

# องค์ประกอบเชิงยืนยันของสภาพแวดล้อมการแข่งขันในอุตสาหกรรม ผักและผลไม้กระป๋องของไทย

## A Confirmatory Factor Analysis of Competitive Environment of Thai Canned Fruit and Vegetable Industry

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### บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อวิเคราะห์องค์ประกอบเชิงยืนยันของสภาพแวดล้อมการแข่งขันในอุตสาหกรรมผักและผลไม้กระป๋องของไทย กลุ่มตัวอย่างได้แก่ ผู้ประกอบการธุรกิจผักและผลไม้กระป๋องของไทยจำนวน 500 คน โดยใช้วิธีการสุ่มแบบอาศัยความน่าจะเป็น โดยใช้แบบสอบถามที่ผ่านการทดสอบความเที่ยงและความเชื่อถือได้เป็นเครื่องมือในการเก็บรวบรวมข้อมูล การวิเคราะห์ข้อมูลใช้สถิติเชิงพรรณนาและการวิเคราะห์องค์ประกอบเชิงยืนยันด้วยการวิเคราะห์สมการโครงสร้าง ผลการศึกษาพบว่า องค์ประกอบสภาพแวดล้อมการแข่งขันของอุตสาหกรรมผักและผลไม้กระป๋องของไทยประกอบด้วย 1) คู่แข่งขันเดิมในอุตสาหกรรม 2) การผู้แข่งขันรายใหม่ 3) อำนาจของผู้ซื้อ 4) อำนาจของผู้ขาย และ 5) สินค้าทดแทน ผลการวิเคราะห์องค์ประกอบเชิงยืนยันพบว่ามีค่าความสอดคล้องของโมเดลกับข้อมูลเชิงประจักษ์ซึ่งผ่านตามเกณฑ์ที่กำหนด คือ P-value of 0.059, CMIN/DF of 1.139, GFI of 0.954, and RMSEA of 0.017 ดังนั้น จึงยืนยันแนวคิดการวิเคราะห์สภาพแวดล้อมอุตสาหกรรมของไมเคิล อี พอร์เตอร์ สามารถประยุกต์ใช้กับสภาพแวดล้อมอุตสาหกรรมผักและผลไม้กระป๋องของไทย และองค์ความรู้ใหม่ที่ได้ คือ ตัวชี้วัดสำหรับการวิเคราะห์สภาพแวดล้อมอุตสาหกรรมผักและผลไม้กระป๋อง จำนวน 25 ตัวชี้วัด เพื่อนำไปประยุกต์ใช้ประเมินอุตสาหกรรมในอนาคต

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# A Confirmatory Factor Analysis of Competitive Environment of Thai Canned Fruit and Vegetable Industry

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## Abstract

The purpose of this study is to conduct a confirmatory factor analysis of the competitive environment of the Thai canned fruit and vegetable industry. The target population is 500 entrepreneurs who are the fruit and vegetable industries in Thailand. A questionnaire derived from the content analysis served as the data collection instrument. The descriptive statistics and statistical analyses included percentage, mean, and standard deviation. The AMOS program was used to assess analytical statistics via confirmatory factor analysis.

Findings, the competitive environment of the canned fruit and vegetable industry consists of five components: first, the rivalry among existing competitors; second, the threat of new entrants; third, the bargaining power of buyers; fourth, the bargaining power of suppliers; and fifth, the threat of substitute products. P-value of 0.059, CMIN/DF of 1.139, GFI of 0.954, and RMSEA of 0.017. Therefore, the model is consistent with the empirical data it can be concluded that Michael E. Porter's industrial environment analysis concept can be applied to Thai canned fruit and vegetable industry. The new knowledge gained is the set of indicators for analyzing the environment of the canned fruit and vegetable industry, amounting to 25 indicators to be applied to assess the industry in the future.

