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Consumer Purchase Intentions for Sustainable Wild Salmon in the Chinese Market and Implications for Agribusiness Decisions

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Abstract: Sustainable food consumption and production play an increasingly important role in improving food security and quality in the food system worldwide. Consumers' food consumption patterns in China, a rapidly emerging economy with the largest population and one of the largest consumer markets in the world, significantly influence the structure of global trade flows and the sustainable ecosystem and environment. In this paper, we assess the emerging demand for imported wild and sustainable Alaskan salmon fillet and varietal parts in China's market through consumers' stated purchase intentions for the products. We use an ordered logit model to link consumers' purchase intentions with potential influencing factors and identify important factors, including consumers' consumption habits, perceptions, and social demographic characteristics. Due to differences between western and Chinese consumers on how different parts of fish are consumed, seemingly low-value salmon heads and bones may carry significant value if being imported and sold to Chinese consumers. We believe that our study is an important step in helping to build a sustainable business model, thereby creating a win-win situation for both the importing and exporting countries in order to allocate resources efficiently, feed people with healthy food, avoid food waste, and fulfill the economic value of products.

Keywords: sustainability; consumption; purchase intentions; wild salmon; China market

1. Introduction

With global population growth and social demographic changes, sustainable food consumption and production play an increasingly important role in ensuring food security and improving food quality in the global system. Sustainable development in the agricultural and food sector includes the ecological component of preserving the environment and using natural resources in a sustainable way, and the social component of integrating agriculture with the needs of society and gaining support from both the public and governments [1]. Understanding consumers' attitudes towards sustainable food consumption and designing a sustainable production and supply system will help the industry to utilize natural resources along the food value chain efficiently, as well as reduce food waste [2] and the excess use of chemicals that contaminate the environment [3].

China, as an emerging economy with the largest population in the world, has experienced rapid economic development in the last three decades. Accordingly, Chinese consumers' food

preferences and consumption patterns have been moving in a consistent direction and catching up with the world trend. With the rise of a middle-class earning a significant disposable income, there emerges a large consumer segment that cares about quality and pursues high-end food products [4]. Due to environmental pollution and a number of food-safety scandals in China in recent years, Chinese consumers have growing concerns about food safety and possible contamination of the domestic food supply. This creates a strong demand for food sourced from clean, safe and natural environments, especially imported products of good quality and reputation. In addition, under the "Belt and Road" initiative proposed by the Chinese government aiming to promote China's international cooperation and efficient resource allocation, environmental sustainability is becoming a significant factor influencing production and consumption decisions.

China's seafood market is the largest in the world [5] and an increasing proportion of that is from imported sources [6]. A significant proportion of seafood products imported into China is processed and then re-exported to other countries; the rest is consumed domestically, especially the species not produced locally [7,8]. Imported salmon, a highly valued seafood, has gained increasing popularity among Chinese consumers due to its health benefits and taste [9]. Currently, farm-raised salmon from Norway and Chile are dominating the Chinese market, while wild salmon, such as Alaska salmon, from clean and natural environments, are sold only in a few upscale restaurants and not yet available to mass consumers. However, since its natural and safe production environment results in superior food quality, wild salmon has begun to attract consumers' attention. According to 2012 data, Alaska sockeye salmon exports have risen, which reflects a growing demand from Chinese consumers for highly valued wild seafood [10].

In the meantime, there are significant differences between western and Chinese consumers on how different parts of fish are consumed. In the US, for example, most consumers only eat salmon fillet. Even though other varietal cuts or parts of salmon are sold in the market occasionally, their prices are usually very low. In contrast, it is well known that Chinese culinary traditions include the cooking of fish heads, tails and bones for various soups and stews that are considered to be healthy meals. These salmon varietal parts are usually displayed together with fillets for sale in supermarkets, and they may carry significant value if being imported and sold to Chinese consumers. This potential not only helps enhance the economic value of salmon for producers, but also contributes to the sustainable use of natural resources and waste minimization in the global food system.

In this paper, we assess the emerging demand for imported wild and sustainable salmon fillet and varietal parts from Alaska in China's market through consumers' stated purchase intentions for the products. We build a model to link consumers' purchase intentions with potential influencing factors, including consumers' seafood and salmon consumption habits, perceptions on sustainable production environments, taste, and nutrition of seafood from such environments, and social demographic variables. The objectives of the paper are (1) to understand Chinese consumers' purchase intentions of imported wild salmon, which is harvested through sustainable fishing practices in natural and pure environments; (2) to examine the factors that affect the potential purchase of the products and provide insights into consumer segmentations that show a preference for the sustainable seafood; and (3) to provide guidance on the sustainable business potential for the entire seafood value chain and policy implications in order to align production with consumption in a sustainable way for policy-makers.

2. Background and Literature

There are two methods for quantifying consumers' preference, the revealed preference and stated preference methods. The former applies to goods already existing in the market, and researchers use observations on actual choices to measure the influence on consumer behavior of market or policy factors such as price, labeling mandates, information in the advertisement and media reports, and income [11–13]. The latter applies to emerging goods or even hypothetical goods not yet in the market or attributes of goods that are not observable.

Currently, the stated preference methods become popular because the market is more consumer driven, and new products and new concepts of producing and promoting products are introduced into markets at an accelerating rate. Many of such products or concepts are relevant to sustainable practice, such as locally grown food, organic food, and food with animal welfare attributes. Most of these studies used survey-based stated preference methods that provide the flexibility to elicit consumers' preferences for existing or hypothetical attributes.

