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Determinants of Consumers' Purchasing Behavior for Certified Aquaculture Products in South Korea

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Abstract: This study aims to investigate consumers' decision-making process for purchasing certified aquaculture products using the theory of the planned behavior (TPB) model. Based on the TPB model, this study empirically examines the relationship among TPB constructs, namely; attitude, social norm, perceived behavioral control, and behavioral intention to purchase sustainably produced products (i.e., Aquaculture Stewardship Council-certified products). Data from a web-based survey conducted through an online survey company (960 usable response samples) are analyzed using structural equation modeling. The results indicate that all latent variables (i.e., attitude, social norm, and perceived behavioral control) positively affect consumers' behavioral intention. More importantly, environmental awareness moderates the relationships between TPB constructs and behavioral intention. In the case of the high awareness group in this study, attitude influences behavioral intention more than social norm does. On the contrary, in the case of the low awareness group, social norm influences behavioral intention more than attitude does.

Keywords: theory of planned behavior; sustainable aquaculture; structural equation modeling (SEM); new ecological paradigm; Aquaculture Stewardship Council (ASC); environmental awareness; sustainable seafood certification

1. Introduction

The Food and Agriculture Organization (FAO) developed new guidelines on sustainable aquaculture certification in 2011 following a dramatic increase of global aquaculture production [1]. Based on the guideline, many sustainable aquaculture certification systems were launched, establishing an international sustainable aquaculture standard [2–4]. In particular, the Aquaculture Stewardship Council (ASC) certification is one of the major sustainable aquaculture certification systems. It has grown rapidly in Europe, and recently expanded into North America and Asia [5].

The Korean government is making efforts to transform conventional aquaculture into sustainable aquaculture by creating relevant laws and implementing certification systems [6]. The law "Act on the Promotion of Environment-friendly Agriculture and Fisheries and the Management of and Support for Organic Food (Korea)" required a promotion plan every five years to facilitate the transition to sustainable aquaculture, and has a legal basis for the certification of organic foods. The Korean aquaculture industry produced 2.25 million tonnes of aquaculture products in 2018 (Figure A1), increasing the share of certified products in total production (Figure A2). To be specific, the volume of certified organic production increased from 13,757 tonnes in 2016 to 50,540 tonnes in 2017, an increase of 267%. This trend shows that the Korean domestic market has great potential for supporting sustainable aquaculture.

Academia has responded to the market trend with various types of research on sustainable aquaculture. The FAO certification guidelines provide a basic direction for implementing sustainable aquaculture and Sustainable Development Goals (SDGs), but details on how to transition to a sustainable aquaculture industry should be driven by further research [7,8]. For example, consumer support

for sustainable aquaculture is essential in a market-based approach, therefore, consumer research on sustainable aquaculture products is of great importance [3]. Consumer support can be earned through implementing sustainability-related certification systems [9]. The certification systems are a mechanism for transferring value, trust, and reward between producers and consumers.

Even though consumer awareness of and support for sustainable aquaculture are an essential factor for implementing sustainable aquaculture, academic research on consumer awareness and attitudes toward sustainable aquaculture have been limited. It is unclear which latent variables affect pro-environmental consumer behavior (e.g., purchasing certified products for sustainable production) and how the environmental awareness of the consumer affects their behavior. Therefore, the author proposes the following research questions so as to fill such research gaps:

1. What are the relationships between underlying latent variables determining pro-environmental behavior, such as purchasing certified products?
2. Does environmental awareness affect consumers' decision-making process?

The purpose of this study is to analyze the determinants of consumers' pro-environmental behavior using ASC-certified products as an example. Specifically, the author examines how the consumers' perception affects their decision-making process through the framework of the theory of planned behavior (TPB), which is a dominant consumer behavior analysis tool.

2. Literature Review

2.1. FAO Technical Guidelines on Aquaculture Certification

The FAO Technical Guidelines on Aquaculture Certification are a representative reference for establishing sustainable aquaculture schemes. Based on the guidelines, many private certification standards have been established in pursuit of sustainable aquaculture [10]. The development of aquaculture guidelines was requested during the third session of the FAO sub-committee on aquaculture in 2006. A draft of the guidelines was proposed after six expert workshops and a technical consultation centered on the FAO Committee of Fisheries [11]; resulting in the FAO member countries finally approving the guidelines in 2011 [1].

The development of the FAO guidelines came against a background of dramatic growth in aquaculture production, giving rise to concerns about the negative impacts on social and environmental sustainability [1]. The FAO has forecasted that aquaculture production is expected to exceed production from capture fisheries in 2020 because of aquaculture's dramatic growth [12]. However, in some cases, it might not be environmentally friendly. The destruction of the Southeast Asian mangrove forests for shrimp farming shows the potential problems of aquaculture [13]. Fish farming also raises ethical problems and the need to strengthen the management of the rapidly growing aquaculture industry. The current FAO guidelines reflect the international community's commitment to respond to hunger and poverty challenges, achieve food security, and meet the United Nations Millennium Development Goals (MDGs) and SDGs.

The FAO Technical Guidelines on Aquaculture Certification consist of a total of 176 articles, suggesting four minimum substantive criteria (Table 1). The main items are the principles of the aquaculture certification scheme and the sustainable aquaculture standards. The principles of the FAO guidelines stipulate how to comply with the law, develop standards and procedures, ensure the reliability and effectiveness of the standards, establish accountability, and comply with the FAO guidelines for fisheries trade.

Table 1. Minimum substantive criteria for developing aquaculture certification standards.