**Keywords:** Confirmatory factor analysis, Competitive Environment, Five forces model, Canned fruit and vegetable industry

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## Introduction

Thailand has an abundance of natural resources and a year-round production season. Thailand is one of the largest exporters of canned tuna and cassava, including the canned of pineapple, rice, and the most important in the world. Thailand's food processing industry uses more than 80% domestic raw materials, which reduces production costs for entrepreneurs and enables Thai food manufacturing and processing companies to develop and remain competitive on the global market (Eastern Economic Corridor, 2022). In addition, the food processing industry is essential for adding value to agricultural products. As a result of the process of transforming agricultural products into consumer-desired sustenance, the manufacturer is able to produce items that utilize agricultural raw materials. The vegetable and wood processing industry of Thailand is one of the 12 sub-sectors that make up the country's food industry and utilizes agricultural sector vegetable and fruit products as production inputs. This industry, which has a long history in Thailand, employs a variety of technologies to produce products that are easy to consume or to use in the next stage. This is due to the fact that Thailand is a major producer of tropical fruits, and supplies circulate throughout the year. It has the most businesses and the largest labor force in its industry. It is the most important export industry in Thailand's culinary industry, which has been categorized as a high-potential industry due to its competitiveness and popularity (Office of Industrial Economics, 2016).

To effectively study and develop competitive strategies for gaining a competitive advantage, it is imperative to thoroughly examine the environmental factors associated with corporate operations. Through a comprehensive analysis of the various elements and situations that contribute to competition inside each organization, they can get insights into the origins of competitive aggression and the ways in which these conditions impact such behavior (Carney et al., 2017). Without this analysis, executives cannot formulate a successful strategy for their organization. Michael E. Porter identified five structural factors that influence an industry's attractiveness and demonstrated how positioning a company in an attractive industry can result in long-term success (Porter, 1980). It has evolved into a highly useful concept for analyzing the competitive landscape of a sector and is also known as the "Five-Forces Model" (Mugo, 2020), which describes the importance of each factor. As a result, it is the basis of the investigation.

Moreover, it addresses the knowledge deficit inside the strategic planning framework and presents significant consequences for managers, which may enhance their strategic decision-making by the procedure of confirmatory factor analysis, and academic benefits will acquire new information regarding competitive environment assessment indicators. Given its significance and potential benefits, the researcher is interested in conducting this study.

## Objective

To confirmatory factor analysis of the competitive environment of Thai canned fruit and vegetable industry.

## Literature Review

Every organization that runs a business must contend with "competition." Naturally, there will always be losers and winners in competitions, and no one likes to be in a defeated position. There are other factors at play in business failure besides rivalry (Ariffin & Sahid,

2017). However, a variety of circumstances play a role in whether the company will survive (Rahman, 2019). There must be measurable rules in place to lessen corporate disadvantage. A variety of theoretical frameworks can be applied to examine market viability and apply that data to future company planning. The "Five Forces Model" (Porter, 1998), Learn how profitable the sector is and how crucial it is, as stated by Novikov (2018), to develop a strategy to have the strongest competitive advantage. The most well-known and significant model is the Five Forces Model, which served as the foundation for this study.

According to Michael E. Porter's theory known as the "Five Forces Model," (Porter, 1980; 1998) there are five factors that will affect each industry's level of competitiveness. This will help businesses know their competitive position. Therefore, businesses should have an understanding of the five factors in the industry in order to formulate appropriate business strategies, as follows (Thompson, Peteraf, Gamble, & Strickland, 2018):

1) Rivalry among existing firms: The number of competitors in an industry that are large or equally capable has resulted in intense competition, customer scrambles, and price wars. In some cases, even a small number of competitors but the presence of competitors with superior management capabilities simultaneously affects the competitive landscape. (Huang, 2019).

2) Threat of new entrants: The industry's market share has become increasingly fragmented as a result of the entry of new competitors. This phenomenon leads to a reduction in profits for enterprises already operating within the aforementioned industry. Put simply, when the barrier to entry into a market is low, the potential risk posed by new rivals becomes more pronounced (Dias, Espadinha-Cruz, & Matos, 2023).