Over the last three decades, a rich literature on consumer demand for food attributes has developed and the research consistently demonstrates that consumers value food attributes, both intrinsic and extrinsic ones. Some extrinsic attributes only provide external benefits and do not necessarily affect the intrinsic attributes of food. Consumers show a preference and willingness to pay for these attributes such as animal welfare [14–16] and fair trade or labor practices [17–19] for the benefit to the public instead of their own individual benefit.

Other attributes directly affect the taste and health content of the food products, and thus the well-being of the consumers, such as food-safety characteristics, country of origin, eco-friendliness, organic or sustainable production practice. Food safety is always a concern and consumers are skeptical about the use of pesticides, genetic modification, antibiotics, and other substances or technology. Consumers are found to be willing to pay a premium for foods that avoid these methods [20–22]. A large number of studies also confirm that consumers are willing to pay for country-of-origin labels (COOL) showing a preference for food from home countries or developed countries [23–26], not only because they are ethnocentric but also because they believe the COOL signals high quality [27]. Consumers have shown purchase intentions or willingness to pay for ecolabeled products because of environmental and/or food-safety concerns [28–30]. Consumers' valuations of organic food or sustainable food are also elevated [31–33], because it not only preserves the environment but also may improve intrinsic attributes such as taste and nutrition. Consumers perceive food of this kind as tastier, safer and healthier, as well as being environmentally and animal friendly [34,35].

Most of the aforementioned research has investigated consumers in developed countries. The concepts of organic or sustainable production practice are still relatively new to consumers in China, an emerging economy. Although there is some research about Chinese consumer purchase intentions [36,37], attitudes [38,39], motives [40] or support [41] for organic or sustainable food, the categories studied are general organic foods or vegetables. There is very limited research on Chinese consumers' preferences for sustainable food in a specific category, such as seafood, the production and harvest of which significantly affect environmental sustainability.

Chinese consumers have growing awareness of health and environmental issues related to food production [41]. While there is an argument about the integration of human health and environment into the field of food [42,43], some research recommended that health should be the principle to change consumer behavior since personal benefit may have a greater potential to support behavior change [44,45]. Therefore, it is important to assess the effects of the production environment, health and nutrition content benefits resulting from sustainable production practices on Chinese consumers' potential purchases in order to understand their preferences for seafood that follows sustainable production practice.

Our study will contribute to the literature by providing an in-depth understanding about Chinese consumers' purchase intentions for wild sustainable seafood, specifically salmon. Since wild salmon is not widely available in the Chinese market yet, a purchase intention survey is a helpful tool to forecast consumer's behavior and the market potential of emerging products [46,47]. Many studies have examined the causal relationship between various determinants and purchase intentions. Consumers' familiarity and prior experience with the product, attitudes towards it, and perceptions of its attributes are all potential determinants affecting purchase intentions [48–51]. Consumers' characteristics are also important in determining their purchase intentions [49]. In addition, researchers relate purchase intentions to the perceived value of a product which is determined by consumers' perceptions of the quality and price of the product [52–55]. In this study, we follow

the conceptual relationship between perceived value and purchase intentions to build a model linking potential determining factors with consumers' purchase intentions for Alaska salmon fillet and heads/bones. A particular contribution of this study is that our selection of studying salmon fillet and heads/bones facilitate us to propose a very practical agribusiness model to align food production and distribution to consumption in a sustainable way under the global food system framework.

3. Methodology

3.1. Conceptual Framework

Since Alaskan wild salmon is relatively new to mass Chinese consumers, we examine consumer stated intentions to purchase wild salmon fillet and heads/bones and identify important factors that affect their purchase intentions. Consumers' purchase intentions are affected by their perceived value (perceived value was developed in previous studies in multiple dimensions including social, emotional, functional, epistemic and conditional value [56–58]. In this paper, we simplified the mechanism of perceived value and emphasized the impact of consumers' perceptions on product attributes including production environment, taste and nutrition content on perceived value and thus purchase intention. Further dimensions of perceived value may be considered in future research) of the salmon that is determined by their perceptions of the quality and price of the product. Their perceptions on the quality of wild sustainable salmon derive from their attitudes towards the extrinsic and intrinsic attributes of the product. Consumers who perceive positive benefits of clean production environment, superior taste, and higher nutrition content from Alaskan wild sustainable salmon may consider that the product has a higher quality and, thus, have greater intentions to purchase it. The extrinsic environmental benefits may affect the taste and nutrition content of the product which altogether result in a higher perceived quality. In addition, prior experience such as previously established seafood consumption habits and salmon consumption preferences may affect consumers' intentions to purchase new products. Social demographic information that describes consumers' characteristics are important factors affecting their purchase intentions. Figure 1 shows the conceptual framework describing the important factors that potentially affect consumers' purchase intentions for Alaskan wild salmon. Although both salmon fillet and heads/bones are sustainably harvested, the effects of different factors on purchase intentions may vary between the fillet and varietal parts due to the different nature of these two products.
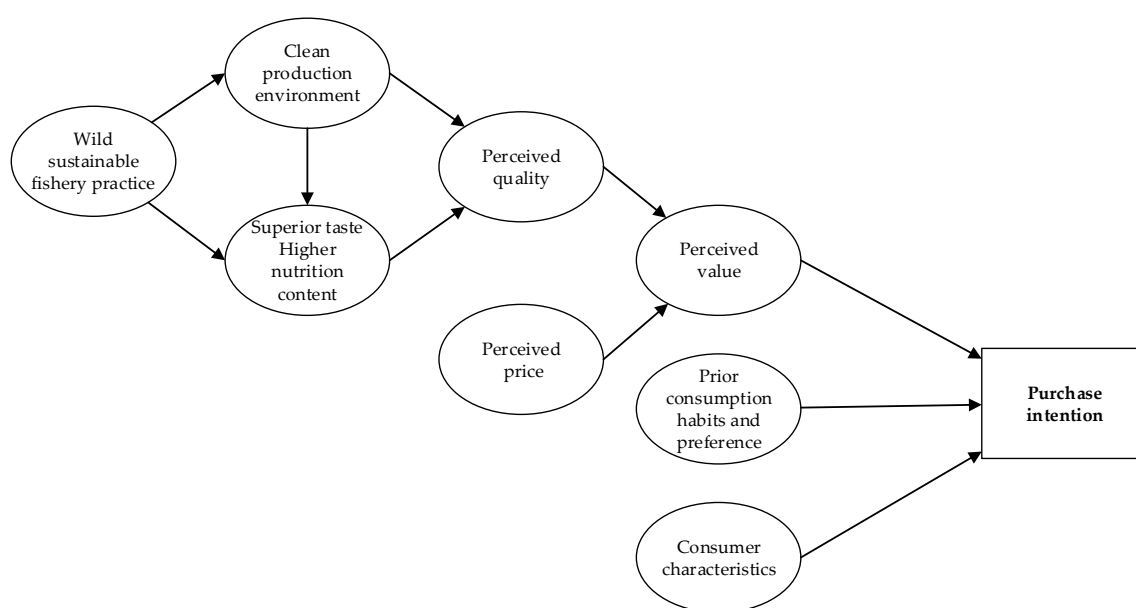

