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Assessing the Competitiveness of the Malaysia's Brackish Water Fish Industry using the Porter's Diamond Model Approach

By

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Abstract

Purpose: This paper investigates the determinants and constraints of competitiveness in Malaysia's brackish water fishery industry.

Design/Methodology: The self-administered questionnaires were distributed randomly to 20 brackish water fish farmers in Malaysia. The questionnaire was designed based on the previous studies focusing on Porter's diamond model theory for the determinant of competitive advantage to capture the constraints and determinants influencing competitiveness success. Using the Google Form, the questionnaires were distributed randomly to the brackish water fish farmers.

Findings: Based on the results, the demand conditions, factor conditions and firm's strategy, structure, and rivalry have a negative relationship to the competitiveness of the brackish water fish industry. The fish farmers need to consider the demand factors, such as consumers' preferences for brackish water fish, the impact on the consumer's income, and the need for investment due to changes in the country's consumption pattern and economic

condition. Besides that, the fish farmers should consider the impact of labour market changes in the current economic condition, the affordability of the cost in infrastructure and the capital requirement in the expansion and modernization of the fish farms. Thru this, they can expand their businesses by focusing on different varieties of brackish water fish, expand their business strategies to equate with the rival firms and implement new unique strategies to increase the consumer's demand for their output. Finally, they should develop strategies to collaborate with the supporting industries to develop their firm and improve their competitiveness in the global market.

Research Limitation: The study has a small sample size; therefore, it can be extended by increasing the number of respondents in the aquaculture sector.

Practical Implications: This research provided references to the policymakers to determine the appropriate policies to aid the difficulties faced by the aquaculture farmers in increasing their competitiveness in the global market and to aid the shortages in food security.

Keywords: Brackish Water Fish Industry, Porter's Diamond Model, Fish Farmers, Fishery Sector, Competitiveness

Introduction

The Department of Fishery Malaysia plays an essential role in developing a dynamic market-based fisheries industry through creative and innovative approaches (Azra et al., 2021). In 2019, 126,595 fishermen were working on licensed fishing vessels (Department of Fisheries Malaysia, 2020). The aquaculture sector in Malaysia shows growth in its production performance, with a significant increase of 5.19% in quantity compared to the year 2018. Meanwhile, the aquaculture industry contributes 22% to the total fishery production in the country, with 20,149 culturists actively involved in the production. Among all the types of products under the aquaculture sector, brackish water fish production contributes the most to fishery production, with RM 2,458 million in 2019 (Department of Fisheries Malaysia, 2020).

Brackish water production differs from freshwater production in terms of its water solution. Most species under marine fish categories can be primarily bred under brackish water ponds and cages (Thirunavukkarasu et al., 2015). This is duly due to the case that brackish water is saltier than freshwater. However, it is less salty than seawater as it is a solution mixture between seawater and freshwater (Muralidhar et al., 2017). Therefore, brackish water production contributes as a supplement to marine fish production to meet world food security.

Several methods of brackish water fish production have been adopted in the country. They are mainly the brackish water ponds, brackish water cages, brackish water tanks, and brackish water pen culture. Among all these methods, brackish water pond production is the most popular product in the country. Thirty-one types of fish are being produced under the brackish water culture, including seaweed, mussels, cockle, and oysters (Department of Fisheries Malaysia, 2020).

Even though many studies were conducted on general perspectives on the aquaculture industry in Malaysia, there was a lack of research conducted specifically in the brackish water fish industry. Therefore, this study is timely and vital to investigate the determinants and constraints of the competitiveness in Malaysia's brackish water fishery industry to support the total fishery production in the country.

Literature Review

Most of the research viewed aquaculture as a potential sector to increase the nation's economic development. The government should consider various initiatives to boost production growth among aquaculture farmers with more investment in collaboration with the public and private sectors during the pandemic (Asra et al., 2021). The new norm during the pandemic badly affects the aquaculture sector in various nations (Hossain, 2020). Besides that, before the pandemic, Malaysia was still under poor growth and instability in fish production and exportation, while Bangladesh and Vietnam are shown otherwise (Ravisankar et al., 2005). The competitiveness could be enhanced further if the aquaculture farmers appropriately responded to the demand characteristics by identifying the demand constraints earlier. Besides that, it was seen that the competitiveness position of the region seems to be sustainable as it has been more exporter-specific character and subjected to the economic policy decision in the nation (Silgoner et al., 2015). Besides that, the environmental management policy can create a potential market for the aquaculture industry to grow as it becomes the most reliable source (Chen and Qiu, 2014).