3) Bargaining power of buyers: The customer's ability to negotiate with the vendor is contingent upon placing a bulk order or having a significant clientele. In the event that the seller fails to acknowledge or adhere to the customer's request, customers may opt to transition their purchasing activities to an alternative provider (Com, 2015). Similarly, in the event that the seller consents to a decrease in price, it will result in a reduction of the seller's income. The greater the level of client interest a business possesses, the stronger the negotiating power of said customers.

4) Bargaining power of supplier: The presence of suppliers is crucial for the continuity of business operations. However, in the event that the suppliers with which the business engages possess a significant degree of bargaining power, the business may encounter challenges in negotiating rates, hence resulting in escalated manufacturing costs. Consequently, the trade yields a diminished profit. In many industries, where there exists a limited number of suppliers and a substantial number of customers, the pricing of raw materials tends to be elevated. Moreover, the providers form a collective and establish a median price.

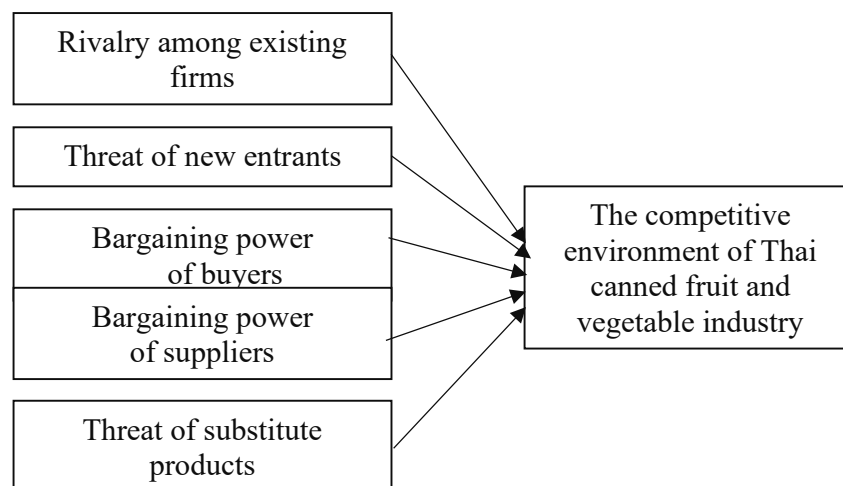
This situation presents challenges in terms of negotiating, potentially leading to a complete absence of negotiation. Additionally, a significant concern arises from the potential for suppliers to transition into future competitors within the corporate landscape (Jitprapai, Techakana, & Wattanakomol, 2022).

5. Threat of substitute products: The concept of substitute pressure pertains to the existence of alternative products that possess similar features or advantages (Peng, 2021) and can be utilized in a comparable manner to the offerings of a particular organization. Consequently, consumers are presented with a greater array of options. The potential impact on sales and earnings of enterprises in a given industry is particularly significant when a substitute product is available at a lower price.

In brief, Porter's Five Forces are five factors that influence the difficulty of business competition, including intra-industry competition. New competitor threats, consumer bargaining power, supplier bargaining power, and substitute product threats.

### Conceptual Framework

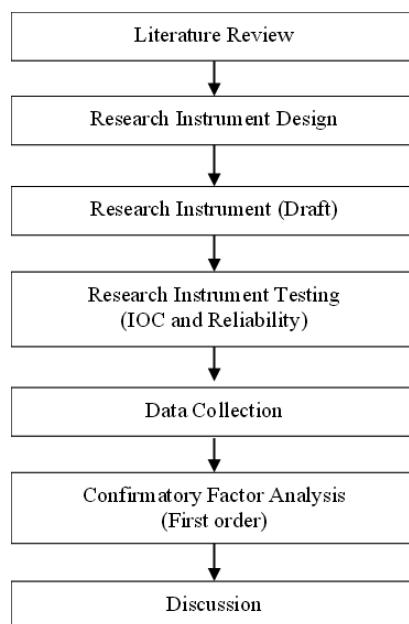
Figure 1 illustrates the variables to be investigated in this study, with the competitive environment of the Thai canned fruit and vegetable industry. The dependent variable is the competitive environment of Thai canned fruit and vegetable industry. The independent variables are 1) Rivalry among competitors 2) Threat of new entrants 3) Threat of new suppliers 4) Bargaining power of suppliers and 5) Threat of substitute products/services.