Figure 1. Conceptual framework.

3.2. Model

Economic theory states that consumers make their consumption choices to maximize their utilities, subjective values measuring their satisfaction, under certain constraints, such as budget and availability constraints. They make a consumption choice only if that choice brings them higher utility than other choices under the same constraints. The utility, or satisfaction, may be based on the quantity, quality, and cost of consumption goods, and attributes such as sustainability and altruistic factors. It is also different across individuals, so that an individual consumer's own characteristics also affect the utility levels.

In our study, assuming the utility can be represented by the common random utility function with linear specifications, the utility of individual i, U_i^*, can be represented as:

$$U_i^* = x_i'\beta + \varepsilon_i \tag{1}$$

where x_i represents a vector of factors affecting the utility from buying the product, β denotes the corresponding coefficients, and ε_i represents the unobserved random component that is assumed to be logistically distributed.

The consumer choices we investigate in this study are their stated intentions to purchase the products by choosing one of five categories. Variable Y_i records the response and assumes values as 1 if the response is "Definitely would not buy it", 2 if "Probably would not buy it", 3 if "Might or might not buy it", 4 if "Probably would buy it", and 5 if "Definitely would buy it". The ordered responses represent a censored version of the consumer's true underlying utility, U_i^*. Higher levels of U_i^* indicate that the consumer has a higher intention to buy the product and lower levels mean the consumer has a lower intention to buy it. Following [59], the consumer's decision is represented by the underlying utility as:

$$Y_i = \begin{cases} 1, & i.e. \text{ "Definitely would not buy it"} & \text{if } \mu_0 < U_i^* \le u_1 \\ 2, & i.e. \text{ "Probably would not buy it"} & \text{if } u_1 < U_i^* \le u_2 \\ 3, & i.e. \text{ "Might or might not buy it"} & \text{if } u_2 < U_i^* \le u_3 \\ 4, & i.e. \text{ "Probably would buy it"} & \text{if } u_3 < U_i^* \le u_4 \\ 5, & i.e. \text{ "Definitely would buy it"} & \text{if } u_4 < U_i^* \le u_5 \end{cases} \tag{2}$$

where u_k ($k = 1, 2, \ldots, 5$) indicates the utility threshold level corresponding to each decision category. Particularly, $u_0 = -\infty$ and $u_5 = +\infty$.

The probability of observing a respondent choosing a particular purchase intention category equals the probability that their utility is within the range of the threshold levels of that category. The probability of observing a specific response $Y_i = j$, $j = 1, 2, \ldots, 5$ for individual i is:

$$\begin{aligned} P(Y_i = j) &= P\left(u_{(j-1)} < U_i* \le u_j\right) \\ &= P\left(u_{(j-1)} < x_i'\beta + \varepsilon_i \le u_j\right) \\ &= P\left(u_{(j-1)} - x_i'\beta < \varepsilon_i \le u_j - x_i'\beta\right) \\ &= \frac{e^{u_j - x_i'\beta}}{1 + e^{u_j - x_i'\beta}} - \frac{e^{u_{(j-1)} - x_i'\beta}}{1 + e^{u_{(j-1)} - x_i'\beta}}, \text{ for } j = 1, 2, \ldots, 5 \end{aligned} \tag{3}$$

The likelihood function is obtained by multiplying the probabilities across all respondents. Maximizing the log likelihood function provides the estimates of coefficients and the threshold levels for the ordered logit model.

The exponential value of the estimated coefficient is the odds ratio which is the ratio of the cumulative odds of the dependent variable belonging to a certain category or higher versus its

belonging to the lower categories, i.e., $P(Y_i \geq j)/P(Y_i < j)$ where $j = 1, \ldots, 5$. In the ordered logit model, these odds are assumed constant for any category j.

We implemented the ordered logit model procedure in Stata 14 (Code is available upon request) to examine potential impact factors on consumer's purchase intentions for wild salmon fillet and heads/bones from Alaska, respectively.