Therefore, to investigate the determinants and constraints of competitiveness in the aquaculture sector, numerous studies have adopted the Porter's Diamond model to analyze the industry's competitiveness in the market (Lindbergh and Graff, 2014; Esen and Uyar, 2012; Dlamini, 2012). Michael Porter developed the diamond model. This diamond model is commonly known to determine the competitive position of a nation in international competition. Porter developed a diamond-shaped diagram as the basic framework to illustrate the determinants of national advantage. He argued that the nation could create advanced factor endowments such as skilled labour, a robust technology and knowledge base, government support and culture. The whole diamond diagram affects the four factors that could lead to national comparative advantage. These factors included the availability of the resources, the information gained by the firms to determine the opportunities, and the companies' aim and pressure to innovate and invest. Due to these factors, he developed the shape of the diamond model based on four main factors: the factor conditions, demand conditions, firm strategy, structure, rivalry, and related and supporting industries (Vlados, 2019).

The figure below illustrates the Porter's Diamond model:

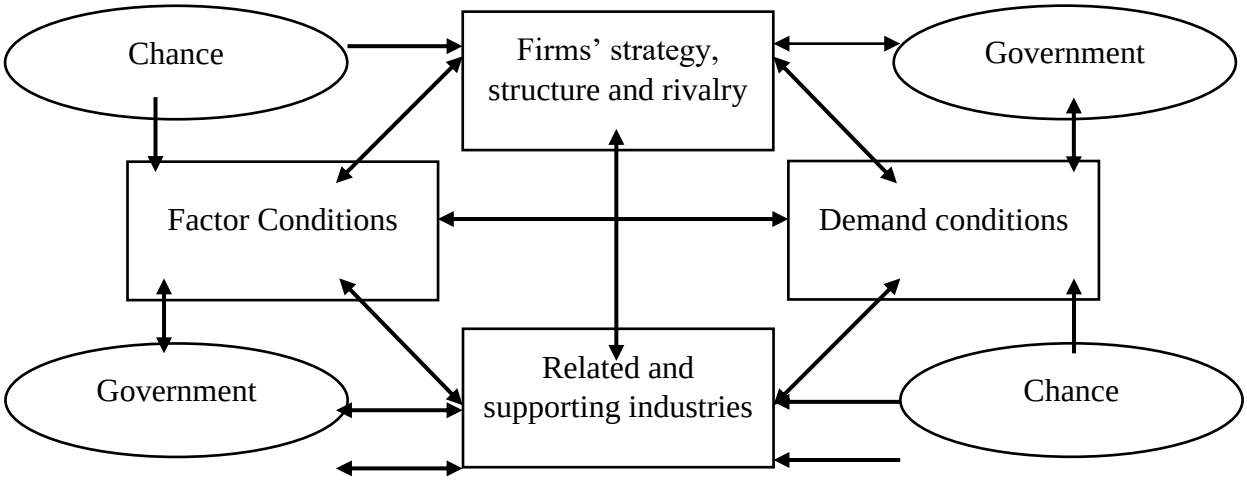

Figure 1: *Source: Porter (1998)*

Methodology

The data for the analysis were collected through self-administered questionnaires distributed randomly to the brackish water fish farmers. Porter's (1998) theory for the determinant of competitive advantage will be used to design the questionnaires to capture the constraints and determinants influencing competitiveness success. The questionnaire structure was adopted from the A.B.C. agribusiness competitiveness survey from South Africa. Besides that, a similar questionnaire was also adopted by Odhiambo (2010) to determine Kenya's sugar industry's competitiveness based on Porter's diamond model framework. The questionnaire was modified slightly to meet the objective of this study. There were two sections in the questionnaire—the first section mainly on the general background of the firm and the brackish water fish farmer. The following section of the questionnaire was focused on the four determinants of Porter's diamond model to evaluate the industry's competitiveness in the global market. Due to the pandemic travelling constraints, the questionnaires were distributed randomly to the brackish water fish farmers using the Google Form.

Results

Table 1 represents the Factor Loading, Cronbach's Alpha, Composite Reliability and Average Variance Extracted from the measurement model results. The rule for the factor loadings should be 0.70 or higher. Therefore, four items fell below the threshold based on the rule for factor loadings and Table 1. The items were DC6, DC7, RS10 and FSR11. To increase the composite reliability and AVE, these items were re-evaluated and deleted from the scale (see Figure 2 and Table 1). The Cronbach alpha ranged from 0.636 to 0.865. The Composite Reliability (CR) is ranged from 0.791 to 0.894. Besides the value for related and supporting industries, all the values above the threshold value of 0.70. It is found to be dependable for all the measurement constructs. Therefore, the AVE values were applied to examine the constructs` convergent validity further. Based on Table 1, the AVE values ranged from 0.567 to 0.599.

