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Consumer Willingness to Pay for Sustainable Seafood: A Meta-analysis

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ABSTRACT

With the fisheries industry having detrimental effects on the environment and society, sustainable seafood is becoming more important. Understanding consumer preferences is essential to establish and maintain sustainable seafood markets. Numerous worldwide studies have evaluated consumer Willingness to Pay (WTP) for sustainable seafood providing a variety of findings. This article attempts to incorporate these findings and analyze variations in consumer WTP for sustainable seafood consumption. Studies were initially identified through Google Scholar using a set of keywords. With a predetermined set of inclusion and exclusion criteria, 33 studies with 141 observations were selected for the analysis. A weighted ordinary least squares regression was used to analyze the data. When compared to the reference group of 'other attributes', the results of the meta-regression model reveal that consumers place higher price premiums for 'organic' and 'local/domestic' attributes. The 'choice experiment/conjoint analysis' and 'contingent valuation' methods elicited significantly higher WTP estimates in comparison to the reference group 'other methods'. Additionally, WTP estimates from the 'choice experiment/conjoint analysis' was higher than the 'contingent valuation' method. Furthermore, 'Europeans' and 'Americans' displayed significantly lower price premiums compared to 'Asians'. Publication in Journals also resulted in significant positive values compared to publishing in others. Thus, the findings show that consumer WTP varies for different sustainable seafood attributes. The estimation method, region and publication also cause differences in WTP. The findings provide important implications for seafood producers and policymakers when making decisions related to the sustainability of seafood and designing future research work.

Keywords: Consumer preference, Meta-regression, Sustainable seafood, Willingness to pay.

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INTRODUCTION

Sustainable seafood can be described as seafood fished or farmed in a way that does not threaten the population status

of the target species or the ecosCystem (Richter *et al.,* 2017). Sustainable seafood covers ecologically responsible fishing practices that reduce the bycatch of non-targeted species and result in acceptable environmental and ecosystem impacts (Jacquet *et al.,* 2010). The sustainably produced seafood has fewer adverse environmental and social impacts. Further, if seafood is produced without minimizing the ability of generations in the future to produce seafood that can be called sustainable seafood (Hilborn *et al.,* 2015).

With the world's population growth, the demand for seafood is also rising. This challenges the sustainability of marine and inland fisheries. Studies have shown that global fish exploitation patterns are unsustainable (Pauley *et al.,* 1998; Myres and Worm, 2003). Based on FAO assessments, the proportion of marine fish stocks caught at biologically sustainable levels has decreased from 90% in 1974 to 64.6% in 2019. In 2019, out of the total number of stocks assessed, 57.3% accounted for maximally sustainably fished stocks while 7.2% accounted for underfished stocks (FAO, 2022). If the current practices are continued, all taxa fished at the present, will experience a global collapse by 2048 (Worm *et al.,* 2006). Not only overfishing of fish stocks, but also serious environmental impacts including the destruction of fish habitats, fishing down marine food webs and problems of by-catches result from the rapid expansions in marine fishing efforts (Sumaila *et al.,* 2016).

On the other hand, aquaculture plays an important role in meeting the growing demand for fish in the world as many aspects of the production process such as biological, economic, technological and environmental factors can be handled under human control (Asche, 2008). Even though aquaculture has shown clear success in the quantity of seafood produced, it has resulted in serious environmental issues (Naylor *et al.,* 2000). As the aquaculture production process interacts with the environment, it damages the surrounding environment, results in the destruction of natural habitats and pollutes wildlife and habitats around the site. Transmission of diseases and parasites to wild species, salinization of agricultural areas, disruptive socioeconomic impacts and eutrophication can be viewed as other potential negative impacts of aquaculture (Asche, 2008).