3.3. Survey and Data

We recruited local graduate students to administer the survey during June and July 2015 at three representative cities in China including Beijing, Shanghai, and Guangzhou. Consumers living in the three topline cities have relatively higher purchasing power and easier access to upscale grocery outlets to buy imported foods. In each city, we selected nine representative large supermarkets or hypermarkets (such as Carrefour and Walmart) in the districts within the urban area and each of them carried fresh salmon in the seafood department. Teams of two trained student interviewers conducted the surveys at the supermarkets randomly assigned to them. They randomly invited shoppers from the supermarkets to participate in the survey with cash compensation to the respondents. If the randomly invited shopper refused to participate in the survey, they randomly asked another shopper about interests in participation. In total, we interviewed 1028 respondents and obtained 1017 valid observations with complete information, with 339 in Beijing, 338 in Shanghai, and 340 in Guangzhou.

Table 1 presents descriptive statistics of the social demographic variables representing consumer characteristics. In our survey, 35% of respondents were male and 65% were female. The fact that female respondents outnumber males by almost 100% is consistent with many other consumer surveys conducted at shopping sites. For most households, the female household members usually do the grocery shopping. The average age of the respondents was 37 years old, with a range from 18 to 85 years old. Twenty-six percent of the respondents had high school or lower education, 22% had some college education including vocation school or an associate degree, 37% had a bachelor's degree, and 15% had a graduate degree. On average, each household had 3.6 people and half of them had children living with them. The average annual household income was 130,000 RMB (around $21,000 USD). Over the past two years, 51% of the respondents experienced an income increase, 3% experienced an income decrease, and 46% had their income remain the same. Twenty-four percent of the respondents had migrated from small towns or rural areas to cities over the past two years.

Table 1. Descriptive statistics of consumer characteristic variables.

Variable	Description	Mean (%)	Std Dev
age	Age in years	37.20	13.51
hhnum	Number of household members	3.63	1.59
income	Annual household income (in ten thousands of RMB)	13.00	6.11
male	Male	0.35 (35%)	0.48
edu_hs	High school or lower	0.26 (26%)	0.44
edu_col	Vocational school or associate	0.22 (22%)	0.42
edu_ba	Bachelor's degree	0.37 (37%)	0.48
edu_grad	Graduate degree	0.15 (15%)	0.35
d_child	Children presence	0.50 (50%)	0.50
inc_in	Income increase over last two years	0.51 (51%)	0.50
inc_de	Income decrease over last two years	0.03 (3%)	0.18
inc_sa	Income stay the same over last two years	0.46 (46%)	0.50
migrant	Migrate to city over last two years	0.24 (24%)	0.43
city_BJ	Beijing	0.33 (33%)	0.47
city_SH	Shanghai	0.33 (33%)	0.47
city_GZ	Guangzhou	0.33 (33%)	0.47

Note: All variables are dummies except *age*, *hhnum*, and *income*, which are continuous variables.

Table 2 shows descriptive statistics of potential determining variables including respondents' seafood purchase habits, salmon consumption preference and perceptions on wild vs. farm-raised seafood in terms of production environment, taste and nutrition content. As shown in Figure 1, those variables are potential determining factors on consumers' purchase intentions. Regarding

preference for seafood harvest methods, 25% of the respondents often buy wild seafood, 40% buy both wild and farm-raised seafood, 11% often buy farm-raised seafood, and 24% do not pay attention to, or do not understand, the difference. The last two groups combined form a segment of 64% of consumers who do not have a strong preference for the seafood harvest method.

Table 2. Descriptive statistics of purchase habits, consumption preference and perception variables.

Variable		Description	Mean (%)	Std Dev
Harvest Method	*harvest_wild*	Often buy wild seafood	0.25 (25%)	0.43
	harvest_both	Often buy both wild and farm raised seafood	0.40 (40%)	0.49
	harvest_farm	Often buy farm raised seafood	0.11 (11%)	0.32
	harvest_none	Does not pay attention to the difference	0.24 (24%)	0.43
Preservation Method	*pres_water*	Often buy fish preserved in water tank	0.76 (76%)	0.43
	pres_chill	Often buy chilled fish	0.11 (11%)	0.31
	pres_froze	Often buy frozen fish	0.05 (5%)	0.22
	pres_other	No strict preference for preservation method	0.08 (8%)	0.27
Preparation method	*cook_raw*	Often eat salmon raw, sashimi or sushi	0.66 (66%)	0.48
	cook_fry	Often eat salmon pan fried, deep fried or grilled	0.13 (13%)	0.34
	cook_stew	Often eat salmon steamed, boiled or stewed	0.15 (15%)	0.36
	cook_other	Often cook salmon using other methods	0.06 (6%)	0.24
Dining Venue	*place_home*	Often eat salmon at home	0.21 (21%)	0.40
	place_restarant	Often eat salmon at restaurants	0.46 (46%)	0.50
	place_both	Often eat salmon at home and restaurants	0.28 (28%)	0.45
	place_other	Often eat salmon at other venues	0.05 (5%)	0.21
Perceptions	*clean*	Perceive Alaska as a high quality, safe and clean seafood production environment	0.57 (57%)	0.50
	tasty	Perceive Alaskan wild seafood tastes better than farm raised seafood	0.57 (57%)	0.49
	nutritious	Perceive Alaskan wild seafood as more nutritious than farm-raised seafood	0.53 (53%)	0.50

Note: All variables are dummies, and the means are the percentages falling in the corresponding categories.