Criteria	Items	Related International Code
Animal welfare and health	Aquaculture operations	World Organization for Animal Health (OIE) standard
	Movement of aquatic animals	
	Culture environment	
	Veterinary medicines	
	Use of species in polyculture	
	Farming conditions	
	Training of aquaculture workers	
Food safety	Aquaculture facilities	World Health Organization (WHO) Codex (i.e., international food standards)
	Feed requirements	
	Veterinary drugs and chemical use	
	Water used for aquaculture	
	Sources of broodstock and seed	
	Traceability and record-keeping of farming Activities	
	Aquaculture operations	
	Identification of aquaculture products	
Environmental integrity	Aquaculture certification schemes	Local, national, and international laws The Code of Conduct for Responsible Fisheries
	Environmental impact assessment	
	Management practices for addressing Environmental impacts	
	Environmental monitoring	
	Mitigation of negative environmental impacts	
	Water resource management	
	Artificial seed management	
	Use of exotic species	
	Infrastructure construction and waste disposal	
	Management strategies (e.g., feeds, feed additives, chemicals, veterinary drugs)	
Socio-economic aspects	Comprehensive labor issues	International Labor Organization (ILO) conventions
	Wage problems	
	Child labor	

Note: the author created this table based on the technical guidelines on aquaculture certification of the FAO [1].

2.2. ASC Certification

Based on the FAO guidelines, private certification systems for sustainable aquaculture have been developed. In 2010, the Aquaculture Stewardship Council (ASC) was co-founded by the World Wildlife Fund (WWF) and IDH, a Dutch sustainable trade initiative. The primary mission of ASC is to pursue sustainable aquaculture by rewarding responsible farming practices. The council has developed the ASC standards for sustainable aquaculture by species. The certification process is conducted by an independent audit organization, awarding ASC certification to participating farms.

The spread of ASC could reveal how the consumer market reacts to the implementation of sustainable consumption campaigns. Leading retailers (e.g., Walmart, Costco, and Carrefour) have expanded their product lines with certified products (e.g., ASC-certified) to meet consumers' demand for sustainable aquaculture products [14–18]. Major hospitality companies (e.g., Hyatt) have established internal regulations for handling the certified products, responding to the new trend [19,20].

In February 2019, there were 1,696,978 tonnes of ASC-certified production from 816 fish farms across the globe. The ASC standards for eight major species (i.e., abalone, bivalve, pangasius, salmon, seriola, shrimp, tilapia, and trout) have been applied to pursue sustainable aquaculture. The number of ASC-certified products rose to 16,260 in 75 countries in 2019 from 1080 in 37 countries in 2014 [21]. Such rapid development could show that consumer awareness of ASC-certified products is growing, and that the market demand for ASC-certified products is increasing.

In Korea, ASC-certified products were introduced in 2014, increasing the number of product lines (Figure A3). Subsequently, sales volume in South Korea grew from 28.7 tonnes in 2015 to 89.6 tonnes in 2017, an increase of 212%. The growth is expected to continue, as additional ASC-certified products have since been introduced.

2.3. Application of the Theory of Planned Behavior to Seafood Purchasing

The TPB explains individuals' behavioral decisions and predicts future behavior. The TPB can explain the causes and consequences of social phenomena, such as pro-environmental behavior. The TPB is an updated version of the theory of reasoned action (TRA). The TRA was proposed by Fishbein and Ajzen [22,23]. Later, Ajzen added one more important latent variable (perceived behavioral control) to the TRA, thereby establishing the TPB model [24,25].

The TPB model assumes that behavioral intention is the most crucial factor affecting real behavior. Behavioral intention is regarded as a function of three psychological factors: a person's attitude to specific behavior, a person's subjective norm toward the behavior, and perceived behavioral control concerning the behavior. Specifically, a person's attitude to specific behavior refers to the degree to which the person evaluates specific behavior favorably or unfavorably [24]. A person's subjective norm is a social factor; it can be viewed as perceived social pressure to fulfill or not to fulfill specific behavior. Perceived behavioral control refers to the perceived ease or difficulty of adopting specific behavior. This perception is related to a person's ability (e.g., budget, time, and willingness) to adopt a specific type of behavior. According to the TPB model, such latent variables are a precursor to behavioral intention, predicting individuals' future behavior.

The TPB model has been widely applied in various fields to explain the behavior of individuals on specific phenomena. In particular, the TPB explains the individual's response to pro-environmental behavior, such as green purchasing [26,27]. Green purchasing is an important part of sustainable consumption. It refers to pursuing a better quality of life, while minimizing the use of natural resources, toxic materials, and the emissions of waste and pollutants from the service or product [28]. The definition of sustainable consumption highlights the environmental concerns of consumers. In order to improve the predictive capabilities of the TPB model, researchers attempted to incorporate new constructs, namely, environmental concerns and knowledge [29].

In this way, environmental concerns and awareness have been recognized as an important factor affecting outcomes of the TPB model [30]. In environmental psychology, environmental awareness was often measured using the new ecological paradigm (NEP) scale [31–33]. The NEP scale was developed by Dunlap and Van Liere [34], becoming a basic measurement tool for environmental awareness [31,35]. Researchers have used the NEP scale as a measurement tool for environmental awareness in various academic fields, such as education, tourism, and marketing [32,36,37].

This study considers environmental awareness as a moderator to affect the proposed relationships among the TPB constructs: attitude, social norm, perceived behavioral control, and behavioral intention. Bissing-Olson et al. took a similar approach to analyze the hypothetical relationships between daily activities and pro-environmental behavior, confirming the moderating role of environmental

awareness [38]. Consistent with the TPB model and the moderating role of environmental awareness, this study proposes the conceptual model of the research hypotheses (Figure 1).