In this context, sustainable seafood is becoming increasingly important. A large number of studies are conducted worldwide to estimate consumers' WTP for various sustainable attributes of seafood i.e. environmentally friendly (Whitmarsh and Wattage, 2006; Erwann, 2009; Ariji, 2010; Wakamatsu *et al*., 2010; Davidson *et al*., 2012; Xu *et al*., 2012; Uchida *et al*., 2013; Blomquist *et al*., 2015; Chen *et al*., 2015; Fonner and Sylvia, 2015; Lim *et al*., 2015; Salladarr´e *et al*., 2016; Bronnmann and Asche, 2017; Yip *et al*., 2017; Bronnmann and Hoffmann, 2018; Del Giudice *et al*., 2018; Onofri *et al*., 2018; Zander and Feucht, 2018; Banovic *et al*., 2019; Hynes *et al*., 2019; Yi, 2019; Hori *et al*., 2020; Menozzi *et al*., 2020; Vitale *et al*., 2020; Asche *et al*., 2021; Mulazzani *et al*., 2021; Xuan, 2021; Nguyen *et al*., 2022; Shi *et al*., 2022; Sigurdsson *et al*., 2022), organic (Olesen *et al*., 2010; Xu *et al*., 2012; Chen *et al*., 2015; Ankamah-Yeboah, 2016; Zander and Feucht, 2018; Weir *et al*., 2021; Shi *et al*., 2022), local/domestic (Ariji, 2010; Davidson *et al*., 2012; Fonner and Sylvia, 2015; Lim *et al*., 2015; Zander and Feucht, 2018; Banovic *et al*., 2019), animal welfare (Olesen *et al*., 2010; Zander and Feucht, 2018), non-threatened (Hori *et al*., 2020) and without discards (Zander and Feucht, 2018). Maesano *et al*. (2020) reviewed consumer choices for credence attributes of sustainable fish products. They found that consumers have positive perceptions regarding sustainable fish and valued the country of origin as the most important attribute.

Meta-analysis can be described as an analysis of analyses. For the main purpose of integrating the results, a large number of analytical results from individual studies are statistically analyzed (Glass, 1976). A combination of the results of independent studies on a particular subject provides more insight and explanation than individually (Stanley, 2001). Various meta-analysis studies found that the consumer WTP for different sustainable and environmentally friendly products varies significantly across the regions (Sundt and Rehdanz, 2015; Clark *et al*., 2017; Yang and Renwick, 2019; Li and Kallas, 2021) and WTP estimation method used (Sundt and Rehdanz, 2015; Dolgopolova and Teuber, 2017; Yang and Renwick, 2019). Therefore, this study incorporates different publications around the world on consumer WTP for sustainable seafood to perform a meta-analysis from a wider perspective, specifically to

answer the following research questions: i). Are there variations in consumer WTP for different attributes of sustainable seafood? ii). Are there differences in consumer WTP by region? iii). Does the consumer WTP vary based on the estimation methodology used?

MATERIALS AND METHODS

Using the keywords "sustainable fish", "sustainable seafood", "consumer preferences", "price premium", and "willingness to pay" previous studies done on estimating consumer preference for sustainable seafood (from 2006 to 2022) were collected from the Google Scholar platform. Table 1 shows the respective number of studies that appeared in Google Scholar based on the search terms used.

Studies were selected for the analysis using the inclusion and exclusion criteria as shown in Table 2. The flow diagram of the literature search and selection process is shown in Figure 1. Initially, 3524 records were identified from Google Scholar. After removing duplication, gray literature, book chapters, presentations and non-English articles, 1570 studies were selected for further title reading. Only 1177 studies remained after excluding literature reviews, meta-analysis studies, discussion papers and non-accessible papers for abstract reading. After that, only 190 were retained for reading the main body. About 102 studies reported WTP for information. However, some studies did not report sample sizes and base prices for price premium calculations. Seven supplementary studies were found from the reference list of other included studies, and were added for the analysis. Finally, 33 studies with 141 observations were included in the meta-analysis. Table 3 provides the included studies of the meta-analysis.

Consumer WTP was used as the dependent variable. To normalize the data and enhance the quality of estimation results, the natural logarithm of consumer WTP was used. Some studies have reported the WTP price premiums for sustainable seafood attributes as percentages while others present it in monetary terms. Therefore, to standardize differences in WTP estimates from different countries, currencies and years, price premiums for all sustainable attributes were calculated as a percentage. It was measured as the percentage change in WTP for the sustainable attribute

Table 1: Searching terms used and number of articles from Google Scholar.

Searching Term	Date of acquisition	Number of articles
"Sustainable seafood" and "Consumer preferences"	Studies from 2006-2021: 16.03.2022	734
	Studies since 2022: 09.11.2022	101
"Sustainable fish" and "Consumer preferences"	Studies from 2006-2021: 18.03.2022	352
	Studies since 2022: 09.11.2022	49
"Sustainable seafood" and "Willingness to pay"	Studies from 2006-2021: 24.03.2022	708
	Studies since 2022: 09.11.2022	127
"Sustainable fish" and "Willingness to pay"	Studies from 2006-2021: 30.03.2022	426
	Studies since 2022: 09.11.2022	52
"Sustainable seafood" and "Price premium"	Studies from 2006-2021: 30.03.2022	575
	Studies since 2022: 09.11.2022	58
"Sustainable fish" and "Price premium"	Studies from 2006-2021: 29.03.2022	316
	Studies since 2022: 09.11.2022	26

Table 2: Inclusion and exclusion criteria.

