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APPLICATION OF THE STRUCTURE-CONDUCT-PERFORMANCE PARADIGM IN STUDYING THE VANNAMEI SHRIMP MARKET IN THE MEKONG DELTA, VIETNAM

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Abstract – *The study employed the Structure-Conduct-Performance paradigm to analyze the vannamei shrimp market in the Mekong Delta. Using descriptive statistics, the Gini coefficient, Lorenz curves and related methods, the research results show that the market concentration ratio was quite high and that the market had no monopoly tendency but tended to be competitive. For market performance, the gross profit of tier-1 agents was more stable than tier-2 agents. However, in order to enhance the development of the market, it is necessary to reduce the market concentration and move towards a perfectly competitive market.*

Keywords: Gini coefficient, market structure, SCP paradigm, vannamei shrimp.

I. INTRODUCTION

Vietnam's seafood exports reached a turnover of over 8.4 billion USD in 2020. Among the country's seafood exports, the shrimp sector was the main one, with a turnover of over 3.73 billion USD, which accounted for about 44%, and white vannamei shrimp accounted for 72.7% of Vietnam's total shrimp exports, reaching a turnover of 2.715 billion USD [1]. In recent years, shrimp farming in Vietnam has been thriving as it has become an important economic sector that is creating jobs, improving people's incomes, and increasing foreign currency revenue for the country through its export activities.

In order for the shrimp industry to develop and reach an export turnover of 10 billion USD by 2025, it is necessary to have adequate information on the market's structure and performance. Based on the Structure-Conduct-Performance (SCP) paradigm, the goal of this research is to study the vannamei shrimp market in the Mekong Delta by analyzing trader agents, or more specifically, shrimp trading agents. Based on this analysis, the research provides a broader perspective on the vannamei shrimp market in Vietnam so policy makers, traders and seafood enterprises can further develop the industry.

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II. LITERATURE REVIEW

A. Market

There has been a variety of understandings and definitions of 'market' offered by scholars and economists. According to Robert [2], market is a "place" that determines prices, or in other words, it is a collection of buyers and sellers, who, through their actual or potential interactions, determine the price of one or more products. Alternatively, Phi Manh Hong [3] argued that market is a set of conditions and agreements through which buyers and sellers conduct the exchange of goods.

B. SCP paradigm

The SCP paradigm was developed by Mason [4] and Bain [5], and employed in different fields like business management and strategic management [6]. The paradigm hypothesizes relationships between market structure, conduct and performance based on studies like Lipczynski et al. [7] who hypothesized that market structure affects market conduct and market performance, and conversely, the market conduct and market performance also influence market structure. In this article, the SCP paradigm is used as a framework for analyzing the vannamei shrimp market in the Mekong Delta, as illustrated in Figure 1.

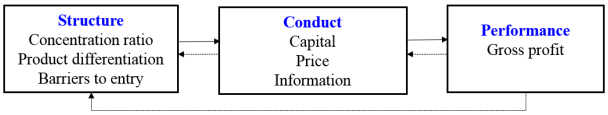

Fig. 1: The analytical framework SCP for the shrimp market in the Mekong Delta

Source: Suggested by the author

1) Market structure: Market structure is a concept that refers to the way of organizing the market. According to Lipczynski et al. [7], market structure refers to the number of sellers and buyers, barriers to entry, product differentiation, vertical entry, and product diversification. The market structure is normally measured by the concentration of sellers and buyers. The Gini coefficient and the Lorenz curve are used to measure the concentration in this study.

2) Market conduct: Market conduct refers to the behaviors of companies in conducting their business in the market. Lipczynski et al. [7] indicated some factors or conduct variables including business objectives, pricing policy, product design, branding, advertising and marketing, research and development, collusion, and merger. The market conduct factor analyzed in this study is the selling prices of raw shrimp.

3) Market performance: Market performance refers to such variables as profit, growth as measured in sales, assets or employment, profitability, quality of products and services, technological progress, and productive and allocative efficiency [7]. In this study, gross profit target (%GP) is used as the variable for representing market performance. Gross profit (GP) is the difference between net sales and cost of goods sold for a given period.

III. RESEARCH METHODOLOGY

Secondary data were collected mainly from reports of the Ministry of Agriculture and Rural Development, the Vietnam Association of Seafood Exporters and Producers (Vasep), and the two seafood processing enterprises (SFCs) which hold the largest shrimp export turnover in Vietnam, namely Minh Phu Seafood Joint Stock Incorporation and Minh Phu Hau Giang Seafood Joint Stock Company. Primary data were obtained from 30 agents purchasing raw shrimp according to supply chain relationships in the study area. Analytical methods used in this study are based on SCP analysis that uses descriptive statistics, the Gini coefficient, the Lorenz curve, market share, gross profit and deductive methods. The subjects surveyed and described in this study are intermediary agents performing the function of trade exchange, i.e. traders or agents referred to as intermediaries.