**Figure 1.** Conceptual Framework

### Research Methodology

This is quantitative research employing the technique of confirmatory factor analysis (CFA) to evaluate the competitive environment of Thai canned fruit and vegetable industry. The model of the competitive environment was devised in accordance with empirical data. The research strategy is illustrated in Figure 2.



**Figure 2.** Research Plan

### Population and Sample

The subjects are the 1,520 organizations of the Thai exporter of canned fruit (Thaitrade, 2022). The sample size was determined based on the structural equation model analysis criteria, which indicated that 500 samples would yield a highly reliable estimation (Comrey & Lee, 2013). The respondents were: chief executive officer or executive involved in the management of the organization's competition.

### Data collection

The data were acquired using a probability-based randomization technique that sent a questionnaire by mail to a company that exports canned fruit and vegetables by assigning the respondents to be export-related executives or personnel from 1,250 organizations. After receiving fifty percent of the questionnaires (625 samples), the researcher examined the questionnaires for accuracy and completeness. A total of 500 samples were used to complete the questionnaire. The distribution of questionnaires occurred between May – June, 2022.

### The research instrument design

1) To generate queries, analyze the interview with the PM Award-winning exporters who were the key informants. This is founded on Michael E. Porter's competitive environment concept.

2) Conduct quality tests on a draft research instrument. Using the index of item objective congruence (IOC) method (Turner and Carlson, 2003), which was evaluated by five academics, we analyzed the congruence of the questions with the research objectives. Results ranged from 0.60 to 0.80.

3) The researcher utilized the revised draught questionnaire based on expert recommendation and research advisor approval. Let's test on a population that is comparable to this research's population. However, they are not the same population as the trial's accepted sample size of 30 subjects.

4) The results of the experiment (try-out) were analyzed by using the scores obtained from the questionnaire to find the discriminant power. In the question section, a checklist item is checked by the standard deviation, and a rating scale questionnaire is tested by a corrected item-total correlation. For reliability testing in the questionnaire that looks like a scale estimate with the determination of Cronbach's alpha from a statistical program, the power analysis classified as a correlation item is between 0.38 and 0.83. The alpha coefficient is 0.986 (Cronbach, 1990).

5) Modify the questionnaire so that it meets the criteria set before it is used to collect the actual data.

### Data analysis

The measurement of the competitive environment is based on the Five Forces Model concept. It is divided into five elements: 1) Rivalry among competitors 2) Threat of new entrants 3) Threat of new suppliers 4) Bargaining power of suppliers and 5) Threat of substitute products/services which each element consisted of 20 questions, for a total of 100. It used 5 rating scales according to the Likert scale (5 levels), and the confirmatory factor analysis of the maximum likelihood method in AMOS was employed to test the measurement model with four criteria according to the evaluation of data-model fit in Arbuckle (2016), which are: 1) chi-square probability level greater than 0.05; 2) relative chi-square less than 2; 3) goodness of fit index greater than 0.90; and 4) root mean square error of approximation less than 0.08.