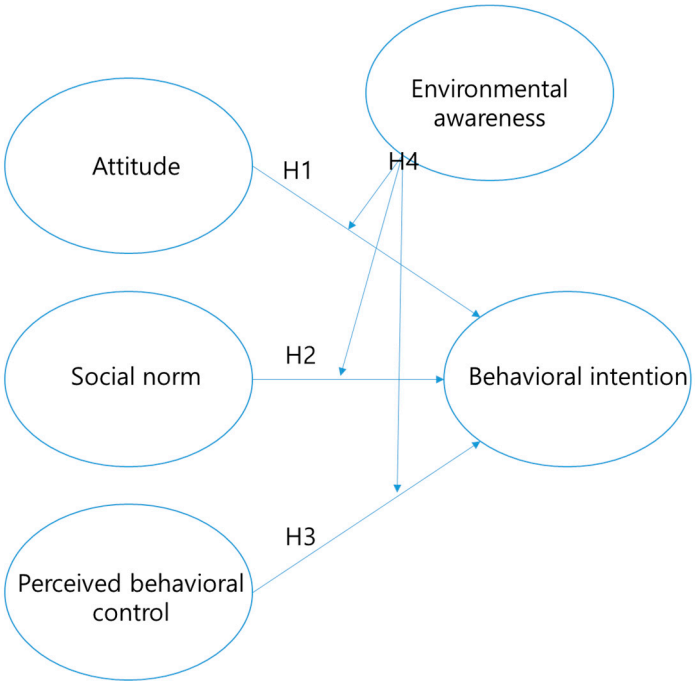

Figure 1. Proposed conceptual model. Note: the TPB model assumed attitude, social norm, and perceived behavioral control affect consumers' behavioral intention. Such relationships were hypothesized in the conceptual model. This figure shows the relationships among TPB constructs. H1: attitudes affect behavioral intention to purchase ASC-certified products. H2: subjective norms affect behavioral intention to purchase ASC-certified products. H3: perceived behavioral control affects behavioral intention to purchase ASC-certified products. H4: consumers' environmental awareness moderates the relationships between TPB constructs and behavioral intention to purchase ASC-certified products.

3. Methods

3.1. Sample

The main subjects of the questionnaire were adults residing in South Korea. Using a stratified sampling method, the author attempted to collect a balanced sample in terms of gender, region, and age. A web-based survey was conducted through an online survey company from November to December 2018. At the beginning of the survey, a description of sustainable aquaculture and the ASC-certified seafood products was given to a total of 2700 survey subjects. Among them, those who were willing to pay for sustainable aquaculture products were given additional survey instruments. As a result, 960 of the final usable response samples were extracted (response rate of 35.6%).

3.2. Survey Questionnaire and Measurement Items

The present research developed a survey questionnaire in the context of sustainable aquaculture and its certification. The developed questionnaire was reviewed by the industry experts and seafood industry researchers, confirming logical flow and its context.

At the beginning of the survey, the description of the ASC, an image of ASC certified products, and survey measurement items were given to participants (Tables 2 and 3, Figure 2). Such items were also carefully reviewed by the experts in order to provide participants with enough information about ASC certification.

Table 2. Description of ASC-certified products in survey questionnaire.

Displayed Text
As a general consumer, we are able to purchase sustainable aquaculture products to support sustainable aquaculture, but it is difficult for consumers to distinguish between conventional aquaculture products and sustainable products in the market (traditional market, supermarket, online shop, etc.). To help consumers make purchasing decisions on sustainable aquaculture products, consumer-led aquaculture production certification schemes (e.g., certification by Aquaculture Stewardship Council, ASC) are attracting attention. The ASC certification was developed with the cooperative efforts of environmental groups, civil society groups, and industry representatives, establishing standards for environmentally friendly aquaculture. The ASC certifies aquaculture producers, processing industries, and retailers that implement the ASC standard. Typical ASC-certified products include Norwegian salmon, shrimp, abalone, oysters, seaweed, and more recently, sea bream. By purchasing ASC-certified products, you can help protect the coastal environment and maintain economic, social, and environmental sustainability for the aquaculture industry.

Table 3. TPB measurement statement.

Items	Statement
	For me, purchasing ASC-certified products is
Att1:	Extremely bad (1)/extremely good (7)
Att2:	Extremely stupid (1)/extremely wise (7)
Att3:	Extremely unnecessary (1)/extremely necessary (7)
Att4:	Extremely undesirable (1)/extremely desirable (7)
	Strongly disagree (1)/Strongly agree (7)
SN1	Most people who are important to me would want me to purchase ASC-certified products.
SN2	Most people who are important to me think I should purchase ASC-certified products.
SN3	Most people who are important to me expect I purchase ASC-certified products.
PBC1	Whether or not I purchase ASC-certified products is completely up to me.
PBC2	I have resources, time, and opportunities to purchase ASC-certified products.
PBC3	I am confident that if I want, I can purchase ASC-certified products.
BI1	I am willing to purchase ASC-certified products.
BI2	I am willing to recommend ASC-certified products to other people.
BI3	I will make an effort to purchase ASC-certified products.

(**a**) (**b**)

Figure 2. ASC logo and an example of ASC-certified product: (**a**) ASC Logo; (**b**) an ASC-certified product. Note: ASC authorized the use of these images for this paper.

The survey measurement items consist of three components. The first measures demographic information. The second consists of the TPB constructs, namely, attitude, subjective norm, perceived behavioral control, and behavioral intention to purchase ASC-certified products. The last measurement items are for assessing consumers' environmental awareness (Table A1). The survey instruments were modified in the context of ASC-certified products using the TPB construct measurement items previously developed [39]. The survey instruments measured attitudes toward purchasing ASC-certified products, social pressure, perceived behavioral control, and behavioral intention to purchase (Table 3).