Criteria	Decision
Keywords exist anywhere in the paper	Inclusion
The paper published in 2006-2022	Inclusion
The paper is in the English language	Inclusion
Provides information for the research questions	Inclusion
Papers published before 2006	Exclusion
Duplicate versions	Exclusion
Review papers, meta-analyses, papers that are not accessible and non-English	Exclusion
Papers that do not provide information for the research questions	Exclusion
Papers that are not primary research	Exclusion

Table 3: Studies included in the meta-analysis.

Study	Sustainability attribute	Estimation method	Region
Whitmarsh and Wattage (2006)	Environmentally friendly	Contingent valuation method	Europe
Erwann (2009)	Environmentally friendly	Contingent valuation method	Europe
Ariji (2010)	Environmentally friendly, Local/domestic	Conjoint analysis	Asia
Olesen *et al.* (2010)	Organic, Other	Choice experiment	Europe
Wakamatsu *et al.* (2010)	Environmentally friendly	Other methods	Asia
Davidson *et al.* (2012)	Environmentally friendly, Local/domestic	Conjoint analysis	America
Xu *et al.* (2012)	Environmentally friendly, Organic	Other methods	Asia
Uchida *et al.* (2013)	Environmentally friendly	Other methods	Asia
Blomquist *et al.* (2015)	Environmentally friendly	Other methods	Europe
Chen *et al*. (2015)	Environmentally friendly, Organic	Choice experiment	Europe
Fonner and Sylvia (2015)	Environmentally friendly, Local/domestic	Choice experiment	America

Lim *et al.* (2015)	Environmentally friendly, Local/domestic	Choice experiment	America
Ankamah-Yeboah (2016)	Organic	Hedonic pricing	Europe
Salladarr´e *et al.* (2016)	Environmentally friendly	Contingent valuation method	Europe
Bronnmann and Asche (2017)	Environmentally friendly	Choice experiment	Europe
Yip *et al.* (2017)	Environmentally friendly	Choice experiment	America
Bronnmann and Hoffmann (2018)	Environmentally friendly	Choice experiment	Europe
Del Giudice *et al.* (2018)	Environmentally friendly	Hedonic pricing	Europe
Onofri *et al.* (2018)	Environmentally friendly	Contingent valuation method	Europe
Zander and Feucht (2018)	Environmentally friendly, Organic, Local/domestic, Other	Contingent valuation method	Europe
Banovic *et al.* (2019)	Environmentally friendly, Local/domestic	Choice experiment	Europe
Hynes *et al.* (2019)	Environmentally friendly	Contingent valuation method	Europe
Yi (2019)	Environmentally friendly	Contingent valuation method	Asia
Hori *et al.* (2020)	Environmentally friendly, Other	Choice experiment	Asia
Menozzi *et al.* (2020)	Environmentally friendly	Choice experiment	Europe
Vitale *et al.* (2020)	Environmentally friendly	Other methods	Europe
Asche *et al.* (2021)	Environmentally friendly	Hedonic pricing	Europe
Mulazzani *et al.* (2021)	Environmentally friendly	Contingent valuation method	Europe
Xuan (2021)	Environmentally friendly	Choice experiment	Asia
Weir *et al.* (2021)	Organic	Choice experiment	America
Nguyen *et al.* (2022)	Environmentally friendly	Contingent valuation method	America
Shi *et al.* (2022)	Environmentally friendly, Organic	Choice experiment	Asia
Sigurdsson *et al.* (2022)	Environmentally friendly	Other methods	America