## Data Analysis and Result

### 1) The business profiles

**Table 1.** Summary of respondent's characteristic of business (N=500)

Variable	Number	Percentage
<i>Size of business</i>		
Large ( $\geq 200$ employees)	103	20.60
Small and Medium ( $<200$ employees)	397	79.40
<i>Type of Product</i>		
Vegetables canned	141	28.20
Fruit processed	135	27.00
Juice	203	40.60
Processed	21	4.20
<i>Export continent</i>		
United State of America	144	28.80
Asia	208	41.60
Europe	122	24.40
Australia	26	5.20
<i>Shareholder proportion ratio</i>		
Thai 100%	442	88.40
Joint venture	58	11.60

### Models tested by Confirmatory factor Analysis

The model has the goodness-of-fit with the empirical data which the value of P-value = .059, CMIN/DF = 1.139, GFI = 0.954, RMSEA = 0.017. (Table 2. And Figure 3.)

**Table 2.** The result of modification good-fit Index (Arbuckle, 2016)

Evaluating the Data-Model Fit	Criteria	Adjusted model	Results	Reference
1. CMIN-p	$> 0.05$	0.056	Passed	Arbuckle (2016)
2. CMIN/DF	$< 2$	1.124	Passed	Arbuckle (2016)
3. GFI	$> 0.90$	0.947	Passed	Arbuckle (2016)
4. RMSEA	$< 0.08$	0.016	Passed	Arbuckle (2016)

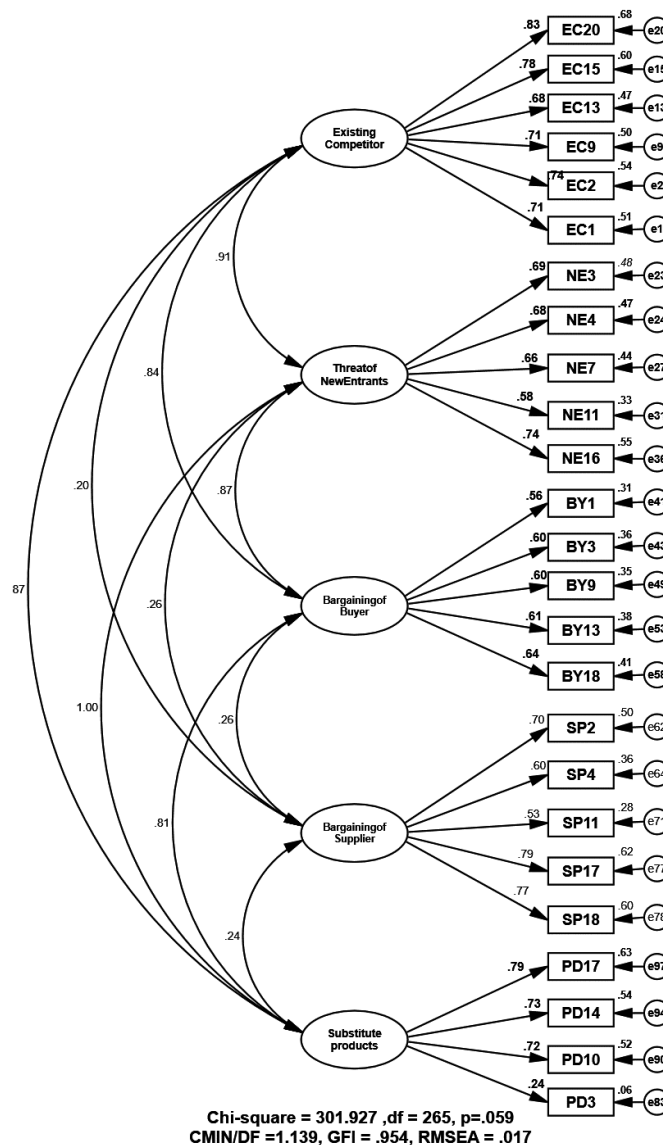


Figure 3. First-order measurement model for the competitive environment

Table 3. The results of the Confirmatory Factor Analysis of the competitive environment model of the canned fruit and vegetable industry after adjusting model