Consumer environmental awareness was measured using the New Ecological Paradigm (NEP) measurement scale [31,35]. The author used the total score of the NEP as a proxy variable for consumer environmental awareness.

3.3. Analytical Procedure

The present study used STATA 15 [40] and AMOS 25 [41] to analyze the data. STATA 15 was employed to examine the basic descriptive information of the sample, and then to check the normality of the measured variables, confirming the fundamental assumptions of structural equation modeling (SEM). In the following data analysis, this study first conducted confirmatory factor analysis (CFA) to test how well the measurement items represent the research constructs [42]. Then, this study undertook hypothesis testing using SEM.

In this research, the TPB model was used as a basic conceptual model to examine the hypothetical relationships among the constructs. In addition, this study attempted to analyze the moderating effect of survey participants' environmental awareness about the relationships. To analyze the moderating effect, the survey participants were classified into high NEP and low NEP groups according to the mean of the composite NEP score. The present research compared the coefficients of two group models and tested a null hypothesis; the coefficients of the two models are equal.

4. Results

4.1. Descriptive Information

The sample profile shows that 50.1% of the respondents are female and 49.9% male, with a balanced age group distribution (Table 4). Furthermore, 67.2% of the respondents are married and 32.8% single. In terms of education level, 63.6% of the respondents have a bachelor's or postgraduate degree. Of the respondents, 22.4% reported annual household income between $54,654 and $76,363.

Table 4. Sample demographics.

Variable	Categories	Frequency	Percentage
Gender	Male	479	49.9
	Female	481	50.1
Age (year)	20–29	167	17.4
	30–39	192	20.0
	40–49	240	25.0
	50–59	224	23.3
	More than 60	137	14.3
Marital status	Married	645	67.2
	Single	315	32.8
Family size (person)	1	102	10.6
	2	191	19.9
	3	251	26.2
	4	338	35.2
	More than 5	78	8.1
Employment status	Primary/secondary occupation	51	5.3
	Self-employed	79	8.2
	Sales/customer service	65	6.8
	Office job	338	35.2
	Business/management	74	7.7
	Professional/freelance	115	12.0
	Housewife	129	13.4
	Student	65	6.8
	Unemployed	44	4.6

Table 4. *Cont.*

Variable	Categories	Frequency	Percentage
Education	Equivalent to high school	177	18.4
	Two-year college degree	115	12.0
	Undergraduate student	57	5.9
	Bachelor degree graduate	514	53.5
	Equivalent to postgraduate	97	10.1
Annual household income *	Less than $21,818	98	10.2
	$21,927–32,727	138	14.4
	$32,836–43,636	166	17.3
	$43,745–54,545	168	17.5
	$54,654–76,363	215	22.4
	$76,472–98,181	103	10.7
	More than $98,290	72	7.5
Total		960	100

Note: * USD.

For SEM analysis, a normality check on measurement variables is required [43]. The normality check results show that the skewness of variables is within ±1. The kurtosis is within ±4, confirming that the normality assumptions are satisfied (Table 5) [43,44].

Table 5. Results of normality check.

Items	Mean	S.D.	Skewness	Kurtosis
Att1	5.91	1.03	−0.57	2.89
Att2	5.86	1.04	−0.53	2.84
Att3	5.88	1.06	−0.60	2.83
Att4	5.91	1.04	−0.60	2.91
SN1	5.32	1.16	−0.21	2.64
SN2	5.32	1.19	−0.33	2.88
SN3	5.27	1.21	−0.27	2.77
PBC1	5.59	1.18	−0.63	3.11
PBC2	4.80	1.30	−0.23	2.91
PBC3	4.98	1.25	−0.19	2.72
BI1	5.32	1.07	−0.31	3.24
BI2	5.28	1.15	−0.30	2.95
BI3	5.40	1.12	−0.46	3.26

Note: the statement of items is presented in Table A1.

4.2. Reliability and Confirmatory Factor Analysis Results

The present study first checked the reliability and validity of the measurement items (Table 6). Cronbach's alpha (i.e., internal consistency) of each construct was acceptable, as the estimates ranged from 0.806 to 0.969 (Table 6, Cronbach's Alpha). Composite reliability is a crucial indicator for verifying the internal consistency of model constructs. The composite reliability of each of the four constructs is more than 0.70, which is the cutoff value. This shows that all latent variables have good internal consistency [42]. The average variance extracted (AVE) values indicate to what extent the variables explain the total variance of the measurement items. The AVE values of all constructs exceed 0.610, indicating that a large amount of the variance is explained by the TPB constructs (Table 6, AVE).

The CFA results provide goodness-of-fit indexes of the measurement model. The indexes confirm that the measurement model fits the data appropriately (NFI = 0.977, CFI = 0.981, IFI = 0.981, GFI = 0.949 RMSEA = 0.070).

Table 6. Results of reliability and validity check of measurement items.

Construct	Item	Loading	Cronbach's Alpha	CR	AVE
Attitude	Att1	0.922	0.969	0.969	0.886
	Att2	0.934			
	Att3	0.953			
	Att4	0.956			
Subjective norm	SN1	0.938	0.963	0.861	0.897
	SN2	0.954			
	SN3	0.950			
Perceived behavioral control	PBC1	0.644	0.806	0.713	0.610
	PBC2	0.795			
	PBC3	0.885			
Behavioral intention	BI1	0.911	0.940	0.836	0.840
	BI2	0.913			
	BI3	0.925			

Note: CR: composite reliability, AVE: average variance extracted.