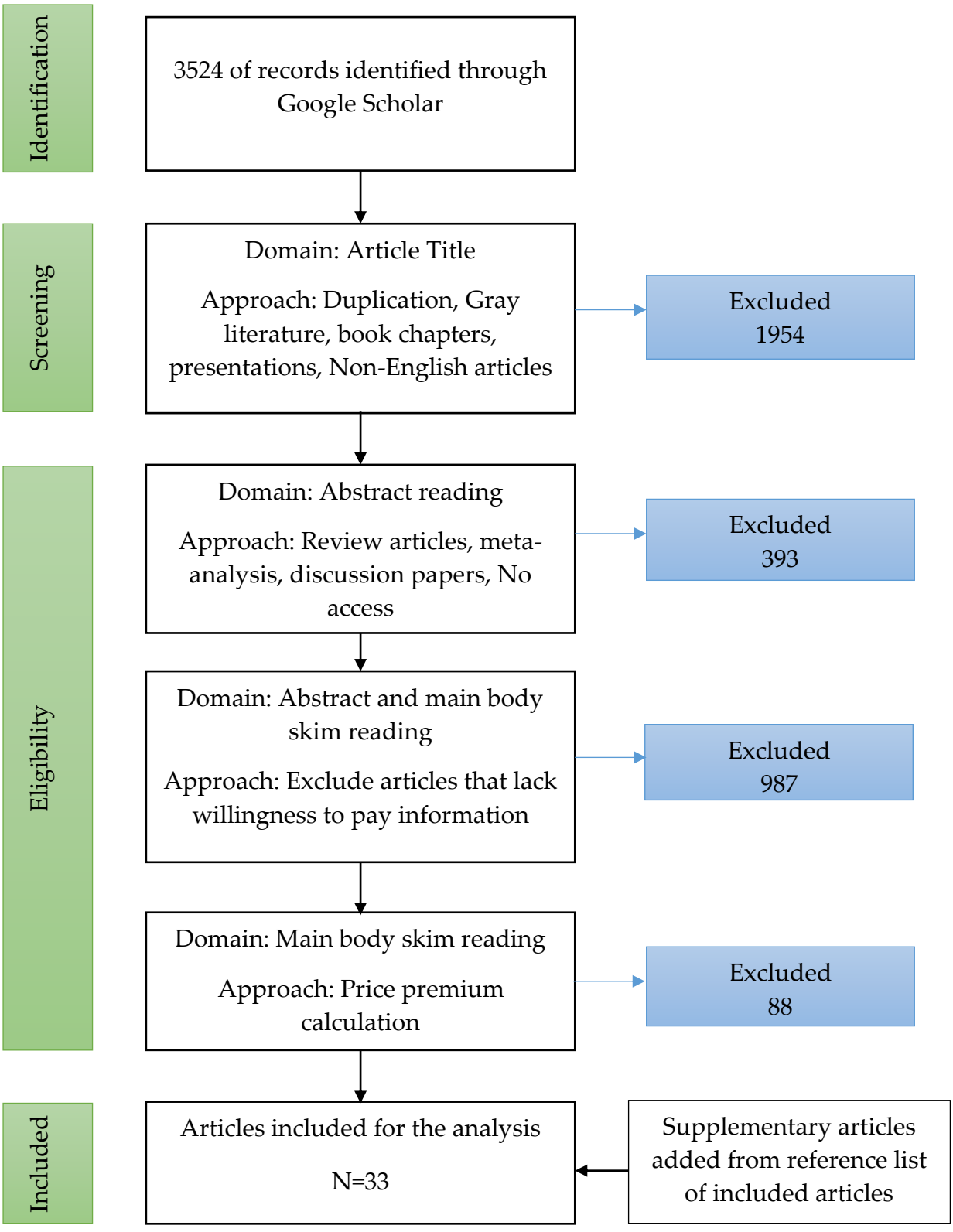

Figure 1: Flow diagram of literature search and selection for meta-analysis.

relative to the base price. The base price was gathered from the study itself.

As the independent variables are categorical, a reference group was required for the study characteristics. For the sustainable attributes of seafood (i.e. 'environmentally friendly', 'organic' and 'local/domestic'), 'other attributes' (i.e. animal welfare, without discards and non-threatened) was used as the reference group. For the regional differences (i.e. 'Europe' and 'America'), 'Asia' was used as the reference group. For the estimation methods, (i.e. 'choice experiment/conjoint analysis', 'contingent valuation' and 'hedonic pricing') 'other methods' (i.e. experimental auctions, difference-in-difference method, face-to-face survey and interviews etc.) were used as the reference group. By considering the valuation method (hypothetical/non-hypothetical) and publication type, we included variables 'hypothetical' (by using non-hypothetical as the reference group) and 'journals' (by using published in others as the reference group) as independent variables.

The studies considered in the analysis reported consumer WTP for different sustainable attributes of seafood. Production of environmentally friendly seafood acts as an important tool for ensuring the sustainability of the fisheries sector. With the application of best environmental practices, the sustainability of aquaculture is ensured by the organic farming of seafood. Additionally, local/domestic production of seafood improves the environmental and social sustainability compared to imported seafood.

Different methods are used to determine the consumer WTP for sustainable seafood worldwide. 'Choice experiment/conjoint analysis' allows respondents to choose alternatives with different bundles of attributes at different levels, rather than allowing them to state their preference only for a particular scenario. 'Contingent valuation' is a method based on surveys that provide a way of estimating values where markets don't exist. The 'hedonic pricing' method is a revealed preference method that estimates the WTP of consumers under a non-hypothetical, real situation based on observations in the markets.

It is not statistically efficient to equally consider each WTP estimate in meta-regression models as it can avoid

Table 4: Independent variables of the regression model.