IV. RESULTS AND DISCUSSIONS

A. Basic features of intermediaries in the shrimp market

Intermediaries are important actors in connecting shrimp farmers with the market. The intermediaries surveyed in the study are 30 tier-1 agents, although some agents were also tier-2. The buying and selling of shrimp mainly occurs directly at farmers' ponds. During these meetings, the selling prices are agreed to between the agents and the farming households and cash is paid in full immediately after the shrimp are delivered and before the shrimp transport vehicle departs. Next, agents resell and ship the shrimp to the processing plants based on the quantity of shrimp reclassified and reweighted at the processing plants. According to the reports on purchasing raw shrimp from two enterprises in the top four largest seafood exporters in Vietnam in 2019 [3], the total amount of raw vannamei shrimp purchased by 30 agents working for these two enterprises was about 60,000 tons, accounting for about 14% of the total production of vannamei shrimp in the Mekong Delta in 2019, a total of 423,444 tons equivalent to 7,443,953 million VND.

B. An overview of vannamei shrimp production and export in recent years

The Mekong Delta has a system of rivers, canals, and coastlines with many favorable conditions for aquaculture development, especially shrimp farming. The production of black tiger shrimp and white-leg shrimp farmed in the Mekong Delta has a relatively good annual

growth rate, reaching 724,647 tons in 2019, accounting for over 97% of the amount produced in the whole country, of which white shrimp production reached 423,440 tons. The situation of white-leg shrimp production in the Mekong Delta from 2015 to 2019 is presented as in Table 1.

Table 1 shows that the production of vannamei shrimp farmed in the Mekong Delta has a very good annual growth rate from 247,213 tons in 2015, to 423,440 tons in 2019, showing an increase of 176,227 tons, equivalent to 71%. In 2019, the production of vannamei shrimp in the Mekong Delta increased by 25% compared to 2018. In 2018, it increased by 5% compared to 2017. In 2017, it increased by 18% compared to 2016, and in 2016 it increased by 11% compared to 2015. The production of vannamei shrimp represents a high proportion of total farmed shrimp production in the Mekong Delta. In 2015, vannamei shrimp production was 247,213 tons, accounting for 50% of the country's total farmed vannamei production. By 2019, farmed vannamei shrimp production reached 423,440 tons, accounting for an increase of 58%.

The shrimp industry occupies an increasingly important position as it contributes a large proportion to the total seafood exports in general. As shown in Table 2, in the period from 2015 to 2019, shrimp export earnings increased from 2,952 million USD to 3,363 million USD in 2019.

Table 2 shows that among Vietnam's exported shrimp products, vannamei shrimp had the highest export value. In 2019, the export earning of vannamei shrimp was 2,358 million USD, accounting for 70% of Vietnam's total shrimp exports of 3,363 million USD.

C. Market structure

Market structure is usually measured by the degree of market concentration, which can be seen as an indicator of competition among market actors. The Gini coefficient and the Lorenz curve are used to measure market concentration. There are many Gini calculation formulas that have been used. The following formula has been used by Huynh Van Tung and Luu Thanh Duc Hai [10] to research sugarcane products in the Mekong Delta, and it is the formula that has been commonly used in many other studies.

$$Gini = 1 - \sum_{i=1}^{n-1}[(P_{i+1} - P_i)(S_i + S_{i+1})]$$

Equation 1. Gini coefficient used to measure market concentration. In which Pi is the cumulative percentage of trader i out of the total number of traders included in the surveyed sample. Si is the cumulative percentage of the market share of the first product sold on the market out of the total number of products sold in the surveyed sample.

The Gini coefficient was developed by an Italian statistician Corrado Gini in 1912. It is used as a way to measure the concentration of the market. The value of the Gini coefficient ranges from 0 to 1. When Gini is 0, it implies a perfect market with perfect equality, and when Gini is close to 1, it implies a highly unequal or imperfect market where the degree of market concentration is high, thus market competition becomes less severe [11]. To determine the Gini coefficient in this study, each shrimp purchasing agent's revenue in 2019 is sorted from highest to lowest, while their respective market share is calculated by the percentage of each individual's sales on the total revenue. The results of the Gini coefficient in 2019 of the agents are presented in Table 3.