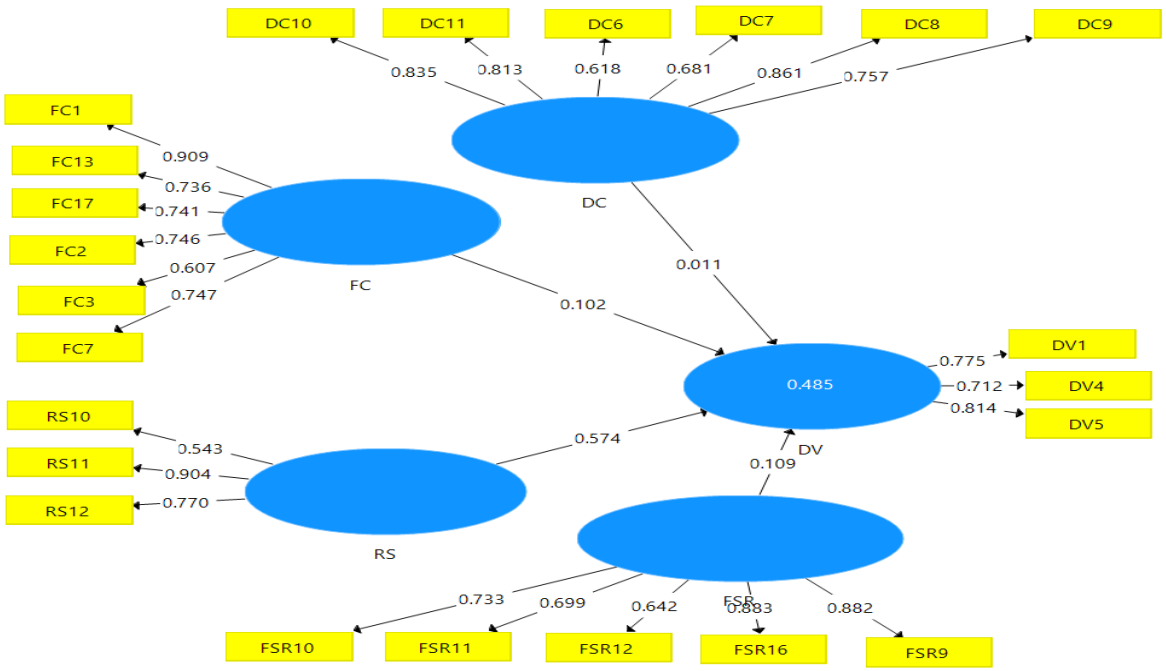

Figure 2: *Measurement and Structural Model*

Table 1: *Result of Measurement Model*

Construct Category	Research construct	Factor Loading	Cronbach's Alpha	Composite Reliability	AVE Value
Competitiveness of the Brackish water Fish Industry	DV1	0.775	0.654	0.812	0.590
	DV4	0.712			
	DV5	0.814			
Demand Condition	DC6	0.618	0.865	0.894	0.587
	DC7	0.681			
	DC8	0.861			
	DC9	0.757			
	DC10	0.835			
	DC11	0.813			
Factor Condition	FC1	0.909	0.852	0.886	0.567
	FC2	0.746			
	FC3	0.647			
	FC7	0.747			
	FC13	0.736			
	FC17	0.747			
Related and Supporting Industries	RS10	0.543	0.636	0.791	0.568
	RS11	0.904			
	RS12	0.770			
Firm's Strategy, Structure and Rivalry	FSR9	0.882	0.846	0.880	0.599
	FSR10	0.733			
	FSR11	0.699			
	FSR12	0.642			
	FSR16	0.883			

Table 2: *R Square*

	R Square	R Square Adjusted
DV	0.485	0.403

The Fornell-Larcker criteria were adopted to assess the discriminant validity. This necessitated using inter-construct correlation to compare the square-rooted values of AVE. Therefore, based on Table 3, all the square-rooted values of AVE were higher than the equivalent inter-construct correlations. This shows that it is helpful since all the constructs have enough discriminant (see Table 3).

Table 3: *Discriminant Validity-Fornell-Larcker Criterion*

	DC	DV	FC	FSR	RS
DC	**0.766**				
DV	0.393	**0.768**			
FC	0.855	0.509	**0.753**		
FSR	0.439	0.376	0.607	**0.774**	
RS	0.430	0.676	0.577	0.349	**0.754**

The statistically significant path coefficients or the evaluation of the level of impact are done using the Smart PLS bootstrapping analysis. The results show that H1, H2 and H3 were

rejected since their t-values were lesser than 1.96 and p-values were more than 0.10, outside the acceptance level. However, only H4 was accepted since the t-value was 2.567 and the p-value was 0.010.