Variable	Definition	Mean	Standard Deviation
Environmentally friendly	1 if the study tested Environmentally friendly, 0 otherwise	0.610	0.490
Organic	1 if the study tested Organic, 0 otherwise	0.121	0.327
Local/domestic	1 if the study tested Domestically Produced, 0 otherwise	0.135	0.343
America	1 if the study was done in America, 0 otherwise	0.092	0.290
Europe	1 if the study was done in Europe, 0 otherwise	0.745	0.438
Choice experiment/ conjoint analysis	1 if the study was done by using the choice experiment or conjoint analysis method, 0 otherwise	0.546	0.500
Contingent valuation	1 if the study was done by using the contingent valuation method, 0 otherwise	0.369	0.484
Hedonic pricing	1 if the study was done by using the Hedonic pricing method, 0 otherwise	0.035	0.186
Hypothetical	1 if the study was done by using a hypothetical valuation method, 0 otherwise	0.929	0.258
Journal	1 if the study was published in a Journal, 0 otherwise	0.922	0.269

taking into consideration the fact that some WTP estimates are assessed with more precision and provide more information for the meta-analysis. Usually, in meta-analysis studies, the inverse of the variance of each estimate is taken as the regression weights. However, it is not possible to calculate the variances, when the studies do not report confidence intervals or standard errors. To address this, various alternative methods are employed. Taking sample sizes as weights, is a common method used (Nelson and Kennedy, 2009). Thus, we used sample size as the weight. Weighted Ordinary Least Squares (Weighted OLS) regression models are widely used in

meta-analysis (Nelson and Kennedy, 2009). A Weighted OLS was used to answer the research questions. The expected model for the Meta-regression can be written as below.

$$WTP = \alpha + \beta_1 environmentally\ friendly + \beta_2 organic + \beta_3 local/domestic + \beta_4 America + \beta_5 Europe + \beta_6 choice\ experiment /conjoint\ analysis + \beta_7 contingent\ valuation + \beta_8 hedonic\ pricing + \beta_9 hypothetical + \beta_{10} journal + \varepsilon$$

α is the intercept and ε is the normally distributed error term that has a zero mean and constant variance σ2. Table 4 presents the definition and summary statistics of independent variables used for the model. The data were analyzed using R commander.

RESULTS AND DISCUSSION

As shown in Figure 2, the majority of the studies (30) in the analysis, considered consumer WTP for 'environmentally friendly' seafood. Consumer preference for 'organic' seafood was estimated by seven studies while six studies evaluated the 'local/domestic' attribute. The least number of studies (03) considered other sustainable attributes. However, some studies considered more than one sustainability attribute.

The 'choice experiment/conjoint analysis' method was used by 46% of the studies included in the analysis followed by 27%, 18% and 9% using 'contingent valuation', 'other methods' and 'hedonic pricing' respectively (Figure 3).

According to Figure 4, more than half of the studies (55%) were conducted in European regions while 24% and 21% of studies were recorded from Asia and America.

The results show that the highest average price premium (32.89%) was given for the organic attribute. This is consistent with the 20-40% current price premium that the organic attribute had in the global market (Xia and Zeng, 2008). Further, Li and Kallas (2021) found in a meta-analysis conducted on sustainable food products that the highest WTP estimate was (38.1%) for organic attributes among sustainable attributes considered in their study. The average price bonus for environmentally friendly seafood was

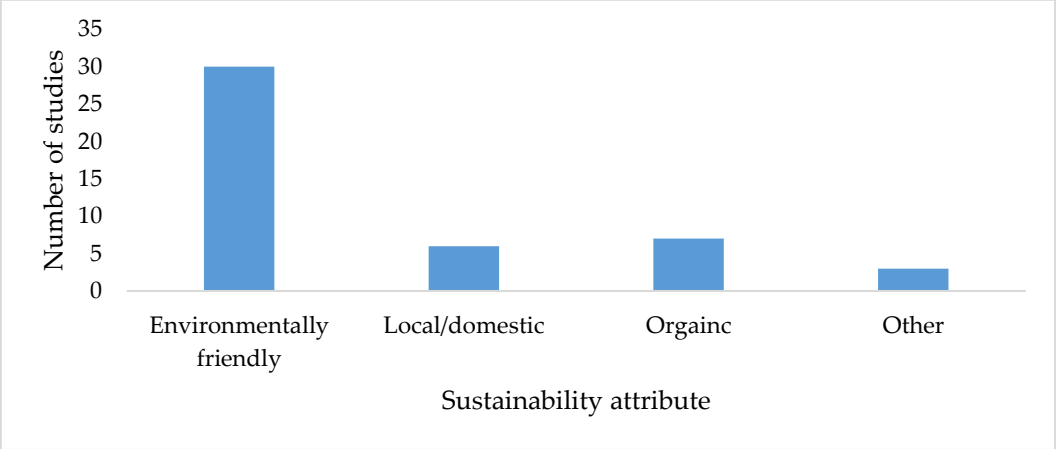

Figure 2: Number of studies on sustainability attributes.

