year profits are small compared to the total assets owned by the company. This may also be attributed to the relatively high prices of raw materials around 2023. According to GPMT, production of agro-feed in 2024 is projected to grow by 5% from 2023, amounting to approximately 19 million tons. Some of the factors underlying this growth forecast include the fact that 2024 is a political year, with democratic

elections expected to boost the economy and numerous government programs being rolled out to the public, including animal protein products (agropustaka.id, 2024).This can be evidenced by the increasing ROA value in the third quarter of 2024.

Table 6 X-EFF analysis results data

Quadran	Company					
	CPIN	CPRO	JPFA	MAIN	SIPD	Average
2023T1	0,3555	0,3119	0,3448	0,0005	0,4473	0,2920
2023T2	0,7540	0,6473	0,7082	0,0010	0,8942	0,6009
2023T3	1,1503	0,9866	1,1072	0,0016	1,3978	0,9287
2023T4	1,5039	1,3166	1,5003	0,0022	1,8563	1,2359
2024T1	0,3655	0,3249	0,3894	0,0006	0,4209	0,3002
2024T2	0,7727	0,6453	0,7657	0,0012	0,8850	0,6140
2024T3	1,1583	0,9912	1,1617	0,0017	1,3238	0,9273

Source : data processed, 2025

In this study, the performance of an industry can also be seen from its internal efficiency value (X-EFF). The X-EFF value can be derived from the value-added ratio or, in this study, from the industry's revenue divided by its input value. According to (Sulastri & Suhono, 2016), the higher the X-eff, the more efficient the industry, and the more efficient it is, the better the company's performance. As shown in Table 6, the development of the X-EFF value of the livestock feed sub-sector industry in Indonesia during the period from the first quarter of 2023 to the third quarter of 2024, the X-EFF value fluctuated. In the first quarter of 2023, the average X-EFF value was 29.20%, indicating that the value produced was still in the low category. This is because the industry's ability to minimize the amount of input costs used in the production process is still low, meaning that the company is not yet managed effectively and efficiently. The X-EFF value continued to fluctuate up and down until the third quarter of 2024. The highest value was in the fourth quarter of 2023 with a value of more than 100%. According to (Siregar dkk., 2015), a high XEF value reflects the industry's ability to minimize the amount of input costs used in the production process, meaning that companies are managed very well.

Analysis of Factors Affecting The Animal Feed Subsector Industry

This study uses panel data regression to examine how market structure affects the performance of the animal feed subsector industry in Indonesia during the period from the first quarter of 2023 to the third quarter of 2024. The econometric model used is based on the SCP (Structure–Conduct–Performance) approach, with the dependent variable using Return on Assets (ROA) as a proxy for industry performance, while the independent variables use Market Share and CR4 as representations of market structure and X-EFF as a representation of industry performance to determine the extent of a company's efficiency in relation to ROA.

Model Selection Tests

In model selection, several tests need to be conducted. First, the Chow Test is used to determine the best model between the Common Effect Model and the Fixed Effect Model. Second, the Hausman Test is used to determine whether the best model remains the Fixed Effect Model or changes to the Random Effect Model. Third, the Lagrange Multiplier (LM) Test is used to determine whether the Common Effect Model or the Random Effect Model is the best model. The results of the Chow Test, Hausman Test, and LM Test are as follows:

Table 7 Results of Chow Test, Hausman Test, and LM Test

Uji	H0	H1	Prob.	Kesimpulan
Chow	CEM	FEM	0,0008	H0 Rejected
Hausman	REM	FEM	1,0000	H0 Accepted
Lagrange Multiplier	CEM	REM	0,0117	H0 Rejected

Source : data processed, 2025

Based on the results of the Chow test, a probability value of 0.0008 was obtained. Using a significance level or α of 0.05, it can be concluded that H0 is rejected because the probability value is < α (0.05). Therefore, through the Chow test, the selected model is the FEM (Fixed Effect Method) model. The selection of the panel data method using the Hausman test leads to the conclusion that with a probability value of 1.0000 > α (0.05), H0 is accepted. Therefore, based on the Hausman test, the selected model remains the CEM (Common Effect Model). Since the selected models differ in the Chow test and Hausman test, the LM test is conducted. Based on the results of the LM test, the probability value obtained is 0.00117. Using a significance level or α of 0.05, it can be concluded that H0 is rejected because the probability value is < α (0.05). Therefore, through the LM test, the selected model is the REM (Random Effect Method) model.