4.3. Results of Structural Equation Modeling

The proposed structural model was estimated (Figure 3). The coefficients of the SEM model are statistically significant. In the model, social norm has more influence on behavioral intention than other constructs do (attitude and perceived behavioral control).

The impact of environmental awareness was examined by the chi-square difference test (Figure 4 and Table 7). All coefficients of both models are significant. However, they produced different coefficients. In the case of the high awareness group, attitude influenced behavioral intention more than social norm did (Figure 4a). On the contrary, in the case of the low awareness group, social norm influenced behavioral intention more than attitude did (Figure 4b).

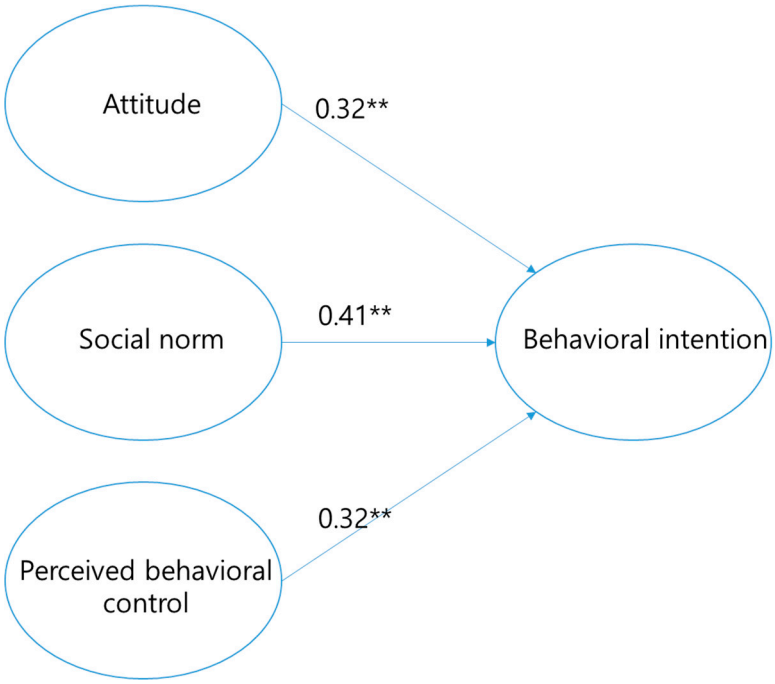

Figure 3. SEM results of general TPB model. Note: the overall model fitness indexes: NFI = 0.977, CFI = 0.981, IFI = 0.981, GFI = 0.949 RMSEA= 0.070 ** p <.01.

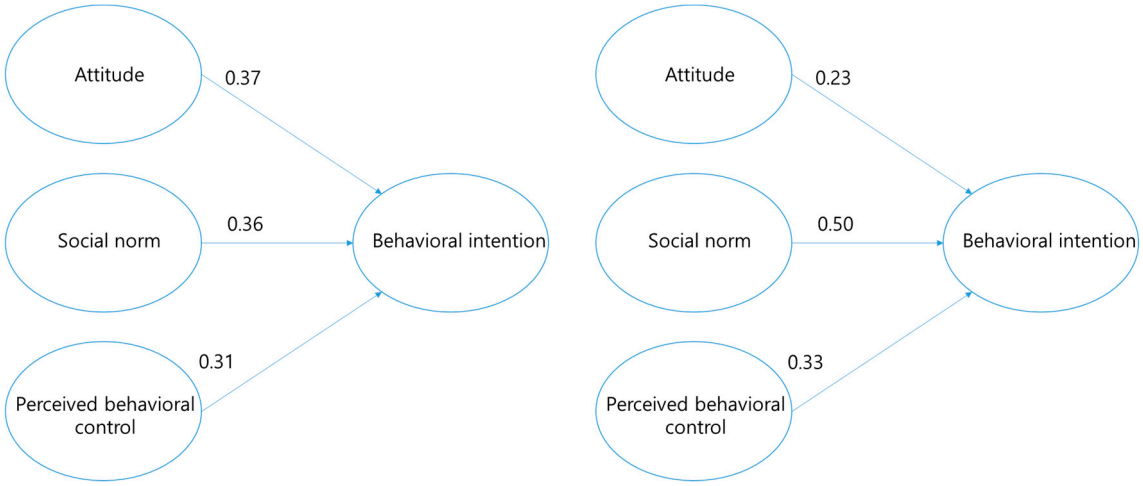

Figure 4. Test results of impacts of environmental awareness: (**a**) high NEP group; (**b**) low NEP group. Note: the overall model fitness indexes: NFI = 0.964, CFI = 0.974, IFI = 0.981, GFI = 0.927, RMSEA = 0.052.

Table 7. Results of the chi-square difference test.

	NPAR	CMIN	d.f	*p*-Value	CMIN/d.f.
Unconstrained model	45	491.91	137	0.000	3.591
Structural weights model	42	502.15	140	0.000	3.587
Chi square difference		10.24	3	0.017	

Note: NPAR = the number of parameters, CMIN = chi-square value, d.f. = degree of freedom.

The test results support all four hypotheses: H1, which hypothesizes a significant relationship between attitude and behavioral intention; H2, which hypothesizes a significant relationship between social norm and behavioral intention; H3, which hypothesizes a significant relationship between perceived behavioral control and behavioral intention; and H4, which hypothesizes an impact of environmental awareness on TPB constructs (Table 8).

Table 8. Hypothesis test results.