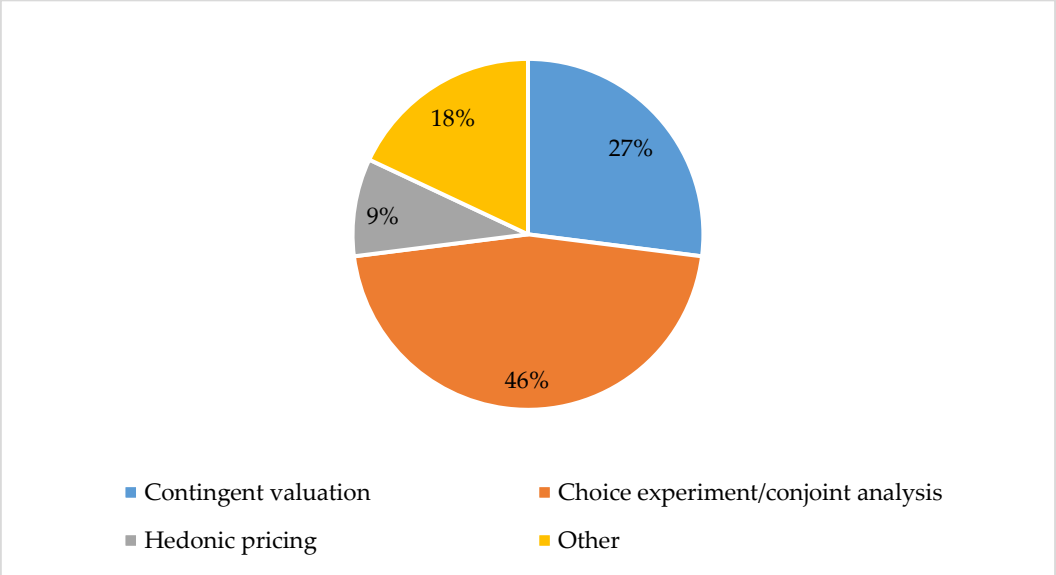

Figure 3: Number of studies on the estimation method used.

28.68%. Similar estimates were obtained by Yang and Renwick (2018) and, Li and Kallas (2021) for the environmentally friendly attribute by meta-analysis on livestock products (26.3%) and sustainable products (21.1%) respectively. An average price premium of 24.53% resulted for the locally or domestically produced attributes while the lowest was recorded for other attributes (14.22%). It is in line with the price premium of 21.1% for the local attribute estimated by Li and Kallas (2021). However, Yang

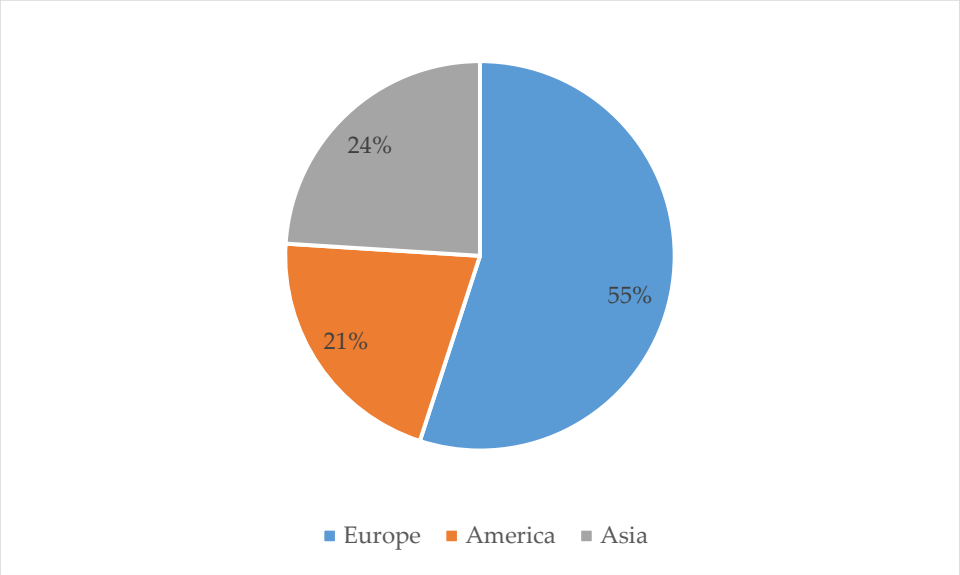

Figure 4: Number of studies on regions.

and Renwick (2018) found a higher value of 40.30% for the country of origin or region of origin.