Statistical Test

Table 8 Model Specification Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.829706	0.798180	-3.545196	0.0013
MS	0.000478	0.000473	1.011272	0.3197
CR4	0.029482	0.008322	3.542553	0.0013
XEFF	0.020963	0.007475	2.804518	0.0086
Root MSE	0.016953	**R-squared**		0.402025
Mean dependent var	0.008125	**Adjusted R-squared**		0.344157
S.D. dependent var	0.022243	**S.E. of regression**		0.018014
Sum squared resid	0.010059	**F-statistic**		6.947219

Durbin-Watson stat	0.969317	**Prob(F-statistic)**	0.001040

Source : data processed, 2025

Based on the results of the Random Effect Model test, the regression formula can be written as follows:

ROA = -2.829706 + 0.000478MS + 0.029482CR4 + 0.020963XEFF

After obtaining the estimation results in Table 8, the tests that can be performed are statistical tests using the F-test, t-test, and coefficient of determination (R2).

Simultaneous Significance Test (F-test)

In Table 8, it can be seen that the F-calculated value is 6.947219 with a Prob(F-statistic) value of 0.001040. This Prob(F-statistic) value is greater than α = 5%. Based on the hypothesis testing criteria, if Prob(F-statistic) > α = 5%, this indicates that the simultaneous effect of the independent variables MS, CR4, and XEFF is significant on the ROA of the livestock feed sub-sector industry listed on the Indonesia Stock Exchange.

Partial Significance Test (t-test)

This test is conducted to determine the extent to which an independent variable individually influences the variation in the dependent variable. For the partial significance test (t-test), the probability value must be greater than α = 5%. Based on Table 8, it can be seen that:

1) The influence of Market Share (MS) on Return on Assets (ROA)

   Based on the results of the panel data regression estimation in Table 8, it is known that with a probability value of Market Share of 0.3197 and a coefficient value of 0.000478, the influence of Market Share (MS) on Return on Assets (ROA) shows a positive but insignificant relationship, meaning that for every 1% increase in Market Share, Return on Assets will increase by 0.000478%.

   This is inconsistent with the research conducted by (Pramono, 2022),which concluded that the MS variable has a significant positive effect on the ROA variable. That research focused on tobacco companies. This may be due to the fact that the animal feed industry in Indonesia tends to have an oligopolistic market structure, where a few large companies dominate the market. In this situation, an increase in Market Share does not always correlate directly with an increase in Return on Assets. Although large companies have high production capacity, they also face challenges in terms of high fixed costs and intense competition, which can reduce profit margins.

2) The effect of concentration (CR4) on Return on Assets (ROA)

   The results of panel data regression estimation in this study show that the CR4 probability value is 0.0013 with a coefficient value of 0. 029482, indicating that the effect of concentration (CR4) on Return on Assets (ROA) shows a significant positive relationship, meaning that for every 1% increase in concentration (CR4), Return on Assets will increase by 0.029482%.

   This aligns with the research conducted by (Saputri & Kusumawardhani, 2016), which concluded that there is a positive influence of market concentration on ROA. This study focuses on the financial performance of private national banks in Indonesia. This may occur because there are similarities between the livestock feed sub-sector and the national private commercial bank sector, namely an oligopolistic market structure dominated by a few large companies. High concentration also provides resilience against economic fluctuations. During an economic crisis, large companies in both sectors tend to be more resilient than smaller companies, thanks to stronger financial resources and distribution networks.

3) The impact of efficiency (X-EFF) on Return on Assets (ROA)

   Based on the results of the panel data regression estimation in this study, the probability value of X-EFF is 0.086 with a coefficient value of 0. 020963, indicating that the impact of efficiency (X-EFF) on Return on Assets (ROA) shows a significant positive relationship, meaning that for every 1% increase in efficiency, Return on Assets will increase by 0.020963%.