In the survey, we asked respondents to provide the proportions of fish they purchased in 2014 that are live in water tanks at stores, chilled, or frozen, respectively. We consider the respondents having an obvious preference for a specific preservation method if the proportion of their 2014 fish purchase in that form is larger than that of the other two forms. Seventy-six percent of the respondents preferred live fish in water tanks, 11% preferred chilled fish, 5% preferred frozen fish, and 8% did not show a clear preference one way or another.

Regarding salmon cooking methods, 66% of the respondents often ate salmon raw, as sashimi or sushi, 13% often cooked salmon as pan fried, deep fried, or grilled, 15% often cooked salmon as steamed, boiled or stewed, and the final 6% used other cooking methods. In terms of the venues where consumers eat salmon, 21% of the respondents often ate salmon at home, 46% at restaurants, 28% at both restaurants and home, and 5% at other venues. Although the methods of preparing salmon are not complicated, almost half of the respondents chose restaurants as their primary salmon consumption venue. This indicates that salmon is relatively new to the Chinese diet and consumers have not gained much experience of preparing it in the kitchen at home.

We asked consumers for their perceptions on attributes of Alaskan wild seafood, including the production environment, taste, and nutritional content. Fifty-seven percent of the respondents perceived Alaska as a high-quality, safe, and clean seafood production environment, while the remaining 43% did not think so or were not sure. This variable shows consumers' perception of an extrinsic attribute of salmon, which is the production environment. By contrast with farm-raised salmon, which generates many environmental concerns [60,61], the wild salmon "production" procedure is all natural, which does not pollute the environment and its harvesting is also managed in a sustainable way. Although the sustainable environment in the production of salmon in Alaska is not a direct benefit for Chinese consumers, the consequential effect on the premium taste and nutrition of salmon may benefit Chinese consumers more directly. We found 57% of the respondents perceived

that Alaskan wild seafood tastes better than farm-raised seafood, and the other 43% did not think so or were not sure. Fifty-three percent of the respondents perceived Alaskan wild seafood as more nutritious than farm-raised seafood, while 47% disagreed or were unsure.

To gain an understanding of consumers' potential purchase decisions on wild salmon, we asked consumers to express their intentions to buy wild salmon fillet from Alaska if it is available at an acceptable price while they were shopping on that day. (In the conceptual framework, we showed that the perceived value is determined by perceived quality and price. In the survey, instead of providing objective price or eliciting subjective price, we control price by adding an assumption to the question of " . . . if it is available at an acceptable price while you were shopping on that day".) We adopted the traditional 5-point purchase intention scale in this question [62]. Respondents answered the question by selecting one of five categorical choices and 19% of them "Definitely would buy it", 40% "Probably would buy it", 28.4% "Might or might not buy it", 9.3% "Probably would not buy it", and 3.3% "Definitely would not buy it".

We designed a similar question to ask the consumers to express their intentions to buy wild salmon heads and bones from Alaska assuming they are available at an acceptable price which is much cheaper than salmon fillet while they were shopping on that day. (Heads are the whole heads chopped off from the body with meat in the collar and behind the gills. Bones refer to the remaining part of the fish after the fillets are sliced away from both sides of the salmon body. It usually comes with the skeleton bones and meat attached to it. These two cuts are often displayed alongside with the salmon fillet in supermarkets in China for sale. In addition, we control the price of salmon heads/bones by adding an assumption to the question of " . . . assuming they are available at an acceptable price which is much cheaper than salmon fillet while they were shopping on that day".) We found that 18.7% of the respondents "Definitely would buy it", 37.5% "Probably would buy it", 24.1% "Might or might not buy it", 12.6% "Probably would not buy it", and 7.2% "Definitely would not buy it".

Since the two questions on stated purchase intentions are similar, a comparison between answers is summarized in Figure 2. The average purchase intentions for heads/bones are lower than those for fillet, but not substantially. However, there are similar percentages of respondents who would definitely buy wild salmon fillet or heads/bones, indicating a segment of consumers who are strongly interested in purchasing wild salmon products from Alaska.
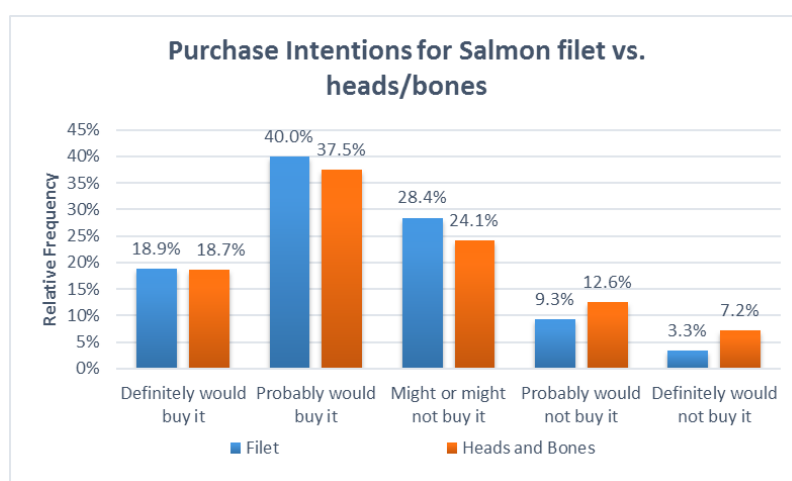

Figure 2. Consumers' purchase intentions for Alaskan wild salmon fillet vs. heads and bones.