Observed Variable	Mean	Factor loading	S.E.	P
<i>1. Rivalry Among Existing Firms</i> (Cronbach's alpha = 0.879)				
EC1. There are the key operators who have a high potential in research and product development, production, and distribution.	4.72	0.71	1	
EC2. The factory must have a product standard such as GMP, ISO, HALAL, BRC, HACCP, IFS, GAP, ECOCERT.	4.67	0.74	0.07	0.000*



Observed Variable	Mean	Factor loading	S.E.	P
EC9. Major operators' brands are well-known and have been for a long time	4.67	0.71	0.07	0.000*
EC13. Use the large investment to build a mass production plant.	4.63	0.68	0.08	0.000*
EC15. Implement a strategy to create healthy products through sustainable and environmentally friendly production processes.	4.71	0.78	0.07	0.000*
EC20. Ability to purchase raw materials through brokers and Smart Farmer.	4.65	0.83	0.08	0.000*
<b>2. Threat of New Entrants</b> (Cronbach's alpha = 0.802)				
NE3. An increase in the number of foreign investors entering the market.	4.61	0.69	1	
NE4. requires advanced technology to produce and process products.	4.60	0.68	0.07	0.000*
NE7. The number of entrepreneurs who produce and build brands for distribution increases.	4.65	0.66	0.06	0.000*
NE11. Expansion of the product line of seasoning product operators to include canned vegetables and fruits.	4.65	0.58	0.06	0.000*
NE16. It takes a long time to build a brand that is known to be recognized by sales representatives and consumers.	4.68	0.74	0.06	0.000*
<b>3. Bargaining power of Buyers</b> (Cronbach's alpha = 0.737)				
BY1. Distributors have the right to choose products from Thai exporters to sell abroad.	4.77	0.56	1	
BY3. Capability to conduct domestic and international marketing activities	4.68	0.60	0.12	0.000*
BY9. Distributors must have funds and liquidity to settle their debts.	4.70	0.60	0.11	0.000*
BY13: Mutual trust	4.73	0.61	0.11	0.000*
BY18. Distributors must have good connections with retailers and wholesalers.	4.67	0.64	0.14	0.000*
<b>4. Bargaining power of Suppliers</b> (Cronbach's alpha = 0.815)				
SP2. The ability of an agriculturist to control product quality.	4.05	0.70	1	
SP4. Use of harmful chemicals in fruit and vegetable cultivation.	4.12	0.60	0.07	0.000*
SP11. Raising the price of packing cans.	4.09	0.53	0.07	0.000*
SP17. The number of containers for shipping by ship is limited.	4.03	0.73	0.09	0.000*
SP18. Raw materials for processing vegetables and canned fruit are becoming more expensive.	4.02	0.77	0.08	0.000*
<b>5. Threat of substitute products/services</b> (Cronbach's alpha = 0.706)				

Observed Variable	Mean	Factor loading	S.E.	P
PD3. Fresh local vegetables and fruits, both domestically and internationally	4.56	0.24	1	
PD17. Importing more fresh vegetables and fruits from other countries.	4.52	0.79	0.69	0.000*
PD14. The number of new frozen ready meals is increasing	4.53	0.73	0.65	0.000*
PD10. Dietary supplements made from fruits and vegetables.	4.61	0.72	0.53	0.000*

\*Significant at 0.001

## Conclusion and Discussion

1. Existing Competitor: The variable, Ability to purchase raw materials through brokers and Smart Farmer is the highest of factor loading = 0.83. A broker who has the ability to obtain raw materials (Goffin, Szwajczewski, & New, 1997) and buy raw materials from agriculture with the necessary agricultural knowledge can help you buy excellent raw materials (vegetables and fruits) from the orchard because raw commodities like fruits and vegetables can only be grown in certain seasons. The production facility's ability to meet market demand for raw materials will have an adverse impact on how quickly distributors and customers can receive the products. Because of this, producers must make their purchases through a broker who can find enough raw materials for production all year long (Mwikali & Kavale, 2012). Operators must therefore employ a competitive strategy when dealing with rivals. By working with a broker, the factory may always receive raw materials. This result consists with Mitreva, Taskov, Krivokapić, and Jovanovic (2018) indicate the fact that many of the companies in Macedonia build formal relationship with suppliers that do not deliver the desired results.