The outcomes of the regression model (excluding outliers) are presented in Table 5. The coefficient of determining value (R squared value) of the model is 0.5738. It shows that the independent variables explain 57.38% of the variation in the dependent variable. The higher the R-squared value, the better the model.

The production of organic fish requires full control over the production process, the origin of eggs to adult fish, and food composition to water quality. As such, the word "organic" cannot be used for wild-caught fish. The EU Regulation 710/2009 and 834/2007 has recently taken aquaculture into consideration and deals with its organic certification (Mauracher et al., 2013). Under EU Regulation 834/2007, organic production is defined as a comprehensive system. This includes, managing the farm; producing food production while combining the best environmental practices; preserving natural resources; applying high animal welfare standards; a high level of biodiversity; and a method of production that certain consumers prefer for products made with natural processes and substances. Organic labels contribute to the protection of the environment, animal well-being and

Table 5: Results of the regression model

Variable	Estimated Coefficient	Standard Error	t value	p-value
Intercept	1.528	0.182	8.376	<0.001***
Environmentally friendly	0.040	0.070	0.563	0.57429
Organic	0.236	0.094	2.527	0.01269 **
Local/domestic	0.163	0.091	1.799	0.07441*
Europe	-0.295	0.065	-4.510	<0.001***
America	-0.208	0.089	-2.342	0.02069 **
Choice experiment/ conjoint analysis	0.423	0.160	2.637	0.00939 ***
Contingent valuation method	0.313	0.169	1.849	0.06672*
Hedonic pricing	-0.126	0.142	-0.884	0.37812
Hypothetical	-0.204	0.203	-1.003	0.31786
Journal	-0.291	0.105	-2.776	0.00631 ***

*R^2=0.5738, F statistic=17.5***, ***1% significance or better, ** 5% significance, *1% significance.*

rural development (EU, 2007). However, to maintain all of these organic production standards, additional costs are needed.

The results of the meta-regression showed that compared to the reference group 'other attributes', the estimated WTP is the highest for organically farmed fish and it is significant. Therefore, this has significant implications for aquaculture producers who are involved in organic farming. Significantly higher consumer WTP estimates for organic attribute were found by meta-analysis conducted on extra virgin olive oil (Del Giudice *et al.*, 2015), coffee (Abdu and Mutuku, 2021), sustainable products (Li and Kallas 2021), and fruits and vegetables (Kilduff and Tregeagle, 2022).

'Local/domestic' attribute also reported statistically significant higher WTP values compared to the 'other attributes'. Locally and domestically produced seafood can be considered socially conscious and eco-friendly alternatives to imported seafood. McClenachan *et al.* (2016) showed that

consumers have identified the main benefit of purchasing local seafood as support for maintaining their local economy sustainably for future generations. Supporting their community was another social advantage that consumers were considering when purchasing local fish. Moreover, they showed that consumers were more sensitive to the social benefits of buying local fish than to the environmental benefits. The most important environmental advantage identified by consumers is the reduction of the carbon footprint through the reduction of various factors which include the use of electricity, fossil fuels, other resources, and transportation. Similarly, consumption of domestically produced products also ensures three dimensions of sustainability by taking advantage of higher values provided by domestic supply chains (economic), supporting local producers (social) and reducing food miles (environmental) (Bryla, 2021).

Environmentally friendly production is another important characteristic of sustainability worldwide. In the fisheries sector, eco-labels can be viewed as an important tool for promoting environmental sustainability. These eco-labeled products have the same quality as regular non-eco-labeled products. However, the only difference is that they have fewer adverse effects on the environment (Erwann, 2009). A price premium on eco-labeled seafood products provides a return on investment for sustainable fishing practices. Thus, it provides incentives for fishers to adopt sustainable methods. The Marine Stewardship Council (MSC) label is considered as the most prominent eco label in marine fisheries. In 2019-2020, over 18,735 seafood products carried the MSC blue label in 71 countries (MSC, 2020). In addition to studies on other eco labels and environmentally friendly production, many studies (i.e. Wakamatsu *et al.,* 2010; Blomquist *et al.*, 2015; Chen *et al.,* 2015; Lim *et al*., 2015; Bronnmann and Asche, 2017; Bronnmann and Hoffmann, 2018; Hori *et al.*, 2020) used in this analysis also considered the price premium percentages placed by consumers for MSC label which ensures the seafood production in an environmentally friendly manner. Three key principles are considered in issuing the MSC label i.e. avoiding overfishing (sustainable fish stocks), minimizing environmental impacts (e.g.: limiting bycatch and