4. Results

We report the estimation results from the ordered logit model of consumers' purchase intentions for wild salmon fillet and heads/bones, respectively. Heterogeneity of purchase intentions in consumer groups is indicated by the characteristic variables. We describe the model results by interpreting the

sign and odds ratio of each significant coefficient. (In our interpretation, we simplify the wording of the odds ratio of belonging to a certain category or higher versus that of belonging to the lower categories by the wording of the odds ratio of a greater purchase intention.)

4.1. Purchasing Wild Salmon Fillet from a Sustainable Production Environment

Table 3 shows the estimated coefficients and odds ratios in the wild salmon fillet model. First, it reveals that education has an increasingly strong positive influence on consumers' wild salmon fillet purchase intentions. Consumers with an associate, bachelor's or graduate degree tend to have a greater intention to purchase wild salmon fillet than consumers with high school or lower education. The odds of consumers with an associate, bachelor's, and graduate degree having a greater purchase intention are 1.4, 1.5, and 1.8 times, respectively, the odds of consumers with high school or lower education. Second, family size also affects the purchasing intention significantly. The odds of having a greater intention to purchase wild salmon fillet is 1.1 times higher when there is one additional member in the household. Third, interestingly, the income coefficient is insignificant, indicating the intention to purchase wild salmon fillet may be less of a budget-driven, but more of a subjective utility-driven behavior. When the income factor is under control, higher-educated consumers show a higher stated purchase intention due to higher valuation on the health benefits of wild salmon, a feeling of enjoying imported trendy food, or the positive environmental impact of consuming sustainable wild salmon.

Table 3. Ordered logit model for consumers' purchase intentions for wild salmon fillet from Alaska.

Variable	Coef.	Std. Err.	Odds Ratio
male	−0.123	0.126	0.884
age	0.005	0.005	1.005
edu_col	0.301 *	0.181	1.351
edu_ba	0.401 **	0.176	1.493
edu_grad	0.588 ***	0.226	1.800
hhnum	0.102 **	0.045	1.108
d_child	−0.072	0.139	0.931
income	−0.010	0.011	0.990
inc_in	0.207 *	0.123	1.230
inc_de	−0.452	0.348	0.637
migrant	0.012	0.143	1.012
city_SH	0.317 **	0.151	1.374
city_GZ	0.025	0.152	1.025
harvest_wild	1.052 ***	0.186	2.864
harvest_both	0.790 ***	0.159	2.203
harvest_farm	0.367 *	0.217	1.443
pres_water	−0.332	0.226	0.718
pres_chill	−0.317	0.289	0.728
pres_froze	−0.814 **	0.341	0.443
cook_raw	0.145	0.185	1.156
cook_stew	−0.040	0.223	0.961
cook_other	0.567	0.438	1.763
place_home	0.980 ***	0.188	2.665
place_both	0.697 ***	0.148	2.008
place_other	−1.358 ***	0.476	0.257
clean	0.519 ***	0.135	1.680
tastey	0.375 ***	0.143	1.454
nutritious	0.219	0.142	1.245
$\mu1$	−1.585	0.465	
$\mu2$	−0.023	0.441	
$\mu3$	1.804	0.441	
$\mu4$	3.956	0.456	

Note: ***; ** and * indicate significance level at 1%, 5%, and 10%, respectively.

Consumers, whose income has increased over the last two years have greater purchase intentions than consumers whose income did not change. However, a decrease of income does not impose a significant effect on the purchase intention. The odds of consumers experiencing an income increase having a greater purchase intention are 1.2 times the odds of consumers whose income stayed the

same. This is consistent with the observations that the rising middle class with higher disposable income has been following the world's leading trend in food consumption and generating demand for high-quality food, especially food from clean and safe sources [63].

The odds of Shanghai consumers having a greater purchase intention are 1.4 times the odds of Beijing consumers, while Guangzhou consumers show no difference in the comparison with the base group of Beijing consumers. Shanghai, a global financial center and transport hub, has experienced the fastest development during the economic boom in China. Consumers in this city have been exposed to high-quality domestic and imported food products and also have been the consumption trend setter in the country [64].

Consumers who often purchase wild seafood, farm-raised seafood, or both wild and farm-raised seafood have a greater intention to buy wild salmon fillet than the base-group consumers who do not pay attention to or do not understand the difference between the two production methods. The odds of consumers who often buy wild seafood, both wild and farm-raised, and farm-raised seafood are 2.9, 2.2 and 1.4 times, respectively, the odds of those who do not pay attention to or do not understand the difference. Thus, it is more likely for consumers to express purchase intentions for Alaskan wild salmon fillet and make purchase decisions when they are familiar with the distinction between wild and farm-raised seafood, especially if they have established a preference for wild seafood due to prior consumption experience.

Consumers who prefer to buy frozen seafood have a lower intention to purchase wild salmon fillet, with odds approximately half of those who do not have a preference for seafood preservation methods. On the other hand, those who prefer live fish and chilled fish have similar salmon fillet purchase intentions as the base group of consumers with no preference for preservation methods. Since salmon was first introduced to China as sashimi or sushi in Japanese cuisine, consumers tend to associate salmon with the fresh and unfrozen form. As shown in Table 2, 66% of the respondents choose raw sashimi or sushi as the primary method of eating salmon, while the most common Chinese fish-cooking methods of steaming, boiling or stewing only account for 15%, far behind the first category. Although most Chinese consumers usually buy live fish from water tanks, as reported in Table 2, there is a small number of consumers preferring frozen fish due to preservation convenience. Consumers who always buy frozen fish will be less likely to buy salmon if they believe it should be eaten raw.