$Gini = [1 - (0.033 * 51, 2316)] = (0.7077) = 0.7077$

The results from Table 3 show that the Gini coefficient is 0.7077, which means that the concentration of the market is quite high, yet there is still competition among traders. As illustrated in Figure 2, the Lorenz curve is far from the diagonal and closer to the perpendicular. Currently in the Mekong Delta, there are thousands of intermediaries participating in the shrimp market, and the market neither focuses on a few intermediaries nor tends to be monopolistic but competitive.

D. Market conduct

The market conduct analyzed in this study is the price policy or buying and selling price.

Table 1: The production of vannamei shrimp in the Mekong Delta (tons)

Provinces	2015	2016	2017	2018	2019
- Ca Mau	52,780	50,347	64,922	71,280	94,988
- Bac Lieu	29,050	32,145	31,240	32,509	52,909
- Soc Trang	71,160	93,136	107,770	103,209	120,050
- Long An	15	12	36	18	16
- Tien Giang	16,036	16,850	21,398	17,200	17,300
- Ben Tre	43,000	47,700	52,960	57,000	61,000
- Tra Vinh	21,043	23,775	30,240	40,473	53,423
- Kien Giang	14,129	10,188	14,988	18,160	23,754
Total	**247,213**	**274,153**	**323,554**	**339,849**	**423,440**
Increase (%)		11	18	5	25
The whole country	**489,679**	**519,800**	**579,506**	**634,578**	**724,647**
%/ the whole country	50	53	56	54	58

Source: The ministry of Agriculture and Rural Development, 2020 [1]

Table 2: Vietnam shrimp export earnings in the period 2015-2019 (million USD)

Products	2015	2016	2017	2018	2019
- Vannamei shrimp	1,742	1,958	2,530	2,441	2,358
- Black tiger shrimp	963	931	879	817	687
- Sea shrimp	247	262	446	296	318
Total shrimp exports	2,952	3,151	3,855	3,554	3,363
% vannamei shrimp/ shrimp exports	59	62	66	69	70

Source: Reports on Vietnam shrimp sector 2015-2019 [2]

According to the current normal trading method, agents come to the ponds to have a look at the shrimp. After the agreement on the shrimp quality, shrimp size and price between the agents and households, the purchase will be conducted. Therefore, the price in the current trading process is set on the agreement between the farmers and the intermediaries, and is based on the many factors such as shrimp quality, epidemic situation (shrimp without antibiotics infection), competition in purchasing, shrimp transport distance, and the quantity of sold shrimp. Due to the market structure, as it does not tend to be monopolistic and is free of competition, the selling price is formed mainly by the agreement between the parties.

When studying the pricing policy that intermediaries received from SFCs, analysis concluded that besides the general issued price list, SFCs also have a separate subsidy level for each size of shrimp according to current market demand. The subsidy level is needed to attract required raw materials to meet production needs in a timely manner, and the subsidy announcement also changed regularly from day to day. In addition to the size-based subsidy, some SFCs also offered a time-based subsidy, which relates to the time of harvest in the pond until the shrimp are transported to the processing plant. This subsidy policy was to encourage agents to quickly conduct the harvest and transport raw shrimp to the processing plant, ensuring the best quality of raw materials and creating conditions for the factory to improve product quality to meet customer requirements. Shorter times between harvest, transportation and receipt at the processing plant resulted in higher time-based subsidies, which gradually decreased as the duration became longer.

E. Market performance

This study uses GP as a representative variable for market conduct. The GP of intermediaries is the difference between the selling price that