usage of destructive fishing gears) and effective management (Asche *et al.*, 2015). Eco-labels thus guarantee the environmental sustainability of marine products. However, the results of this regression model were not significant for the environmentally friendly seafood attribute (β=0.040) even though it indicated a low positive price premium. One possible reason for this can be considered to be a lack of consumer knowledge about eco labels that ensure the environmental sustainability of seafood. Jonell *et al.* (2016) found that the perceived level of understanding and recognition of the majority of eco-labels was low to moderate. Jonell *et al.* (2016) suggested that the emotional aspect of consumer decision-making needs to be strengthened. It also recommends that consumers be more familiar with eco labels. The results of the model also reveal that the price premium consumers have placed for the environmentally friendly attribute is lower compared to organic seafood. This is similar to the findings of Maesano *et al.* (2020) that concluded it may result from less understanding and recognition of consumers about eco labels when compared to organic labels of seafood. Further, Li and Kallas (2021) also identified that consumers display lower price premiums for environmentally friendly food products in general relative to organic food products.

The significant and highest WTP was resulted for the 'organic' attribute. Zander and Feucht (2018) showed that out of seven different attributes related to sustainability, consumers display the highest WTP for organic attribute. Additionally, Li and Kallas (2021) reported that organic attribute received the highest WTP compared to other attributes in their meta-analysis on sustainable food products and mentioned that it fits with the rising consumption of organic food products in the present. The WTP for 'organic' seafood is significant and higher even compared to 'local/domestic' seafood. This is in line with the findings of Zander and Feucht (2018) and Li and Kallas (2021). As a result, retailers can and use this justification to prioritize and draw attention to organic products. To attract customers, organic labels should to be highlighted before other sustainable attributes (Li and Kallas, 2021).

The findings indicate that 'choice experiment/conjoint analysis' and 'contingent valuation' elicit

significantly higher WTP estimates compared to the other methods. This is in accordance with the findings of Dolgopolova and Teuber (2017) which show that values estimated by choice experiments and contingent valuation methods are significantly higher.

Results indicate that American and European consumers show significantly less WTP values for sustainable seafood than Asians (reference group). This might happen because, compared to European and American nations, the concept of sustainable seafood is relatively new and less established in domestic consumer markets of Asian countries. As a result, over time, consumers in European and American regions might acquire a greater understanding with experience of the actual costs of sustainable seafood products and consumers in Asian countries might overestimate the value due to their lack of exposure to sustainable seafood products. Yang and Renwick (2019) also showed that Europeans and North Americans have lower WTP for credence attributes of livestock products, while Asians show higher WTP. Li and Kallas (2021) reported that Asian WTP for sustainable products is higher than North Americans showing that one rationale for this could be that sustainable labelling in products is an incomplete marketing technique for goods viewed as low quality in America and thus, improving quality perceptions and awareness of sustainable labels is necessary to gain a premium in distinct food markets. Additionally, they showed that Asians are more concerned about food safety and are more willing to pay.

Furthermore, published in journals also positively significantly influence the WTP compared to the reference group, published in others. Yang and Renwick (2019) reported similar findings and concluded that publication can be considered an indicator of the quality of studies where studies with higher quality may produce higher WTP estimates.

Based on the results of the study, the preference of consumers for 'organic' and 'local/domestic' seafood labels can be identified as important tools to ensure the sustainability of the fisheries industry. Therefore, this has significant implications for aquaculture producers who are involved in organic farming and local seafood producers to strengthen production. These findings highlight a significant global demand

for sustainable seafood products, offering valuable insights for stakeholders to understand market trends and encouraging governments to advance sustainable policies related to the fisheries industry.

However, this study has several limitations. This study mostly emphasizes the WTP of developed countries as the majority of the studies included in the analysis are conducted in developed countries while only two studies are used from developing countries, there are fewer studies of consumer WTP for sustainable seafood available in the developing world. Additionally, the socio-demographic factors of the consumers were not considered for the analysis. However, the socio-demographic factors of consumers may cause heterogeneity in WTP. Therefore, to improve policies for the sustainable seafood sector, future research should expand both the scope and number of studies.

CONCLUSION

This study showed that consumers are significantly more likely to pay for organic and local/domestic seafood. Variations in consumer WTP based on the estimation methodology used were found in this study. It was found that the choice experiment/conjoint analysis and contingent valuation resulted in a significantly higher WTP for sustainable seafood when compared to the reference methods. The results of the analysis indicated that Americans and Europeans have a significantly lower WTP percentage when compared to Asians and showed that there were variations in the WTP for sustainable seafood based on the region. Furthermore, the publication also caused variations in WTP. However, this study had several limitations as the majority of the studies considered are reported from developed countries. Additionally, socio-demographic characteristics of consumers may cause heterogeneity in WTP.

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