Table 4: *Result of Structural Equation Model Analysis*

Hypothesis	Relationship	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	Result
H1	Demand Conditions -> competitiveness of the Brackish water Fish Industry	0.011	0.036	0.972	Rejected
H2	Factor Conditions -> competitiveness of the Brackish water Fish Industry	0.102	0.341	0.733	Rejected
H3	Firm's Strategy, Structure and Rivalry -> Competitiveness of the Brackish water Fish Industry	0.109	0.586	0.558	Rejected
H4	Related and Supporting Industries -> Competitiveness of the Brackish water Fish Industry	0.574	2.567	0.010	Accepted

Note: *T Statistic > 1.96 for 10%; p<0.05*

Discussions

H1) Demand conditions have a significant relationship with the competitiveness of the brackish water fish industry

The demand condition was the first independent variable investigated in this research. The questions related to demand conditions were aimed to evaluate the extent of the demand condition in contributing to the competitiveness of the brackish water fish industry in Malaysia. Based on the previous research, it was concluded that Porter's diamond model demand condition positively impacts the firm's competitiveness level (Tsai et al., 2021; Butt et al., 2019; Fang et al., 2018). However, the results show that the demand condition has a negative relationship with the competitiveness of the brackish water fish industry. Therefore, the fish farmers must consider the demand factors such as consumers' preferences for brackish water fish, the impact on the consumer's income, and the need for investment due to changes in the country's consumption pattern and economic condition.

H2) Factor conditions have a significant relationship with the competitiveness of the brackish water fish industry

The factor condition was the second independent variable adapted based on Porter's diamond model. The question related to factor conditions aimed to examine how factors such as labour and capital contribute to competitiveness in the brackish water fish industry. The previous study concluded that Porter's diamond model factor condition significantly impacts the firm's competitiveness depending on the different industries (Tsai et al., 2021; Fang et al., 2018). However, the results show that the factor condition has a negative relationship with the competitiveness of the brackish water fish industry. Therefore, the fish farmers need to consider the impact of labour market changes in the current economic condition, the affordability of the cost in infrastructure and the capital requirement for the expansion and modernization of the fish farms.

H3) firm's strategy, structure and rivalry have a significant relationship with the competitiveness of the brackish water fish industry

The firm's strategy, structure, and rivalry is the third independent variable adapted from the Porter's diamond model. The questions related to the firm's strategy, structure, and rivalry were mainly focused on the effectiveness of the organizational structure, business development strategies and research and development's contribution to the competitiveness in the brackish water fish industry. Most of the previous literature concluded that a firm's strategy, structure and rivalry have a constructive impact on an industry's competitiveness (Zhao et al., 2019; Vlados, 2019; Mboya and Kazungu, 2015). However, the results from this study show that a firm's strategy, structure and rivalry have a negative relationship with the competitiveness of the brackish water fish industry. Therefore, the fish farmers must focus on different varieties of brackish water fish, expand their business strategies to equate with the rival firms and implement new unique strategies to increase the consumer's demand for their output.

H4) Related and supporting industries have a significant relationship with the competitiveness of the brackish water fish industry

The last independent variable is Porter's diamond model's related and supporting industries. The questions related to this factor mainly focus on the effectiveness of financial institutions, logistics agencies and research and development support. Based on the previous literature, related and supporting industries plays a significant role in contributing to the competitiveness of different industries (Mboya and Kazungu, 2015; Hove and Masocha, 2014). This supports the results gained in this study, whereby related and supporting industries positively impact the competitiveness of the brackish water fish industry. Therefore, brackish water fish farmers should develop strategies to collaborate with the supporting industries to develop their firms and improve their competitiveness in the global market.

Conclusion And Recommendations

The main objective of this study is to evaluate the competitiveness of the brackish water fish industry in Malaysia. Four leading independent variables were adapted based on Porter's diamond model: the factor condition, demand condition, firm's strategy, structure, rival and related and supporting industries. The results indicate a negative relationship between demand conditions, factor conditions and the firm's strategy, structure, and rivalry toward the competitiveness of the brackish water fish industry. Therefore, it is suggested to improve the questions related to these variables or replace the variables with the other prospective variables relevant to evaluate the competitiveness of the specific industry to improve the analysis results.

Brackish water fish farmers need to re-evaluate the impact of the surrounding factors that influences their competitiveness in the fish industry. It is also crucial for the government to provide financial assistance to this industry since there is a worthwhile contribution from improving the competitiveness in the brackish water fish industry to the country's economic growth. Besides, this research provided references to the policymakers to determine the appropriate policies to aid the difficulties faced by the aquaculture farmers in increasing their competitiveness in the global market and to aid the shortages in food security.

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