Table 3: The Gini coefficient of raw shrimp trading agents in 2019

No.	%	Accumulative (P_i)	Earnings (million VND)	Market share	Accumulative market share (S_i)	$S_i + S_{i+1}$	$(P_{i+1} - P_i) * (S_i + S_{i+1})$
1	0.03	0.03	1,665,305	0.22371	0.2237	0.5808	0.0194
2	0.03	0.07	992,767	0.13337	0.3571	0.8187	0.0273
3	0.03	0.10	778,411	0.10457	0.4616	1.0053	0.0335
4	0.03	0.13	610,268	0.08198	0.5436	1.1646	0.0388
5	0.03	0.17	575,535	0.07732	0.6209	1.2989	0.0433
6	0.03	0.20	424,209	0.05699	0.6779	1.4046	0.0468
7	0.03	0.23	363,009	0.04877	0.7267	1.4973	0.0499
8	0.03	0.27	327,111	0.04394	0.7706	1.5838	0.0528
9	0.03	0.30	316,165	0.04247	0.8131	1.6686	0.0556
10	0.03	0.33	315,741	0.04242	0.8555	1.7515	0.0584
11	0.03	0.37	301,143	0.04045	0.8960	1.8253	0.0608
12	0.03	0.40	248,150	0.03334	0.9293	1.8902	0.0630
13	0.03	0.43	234,591	0.03151	0.9608	1.9324	0.0644
14	0.03	0.47	79,920	0.01074	0.9716	1.9524	0.0651
15	0.03	0.50	69,155	0.00929	0.9809	1.9652	0.0655
16	0.03	0.53	25,721	0.00346	0.9843	1.9719	0.0657
17	0.03	0.57	24,512	0.00329	0.9876	1.9785	0.0659
18	0.03	0.60	24,412	0.00328	0.9909	1.9837	0.0661
19	0.03	0.63	14,509	0.00195	0.9928	1.9874	0.0662
20	0.03	0.67	12,856	0.00173	0.9946	1.9906	0.0664
21	0.03	0.70	10,811	0.00145	0.9960	1.9933	0.0664
22	0.03	0.73	9,454	0.00127	0.9973	1.9953	0.0665
23	0.03	0.77	5,266	0.00071	0.9980	1.9966	0.0666
24	0.03	0.80	4,897	0.00066	0.9987	1.9977	0.0666
25	0.03	0.83	3,225	0.00043	0.9991	1.9985	0.0666
26	0.03	0.87	2,481	0.00033	0.9994	1.9991	0.0666
27	0.03	0.90	1,820	0.00024	0.9997	1.9995	0.0667
28	0.03	0.93	1,433	0.00019	0.9999	1.9998	0.0667
29	0.03	0.97	766	0.00010	1.0000	2.0000	0.0667
30	0.03	1.00	307	0.00004	1.0000	1.0000	0.0333
		0.033	**7,443,953**	**1.00000**		**51.2316**	**1.708**

Source: Data collected and analyzed by the author, 2020

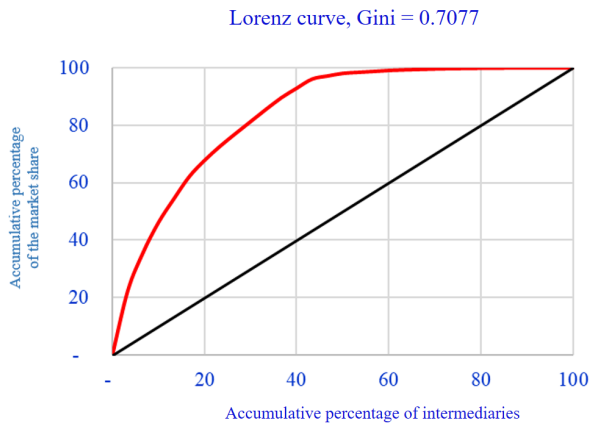

Fig. 2: Lorenz curve of the intermediaries in the shrimp market in the Mekong Delta

Source: The data collected and analyzed by the author, 2020

intermediaries obtained from reselling to the processing factory and the purchasing price paid to shrimp farmers. The interview results showed that normally tier-1 intermediaries had an average GP of about 500 VND/kg of shrimp based on number of shrimp determined by weighing at the processing plant. The more raw shrimp they transacted, the more GP they could get. Tier-2 intermediaries stated that the GP from buying and selling over one shrimp pond was normally between 3,000 VND and 7,000 VND/kg. After deducting the main costs from such expenses as renting nets for catching shrimp, fishing labor, ice and transportation, the remaining profit of tier-2 intermediaries was between 1,000 VND and 3,000 VND/kg. Tier-2 agents bought shrimp at the farmers' ponds at the size-based price, for example, by making an agreement with the pond owner on a price of 81,000 VND/kg for the size of 75 shrimps/kg. They would then transport the shrimp to the processing plant and sell them based on the number of shrimp reclassified and reweighed at the factory. For the tier-2 intermediaries, this form of transaction sometimes resulted in cases where they received high profits or cases where they decreased profit or even lost money.

In the first example case, intermediaries can accrue high profits after reclassification if shrimp were better quality, larger in size, or higher total weight. Table 4 illustrates an example of purchase and sales documents dated 28/8/2020 from an intermediary.