   This aligns with the research conducted by (Permana & Hariyanti, 2016) related to the Food & Beverage industry in Indonesia, which states that XEF has a significant positive effect on performance proxied by the Price Cost Margin (PCM) variable.

   Livestock feed companies with high operational efficiency tend to manage production costs more effectively. This enables them to reduce expenses and increase profit margins, which directly contributes to an increase in ROA. Conversely, if a company cannot leverage efficiency, ROA will decline, as seen in PT. Japfa Comfeed Indonesia Tbk during the 2020-2022 period, which showed a declining trend in the company's efficiency in managing production costs relative to sales revenue. The decline from 20% in 2020 to 18% in 2021, and then 16% in 2022, shows that the company faces challenges in controlling production costs or maintaining sufficiently high selling prices to maintain stable gross profit margins (Febriana & Wulandari, 2024).

Conclusion

Based on the results of the Structure-Conduct-Performance (SCP) analysis and panel data regression analysis of the animal feed sub-sector industry in Indonesia listed on the Indonesia Stock Exchange, it can be concluded that:

1) Market structure analysis indicates that the animal feed sub-sector industry in Indonesia listed on the Indonesia Stock Exchange falls under the oligopoly category, which includes dominant companies. Data such as MS, HHI, CR4, and MES indicate that four major companies, namely Charoen Pokphand Indonesia Tbk (CPIN), Japfa Comfeed Indonesia Tbk (JPFA), Malindo Feedmill Tbk (MAIN), and Central Proteina Prima Tbk (CPRO), dominate the market. The IHH value in the six quarters studied was always above 34%, reflecting that this industry is an oligopoly market dominated by a handful of large companies with significant market shares. From the first quarter of 2023 to the third quarter of 2024, the market structure of the animal feed sub-sector showed stable values with an average of 95.93%, where the value 90<CR4<100 indicates a market structure with dominant companies. The average MES value in the animal feed sub-sector industry in Indonesia from the first quarter of 2023 to the third quarter of 2024 was 44.45%. This indicates

that only companies with large-scale operations can operate efficiently in this industry. In other words, small companies will face difficulties in competing because they must achieve very high production volumes to reduce unit production costs.

2) In terms of behavior, large companies implement aggressive competitive strategies, such as setting pricing and product quality strategies to maintain and expand market share. The animal feed industry in Indonesia faces challenges in terms of securing key raw materials like corn. This makes domestic feed producers highly dependent on imported feed raw materials. Therefore, the pricing strategies set by domestic feed producers are not only based on the balance of supply and demand in the market but also on raw material prices and other input costs. In terms of product strategy, Charoen Pokphand Indonesia Tbk, as the company holding the highest market share in this industry, produces animal feed using the highest quality materials and through extensive research by its R&D department. As a result, the products from PT. Charoen Pokphand Indonesia Tbk offer superior quality and advantages compared to its competitors. To this day, PT. Charoen Pokphand remains both the market leader and the price leader. Charoen Pokphand Indonesia Tbk also has several main animal feed brands, including HI-Pro, HI-Pro-Vite, Bintang, Bonavite, Royal Feed, Turbo Feed, and Tiji.
3) In this study, internal efficiency (X-EFF) and return on assets (ROA) represent performance aspects. Based on the research findings, the ROA values of the animal feed sub-sector industry in Indonesia during the period from the first quarter of 2023 to the third quarter of 2024 are still considered low. This may occur because the current year's profit has a small value compared to the total assets owned by the company. During the period from the first quarter of 2023 to the third quarter of 2024, the X-EFF value fluctuated. In the first quarter of 2023, the average X-EFF value was 29.20%, indicating that the value generated was still in the low category. This is because the industry's ability to minimize the amount of input costs used for the production process is still low, meaning that the company is not yet managed well and efficiently.
4) By using panel data regression to determine the influence of MS, CR4, and Efficiency on ROA in the Animal Feed Sub-Sector Industry in Indonesia through Panel Data Analysis, it is known that simultaneously, the three independent variables have a significant effect on the dependent variable. Partially, the Market Share (MS) variable shows a positive but insignificant relationship with Return on Assets (ROA). Concentration (CR4) and internal efficiency (X-EFF) show a significant positive relationship with Return on Assets (ROA).

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