Consumers who often eat salmon at home, or at both home and restaurants, have a greater intention to buy wild salmon fillet than consumers who often eat salmon only at restaurants, with the odds ratios of a greater purchase intention being 2.7 and 2.0, respectively. It is straightforward to think that, for the consumers who eat salmon mostly at restaurants, they may not have a high intention to buy the fillet products from markets compared with consumers who eat salmon mainly at home. Those who eat salmon at places other than home or restaurants showed lower intentions to buy salmon fillet than even the restaurant diners. The "other places" mean places like friends' or relatives' homes, and these people tend to be marginal consumers of such products whose purchasing intention is only 26% of those restaurant diners. Furthermore, consumers eating at home pay attention to the nutrition content and health benefits of food more than those dining at restaurants [65]. Thus, consumers may be more likely to purchase this healthy product for home consumption. There is no statistically significant impact of the difference in salmon-cooking methods on consumer's purchase intention for wild salmon fillet.

Consumers who perceive Alaska to be a high-quality, safe, and clean seafood production environment have a higher purchase intention to buy wild salmon fillet, with an odds ratio of a greater purchase intention 1.7 times the odds of consumers who do not have such a perception. Consumers who think Alaskan wild seafood tastes better than farm-raised seafood have an odds ratio of a greater purchase intention of 1.5 times the odds of consumers who do not perceive this. Hence, consumers' positive perception on production environment and premium taste significantly affects their potential purchase on sustainable wild salmon fillet. Since these two variables are included in the ordered logit regression model with multiple variables, the effects of perceptions on the extrinsic and

intrinsic attributes can be interpreted in a ceteris paribus way, i.e., given the salmon tastes the same and all other attributes remain the same, the positive perception of the production environment will increase consumers' purchasing intention 1.7 times, and vice versa.

4.2. Sustainable Consumption of Wild Salmon Varietal Parts to Minimize Waste

Typical western salmon consumers do not have the culinary tradition of eating varietal parts of fish. Fish processors usually discard the varietal parts of the fish as waste or utilize them as low-value ingredients in feed or pet-food products. By contrast, in China fish head is a popular food among consumers and one of the most consumed fish parts [66]. Thus, from the perspective of Chinese consumers, the heads and bones of wild salmon of premium quality can be efficiently utilized and built into a healthy diet.

Table 4 presents the estimation results from the ordered logit model of consumers' purchase intentions for wild salmon heads and bones. We proceed in a similar fashion as the previous section to interpret the significant coefficients and odds ratios. The odds of consumers with associate degrees or vocational college having a higher purchase intention are 1.4 times the odds of consumers with high school or lower education. The bachelor's and graduate degree holders do not show a higher purchase intention than the base-group, high school, or lower–educated consumers. Although fish heads and bones are considered healthy meals in Chinese culinary tradition, they are not high-end products compared to the fillet cuts and may not be appealing to the consumers with higher education which is a proxy for a higher social status in China.

Table 4. Ordered logit model for consumers' purchase intentions for wild salmon heads/bones from Alaska.

Variable	Coef.	Std. Err.	Odds Ratio
Male	−0.179	0.123	0.836
Age	−0.003	0.005	0.997
edu_col	0.362 **	0.178	1.436
edu_ba	0.196	0.172	1.216
edu_grad	0.284	0.22	1.328
Hhnum	0.026	0.042	1.026
d_child	−0.165	0.136	0.848
Income	−0.026 **	0.011	0.974
inc_in	0.319 ***	0.121	1.375
inc_de	−0.088	0.334	0.916
Migrant	−0.009	0.14	0.991
city_SH	0.013	0.15	1.013
city_GZ	0.216	0.149	1.241
harvest_wild	1.261 ***	0.184	3.529
harvest_both	0.631 ***	0.154	1.879
harvest_farm	0.191	0.206	1.211
pres_water	−0.423 *	0.217	0.655
pres_chill	−0.396	0.276	0.673
pres_froze	−1.180 ***	0.329	0.307
cook_raw	−0.052	0.183	0.95
cook_stew	0.229	0.22	1.258
cook_other	0.204	0.432	1.227
place_home	0.523 ***	0.182	1.686
place_both	0.252 *	0.147	1.287
place_other	−0.798*	0.459	0.45
Clean	0.528 ***	0.131	1.695
Tasty	0.032	0.14	1.033
Nutritious	0.298 **	0.138	1.347
μ1	−2.129	0.435	
μ2	−0.900	0.424	
μ3	0.391	0.422	
μ4	2.359	0.43	

Note: ***; ** and * indicate significance level at 1%, 5%, and 10%, respectively.

Consumers with higher household income have a lower purchase intention for wild salmon heads/bones, again because these varietal parts are not considered as high-end products and there is no positive income effect on the purchase intentions. The odds of a greater purchase intention decrease to 0.97 for consumers earning each 10,000 Yuan higher annual income. However, income increase over the last two years causes consumers to have a higher intention to buy wild salmon heads/bones, consistent with the effect on salmon fillet purchase intention. The odds of consumers with an increased income having a greater purchase intention are 1.4 times the odds of consumers with no income change. This indicates that it is the increase in income, instead of the relative level of income, which stimulates Chinese consumers to adopt new spending behaviors and explore new products. This is in line with the observed consumption pattern changes of the emerging middle class who experience an upgrade in economic and social status [67].

Consumers who often purchase wild seafood or both wild and farm-raised seafood have a higher intention to buy wild salmon heads/bones than consumers who do not pay attention to or do not understand the difference between wild and farm-raised seafood. The odds of a higher purchase intention for the two segments of consumers are 3.5 and 1.9 times, respectively. This is consistent with the findings for fillet purchase. Prior experience and preference for wild seafood make it easier for consumers to purchase wild salmon parts.