Hypothesis	SEM Model	Results
H1: attitude affects behavioral intention to purchase sustainable aquaculture certified products.	G, H, L	Supported **
H2: subjective norm affects behavioral intention to purchase sustainable aquaculture certified products.	G, H, L	Supported **
H3: perceived behavioral control affects behavioral intention to purchase sustainable aquaculture certified products.	G, H, L	Supported **
H4: consumers' environmental awareness moderates the relationships between TPB constructs and behavioral intention to purchase ASC-certified products.	H, L	Supported *

Note: G = general TPB model, H = high NEP group model, L = low NEP group model. * $p < 0.05$, ** $p < 0.01$.

5. Discussion and Implication

The present study attempted to explore how consumer attitudes and the perception of sustainable aquaculture affect behavioral intention to purchase certified products using ASC-labeled seafood as an example. This study also investigated how consumers' environmental awareness affects their

decision-making about purchasing sustainable aquaculture products. In particular, the present study utilized the TPB model to examine the inter-relationships among the critical constructs in terms of pro-environmental behavior modeling.

The results of SEM revealed that consumer attitude, subjective norm, and perceived behavioral control are significant factors that affect behavioral intention to purchase ASC-labeled products. Such results are consistent with previous studies on food selection [45–49]. However, the results of the TPB model show that all three constructs have significant effects, but subjective norm has the most substantial effect on behavioral intention (Figure 3). These results are consistent with the findings of Wang et al. [27]. However, they contradict some studies [29,47,49,50], which found that the subjective norm is the least influential construct of the TPB model, emphasizing the importance of attitude. This difference could be due to the employment of a different research sample, which comes from a non-identical social and cultural backgrounds. Specifically, the current study is based on samples from a developed country that has a secure social system, where the social norm functions well.

The uniqueness of this study lies in its use of environmental awareness as a moderator in the TPB model for the purchase of sustainable aquaculture products. This approach is similar to Wang et al. [51], in that they utilized environmental interpretations as a moderating variable for explaining tourists' pro-environmental behavior. The present study showed that environmental awareness moderates the relationship between attitude and behavioral intention. In the high awareness group, attitude influences behavioral intention more than social norm does. On the contrary, in the low awareness group, social norm influences behavioral intention more than attitude does. This finding implied that the high awareness group would actively participate in pro-environmental behavior, and that attitude plays a vital role in determining these consumers' behavior. The low awareness group would less actively participate in pro-environmental behavior; the low awareness may well respond to social norm (i.e., social pressure and external factor) rather than attitude (internal factor).

The research findings have crucial implications for the aquaculture industry and seafood marketing. The South Korean government has been making efforts to change the aquaculture production system in order to convert to sustainable aquaculture. Since 2014, the Korean government has established a support plan and policies for the transition to sustainable aquaculture, including an eco-friendly equipment supply program, an eco-friendly aquaculture feed program, and fish farming site relocation [6]. However, the government-led programs have some limitations because they depend on the government budget and planning.

In addition, the Korean government has attempted to provide information about sustainable aquaculture products to help drive change in the Korean aquaculture industry. The government has established a certification system, providing information about how seafood is produced. However, its scope remains at the minimum level of organic certification, which satisfies consumers' desire to consume safe seafood. However, recent changes in the aquaculture industry have exceeded this level. For example, the standards of the ASC certification system call for a comprehensive level of sustainability ranging from species protection to child labor bans. In this case, the government-led transition to sustainable aquaculture is inherently limited. Government policies that take into account the acceptability of fishers have a limited ability to follow rapid changes in market-driven demand. The limited budgets and capacity of government are not sufficient to drive the conversion to sustainable aquaculture. One hopeful fact is that in the case of consumer-driven certification systems, such as ASC, a virtuous cycle of expansion is in operation, and it is gaining momentum. For example, the ASC has been growing in capacity, budget, and publicity. The ASC's Asia-Pacific region has recently been split into two divisions, one for Asia and one for the Pacific. The budget and capacity of each regional headquarters has been expanded as well. This tendency means that a consumer-led certification system is emerging and the transition to sustainable aquaculture, which is dependent on government efforts, is becoming stronger through consumer participation. However, despite these changes in the market, there is a lack of scientific evidence on how consumer participation is supporting such a transition.

In this study, the author identified that the TPB model can verify how consumers' attitudes toward sustainable aquaculture, social pressures, and perceived behavioral control affect purchasing decisions for sustainable aquatic products. This could be a novel contribution of the present research to the literature. In addition, the results of the study should be useful for marketing practitioners. Consumers' support for sustainable aquaculture is based on individuals' attitudes and social norms. Specifically, the social pressure factor is stronger than other personal factors. The next influential factors are attitude and perceived behavioral control of sustainable aquaculture. In other words, social consensus and norms are essential for the transition to sustainable aquaculture through consumer participation. An individual's participation is determined by his or her attitude toward the activity and the social judgment value perceived by society.

Consumers' strong support for sustainable aquaculture could lead to a boycotting of unsustainable aquaculture products. This tendency is illustrated by the "Take a Pass on Chilean Sea Bass" campaign in 2002 [52,53]. The present study's results show that consumers with high environmental awareness are more willing to support sustainable aquaculture actively. Environmental and consumer groups are leading the movement to purchase sustainable aquaculture products, thereby raising consumer awareness. Considering this trend, sustainable aquaculture is likely to become more widespread.

If the paradigm of past aquaculture was to produce seafood at lower cost, the paradigm of future aquaculture is to produce seafood sustainably considering social, economic, and environmental factors. Purchasing sustainable aquaculture is one method to implement sustainable aquaculture. In the past, the production of aquaculture products in a sustainable manner was difficult, owing to high-cost problems. However, recent consumer participation is changing this situation, thereby alleviating the cost problem.