2. Threat of New Entrants: The variable, It takes a long time to build a brand that is known to be recognized by sales representatives and consumers is the highest of factor loading = 0.74. The credibility that can make a difference in doing your business to beat the competition. Trusting people, organizations and brands takes time and it's the first and foremost factor in building credibility no matter what (Kim & Chao, 2019; Kim, Kim, & Lee, 2019). Especially when partners and customers expect that what the organization advertises or communicates is true as the organization says. Which has become something that organizations should not do it for fun because it is honest with customers. that must be communicated in the most direct and transparent manner (Tümer, Aghaei, Öney, & Eddine, 2019). Therefore, those who wish to compete in the industry must build reputation and credibility with stakeholders until they are accepted.

3. Bargaining of Buyer: The variable, Distributors must have good connections with retailers and wholesalers is the highest of factor loading = 0.64. Customer relationship management means any process or activity which is used to build relationships with customers and create satisfaction in products and services for customers (Soltani, Zareie, Milani, & Navimipour, 2018; Almohaimmeed, 2019). In order for customers to develop brand loyalty and a positive relationship with the organization (Siddiqi, Khan, and Sharna, 2018), it benefits both parties: the customer and the organization (Win-Win Strategy) continuously for a long time.

4. Bargaining of Supplier: The variable, Raw materials for processing vegetables and canned fruit are becoming more expensive is the highest of factor loading = 0.77. Cultivation costs are also pressured by imported seed and fertilizer prices (Khudoynazarovich, 2021). In addition, the international conflict affects the agricultural sector in Thailand as a whole and has

higher costs (He, et al, 2019), especially for chemical fertilizers and diesel fuel, which the government has adjusted the ceiling above 30 baht per liter, meaning these costs will be reflected in food prices. The finished products that require various agricultural raw materials must inevitably increase accordingly (Bjornlund, Bjornlund, & Van Rooyen, 2020).

5. Substitutes of Product: The variable, importing more fresh vegetables and fruits from other countries is the highest of factor loading = 0.79. Most of the products for canned fruit and vegetable substitutes are vegetable products. fresh fruit imported from the country. In the meantime, for the international market Substitutes include local vegetables and fruits that can be purchased as substitutes for vegetables. fruits that must be imported from abroad (Limaye & Pednekar, 2019). Therefore, the substitute products for canned vegetables and fruits are fresh fruits and vegetables (Zhu, Ge, & Yue, (2018).

## Recommendation

The researcher has suggestion for this study as follows:

### Implementation Suggestion

1. The government should be provided to exporters of canned fruit and vegetables in the form of membership in a free trade area that reduces product costs and boosts the benefits of international trade.

2. Thai enterprises are capable of producing products that are distinct from both domestic and international competitors. Especially desirable tropical fruits, such as processed pineapples, as well as indigenous fruits such as mangoes, coconut nectar, etc. Therefore, differentiation strategies should be utilized to gain a competitive advantage.

3. Thai exporters should collaborate with Thailand's fruit industry intertrade network in other ways, such as the Trading Strategic Alliance, where Thailand is a contract channel distributor (Superstore, Supermarket et al.) of house brand products with partner countries.

### Future Research Suggestion

In future research, the models developed in this study should be validated using information from all stakeholders, including suppliers, distributors, administrators, buyers, etc. This will corroborate the construct validity of the subscales further. In addition, it is possible to reanalyze data from previous studies in order to investigate the construct validity of the subscales. In this study, we examined a measurement model for CFA, but to obtain additional evidence of construct validity, these variables should be examined in the context of structural models involving other variables, such as AGFI and AVE, which have been identified as antecedents or consequences of conflict styles.

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