Consumers who often buy frozen seafood have a lower intention to purchase wild salmon heads/bones than consumers who do not have a strict preference for particular seafood preservation methods. The odds of consumers who often buy frozen seafood are 0.3 times the odds of consumers who do not have a strict preference for particular seafood preservation methods. Consumers who often eat salmon at home, or both at home and restaurants, have a greater intention to buy wild salmon heads/bones than consumers who often eat salmon at restaurants. The odds of these two types of consumers are 1.7 and 1.3 times, respectively, the odds of consumers who often eat salmon at restaurants. There is no statistically significant impact of the seafood cooking method on purchase intentions for wild salmon heads/bones.

Consumers who perceive Alaska as a high-quality, safe, and clean seafood production environment have a higher purchase intention to buy wild salmon heads/bones, with an odds ratio of a greater purchase intention 1.7 times the odds of consumers who do not have such a perception. This is similar to the wild salmon fillet case; Chinese consumers having a positive perception on the extrinsic environment attribute show a greater purchase intention. By contrast with the results on fillet purchase intentions, consumers' perceptions of the taste of wild seafood does not affect their purchase intentions for wild salmon heads and bones. Instead, consumers who believe Alaskan wild seafood to be more nutritious than farm-raised seafood have an odds ratio of a greater purchase intention 1.3 times the odds of consumers who do not perceive this. The results reflect the fact that Chinese consumers view fish heads and bones as healthy ingredients and value the nutrition content of the heads/bones products. They will show a greater purchase intention, especially when these healthy ingredients are from natural, wild, and sustainable production environments.

5. Discussions and Conclusions

Due to the rapidly expanding trade and globalized market for food products, sustainable food consumption and production is becoming a global trend that brings a better quality of life while minimizing waste and pollution. China is a rapidly emerging economy with the largest population and one of the largest consumer markets in the world. Chinese consumers' food consumption patterns play an important role on the structure of global trade flows, sustainable ecosystems and the environment. Although wild salmon does not currently account for a large share of the Chinese market, Chinese consumers' significant purchase intentions for wild salmon fillet and head/bones indicate an emerging new market potential for wild seafood from natural, clean and sustainable production environments.

In this study, we identified important factors that have effects on Chinese consumers' purchase intentions, including their seafood and salmon-specific consumption habits, perceptions on intrinsic and extrinsic seafood attributes, and social demographic characteristics. For both wild salmon fillet and head/bones, consumers whose incomes have increased over the last two years show a greater purchase intention. Improvement in disposable income and, thus, living conditions, allow Chinese consumers to gain the capacity to explore higher-quality diet options and be able to afford natural and sustainable food products. Consumers who have prior experience in purchasing wild seafood or well-built preferences for wild seafood have greater purchase intentions. As a result, to promote the sustainable consumption and production concept and the health benefits from the food produced following sustainable fishery practice, this segment of consumers will be the first group of supporters. Educating consumers and creating opportunities for them to gain experience and gradually build preference may be an efficient strategy.

In the meantime, while western cuisine has various ways to cook salmon (such as grill, pan fry, oven broil, or smoke), currently the Chinese cooking methods for salmon are limited; most consumers (66% as reported in Table 2) mainly eat it raw as sashimi or sushi. That may explain why we do not find significant effects of salmon cooking methods on purchase intentions. However, consumers who often eat salmon at home have a greater intention to purchase wild salmon fillet and head/bones than consumers who often eat salmon at restaurants. This implies that consumers may pay more attention to the nutrition facts of the food when eating at home. It will be more effective to introduce wild salmon to Chinese consumers if they are provided with various home recipes for cooking salmon.

Although consumers in our survey stated a strong intention to purchase both wild salmon fillet and heads/bones, there is difference between their preferences for fillet and parts. Consumers with higher education, in a larger household, located in Shanghai have a greater intention to purchase wild salmon fillet, but not salmon heads/bones. In addition, consumers with higher income have a lower intention to purchase wild salmon heads/bones.

An important result of this study is that consumers' positive perceptions on the safe, natural and sustainable production environment and premium taste (arguably due to sustainable wild fishery practice) play a significant role in their purchase intentions for wild salmon fillet. Positive perceptions of the production environment with a higher nutrition content for wild seafood causes consumers to have greater purchase intentions for wild salmon heads/bones.

These results suggest that the wild salmon industry can improve its Chinese market by targeting their campaign to the educated urban consumers who experience income rises and who often consume other wild seafood at home. Using the natural and clean environment as a promotion message can also improve the wild salmon sale. With increased demand, the industry will be able to generate higher revenue; it may even refrain from increasing the catching of wild fish, and can use the revenue to further invest in sustainable production technology.

Due to many differences in culinary traditions in fish consumption between western countries and China, Chinese consumers show promising purchase intentions for varietal parts of wild salmon, as revealed by our study. In particular, we believe the seemingly low-value parts of Alaskan wild salmon can potentially carry significant economic value as seafood products to be exported to China. However, a cost-effective business model, which includes an efficient logistics/transportation strategy and reasonable pricing for different salmon fish parts based on a consumer's preference, is important for this to happen. We believe that our study is an important step to help build such a business model, which can then create a win-win situation for the consumers in importing countries, the producers in exporting countries, and the entire global supply chain in order to efficiently allocate resources, feed people with healthy food, avoid food waste, and fulfill the economic value of products.

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