Sustainable aquaculture certification (e.g., ASC) facilitates consumer participation in aquaculture, serving as the basis for the transition to sustainable aquaculture. However, the Korean government needs to provide policy support for this transition. Currently, the ASC is using its chain of custody (COC) certification system to support the distribution of certified seafood. Such private certification schemes are excellent in terms of effectiveness. However, they are relatively costly, and are a burden to producers and consumers in the long run. One government policy option is to improve the traceability of aquaculture production, processing, and distribution. A well-established public system could be an answer to the cost issue.

The present study has the following limitations. The current research investigated consumers' intention to purchase ASC-certified products using the TPB model. Although the ASC certification is the most successful and well known, it is difficult to generalize the research findings to the entire aquaculture industry based on an analysis of one certification system and one country (i.e., South Korea). Therefore, the research findings may only apply to the Korean domestic market; additional research is required to confirm whether the findings would be applicable in other cultures and countries using other certification systems.

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Appendix A

Table A1. A revised New Ecological Paradigm measurement items.

Item	Mean	Std. Dev.
A1. We are approaching the limit of the number of people Earth can support	4.90	1.42
A2. Humans have the right to modify the natural environment to suit their needs	3.72	1.61
A3. When humans interfere with nature, it often produces disastrous consequences	5.81	1.14

Table A1. *Cont.*

Item	Mean	Std. Dev.
A4. Human ingenuity will insure that we do NOT make Earth unlivable	4.82	1.48
A5. Humans are severely abusing the environment	5.97	1.04
A6. Earth has plenty of natural resources if we just learn how to develop them	5.53	1.12
A7. Plants and animals have as much right as humans to exist	5.91	1.03
A8. The balance of nature is strong enough to cope with the impacts of modern industrial nations	4.30	1.58
A9. Despite our special abilities, humans are still subject to the laws of nature	5.57	1.13
A10. The so-called "ecological crisis" facing humankind has been greatly exaggerated	3.12	1.41
A11. Earth is like a spaceship with very limited room and resources	5.70	1.17
A12. Humans were meant to rule over the rest of nature	3.45	1.68
A13. The balance of nature is very delicate and easily upset	4.72	1.36
A14. Humans will eventually learn enough about how nature works to be able to control it	3.28	1.58
A15. If things continue on their present course, we will soon experience a major ecological catastrophe	5.93	1.19

Note: composite NEP scores: the sum of NEP scores; mean = 77.34; std. dev = 8.91; kurtosis = 3.42; skewness = −0.21; therefore, composite NEP scores follows a normal distribution. Source: Dunlap et al. [31].

Appendix B

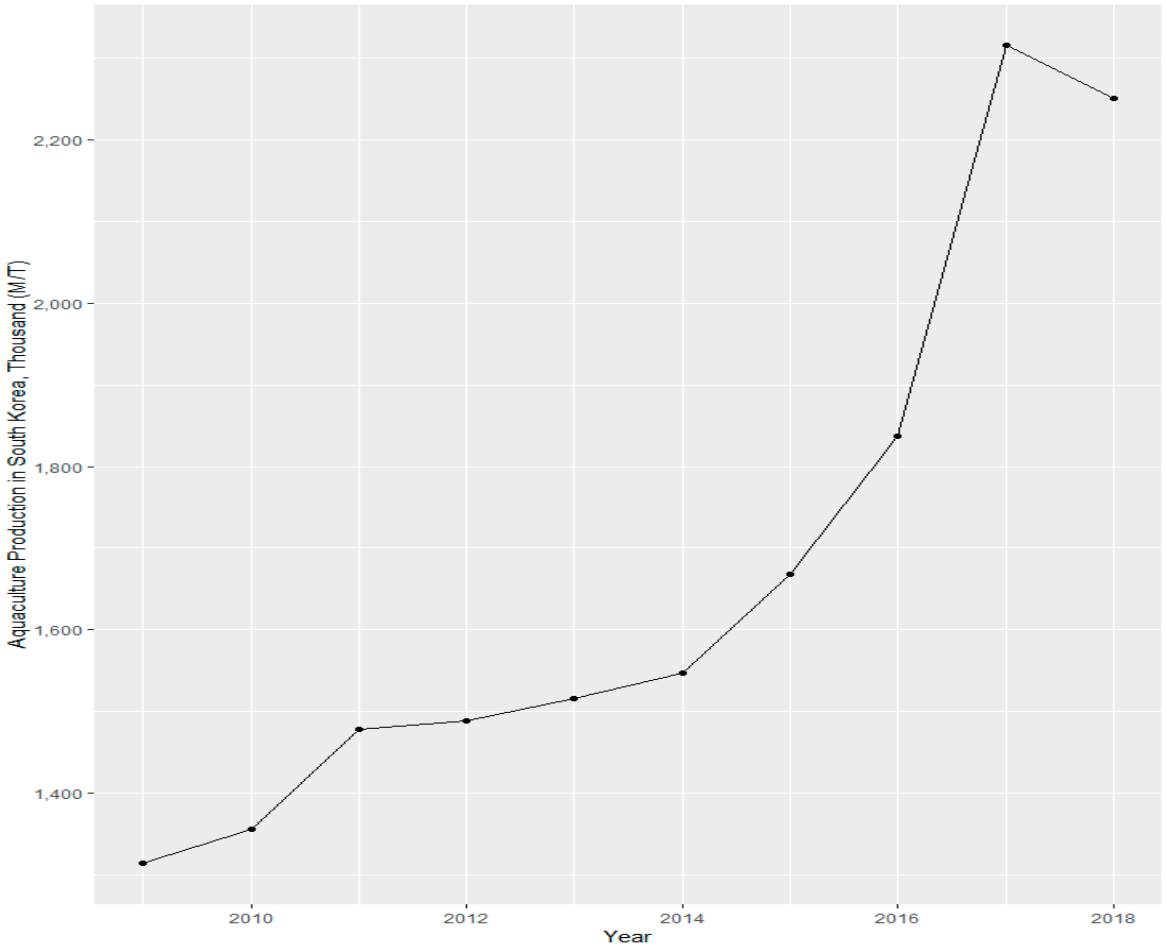

Figure A1. Production volume of Korean aquaculture [54]. Note: unit; thousand metric tonnes (M/T).