The results in Table 4 indicate that raw shrimp bought in buckets at the pond had the size of 75 shrimp/kg and the quantity of 650 kg when they were sealed and shipped for resale to SFC. At the SFC, the weight was reduced to 648 kg (loss of 2 kg). However, after SFC reclassified, the shrimp was considered to have better quality and increased in size. Among them, 324 kg achieved type-1 with size of 70 shrimps/kg and 324 kg achieved type-1 with size of 71 shrimps/kg. This reclassification helped the agent gain better profits because the price of larger shrimp is always higher than the price of smaller sized shrimp. This difference in price shows that the agent's GP was 4,835 thousand VND, which is roughly 9%. In addition, the agent also received an additional price subsidy of 11 thousand VND/kg of shrimp, and the total subsidy received by the agent was 7,129 thousand VND. Therefore, the agent's total GP in this observation was 11,964 thousand VND, or roughly 23%.

In the second example case, after reclassification, the reduction in quality, size or weight of shrimp can result in lower prices and profits for agents. In some cases, the quantity of shrimp is lower than that at the time of purchase, causing the intermediaries to reduce profits or even suffer losses. As an example, Table 5 shows a set of documents for purchasing raw shrimp dated June 20, 2020.

Table 5 shows that the initial quantity of shrimp purchased and sold in the pond was 2,350 kg, but when reaching the SFC, its weight was reduced to 2,266 kg with a loss of 84 kg. The initial size of shrimp determined at the pond was 75 shrimps/kg, but when its size was reconsidered at the SFC, there were 2,153 kg of vannamei shrimp at type-1 with size of 86 shrimps/kg and 113 kg of vannamei shrimp at type-2 with size of 86 shrimps/kg. Due to the assessed reduction in size, the quantity of type-2 shrimps increased so the intermediary suffered a loss of 11,276 thousand VND, which was roughly 6%. However, the agent also received a subsidy of 7 thousand VND/kg of shrimp, so the total subsidy received by the agent was 15,861 thousand VND, resulting in the agent's GP of 4,584 thousand VND, which was roughly 2

The study found that there are many factors affecting the profits of intermediaries, including the buying and selling price, the promptness of delivery, and the health or epidemic situation of the shrimp. Among these factors, prompt and timely delivery of shrimp is a significant factor because some processing factories also have a time-based subsidy policy as mentioned above.

V. CONCLUSION

Through the SCP paradigm, the research results showed that, for the market structure, the market concentration levels of intermediaries was quite high yet the market did not tend to be monopolistic but competitive. In terms of market conduct, the selling prices were formed mainly by

Table 4: The analysis of purchase and sale documents on August 28, 2020 (unit: 1,000 VND)

Data on shrimp at the ponds					**Data on shrimp purchased at SFC**				
No	Size	Amount (kg)	Unit price	Total	Kind of shrimp	Size	Amount (kg)	Unit price	Total
1	75	650	81	52,650	Vannamei type 1	70	324	89.0	28,840
					Vannamei type 1	71	324	88.4	28,645
Cộng		**650**	-	**52,650**	**Total**		**648**		**57,485**
								Accumulative GP	**4,835**
								GP (%)	**9**
					Subsidy	70	324	11	3,564
					Subsidy	71	324	11	3,564
					Total				**7.129**
								Total GP	**11,964**
								GP (%)	**23**

Source: The data collected and analyzed by the author, 2020

Table 5: The analysis of purchase and sale documents on June 20, 2020 (unit: 1,000 VND)

Data on shrimp at the ponds					**Data on shrimp purchased at SFC**				
No	Size	Amount (kg)	Unit price	Total	Kind of shrimp	Size	Amount (kg)	Unit price	Total
1	75	2,350	85	199,750	Vannamei type 1	86	2,153	83.6	179,950
					Vannamei type 2	86	113	75.2	8,524
Cộng		**2,350**		**199,750**	**Total**		**2,266**		**188,474**
								Accumulative GP	**(11,276)**
								GP (%)	**(6)**
					Subsidy	86	2,153	7.0	15,068
					Subsidy	86	113	7.0	793
					Total		**2,266**		**15,861**
								Total GP	**4,584**
								GP (%)	**2**

Source: The data collected and analyzed by the author, 2020

the agreements between shrimp farmers and intermediaries. For market performance, the gross profit of tier-1 agents was more stable than tier-2 agents and mainly depended on the shrimp quantity after re-weighing at the purchasing enterprise. Regarding tier-2 agents, the profit was uncertain, and there were often many opportunities for gaining high profits as well as many risks leading to profit reduction or sometimes losses. However, for the further development of the market, it is necessary to reduce the concentration of the market in order to increase the level of competition, approaching a perfectly competitive market.

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