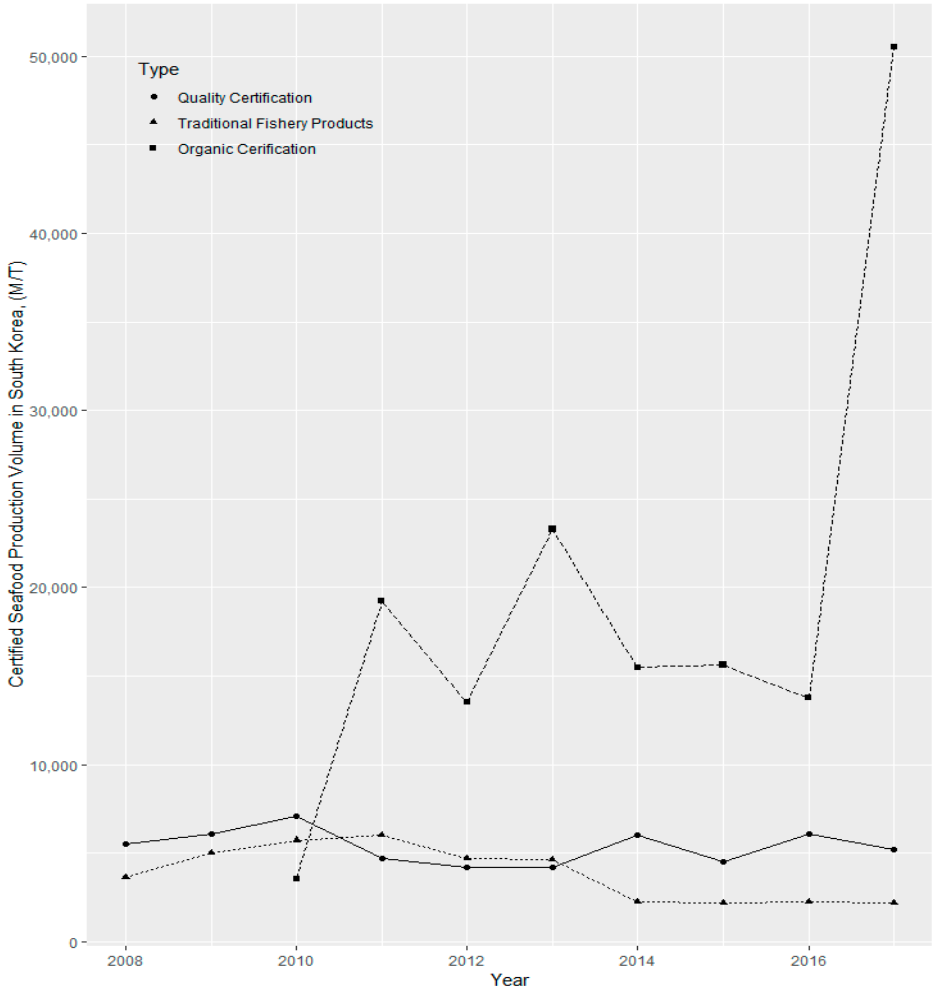

Figure A2. Production volume of certified seafood. Note: unit; metric tonnes (MT).

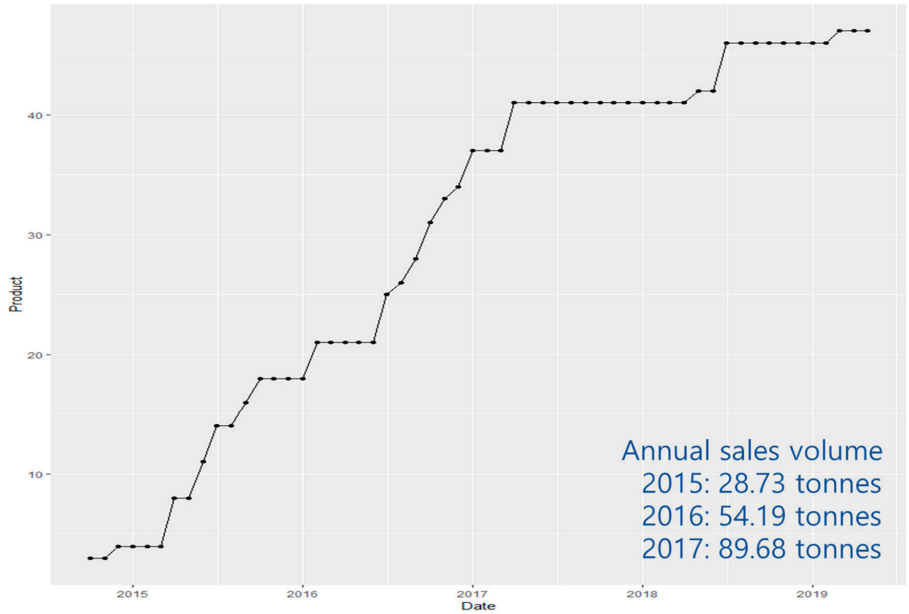

Figure A3. The number of ASC-certified products and sales volume in South Korea. Source: Aquaculture Stewardship Council.

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