## Citation

**[Article title]**
The influences of quality attributes and socio-demographics on Chinese consumers' general and online consumptions of Canadian, U.S. and Australian lobsters

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1 **The influence of quality attributes and socio-demographics on Chinese**
2 **consumers' general and online consumption of Canadian, U.S. and Australian**
3 **lobsters**
4
5 **Abstract**
6
7 **Structured Abstract:**
8 **Purpose -** This study explores the influence of quality attributes and socio-demographics on
9 Chinese consumers' general and online consumption of three origin-specific lobsters: Canadian,
10 United States, and Australian.
11
12 **Design/methodology/approach -** A web-based survey was administrated to 981 consumers from
13 two cities in China: Shanghai and Qingdao. Descriptive analysis and binary logistic regression
14 were used in the data analysis.
15
16 **Findings -** Chinese consumers were more willing to pay for the lobster quality attributes *vitality,*
17 *meat content, texture, size,* and *safety.* Their general and online consumption of three origin-
18 specific lobsters is significantly linked to the following quality attributes and socio-demographics:
19 *meat content, size, shell hardness, texture, safety, nutrition, age, income, education, occupation,*
20 *residential place* and *marital status.*
21
22 **Originality/value –** This is the first study to explore the influence of quality attributes and socio-
23 demographics on consumers' online consumption of luxury seafood.
24
25 **Keywords:** Chinese consumers, lobster, online purchase, quality attributes.
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27 **Article Classification –** Research paper
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## 1. Introduction

China has become the world's largest seafood market and it is still experiencing expansion (Fabinyi et al. 2016). In particular, there has been a dramatic growth in imported luxury shellfish in China over the past few years: a growth of around 5142% from 2009 to 2016 for the import value of lobster from the United States, and a growth of around 2178% from 2010 to 2015 for the import value of lobster from Canada (Phippen 2017; Statista 2017; Whittle 2015; Xiao 2015). This growth is caused by China's huge population, the rise of the middle-class consumer segment and the important symbolic meaning of luxury seafood consumption in many social aspects, such as networking with important people, showing social status and enhancing face-consciousness (Fabinyi et al. 2012; Lindkvist 2008; Wang and Somogyi, 2020). This expanding demand presents a major opportunity for global luxury seafood producers who wish to diversify their export destinations (Chopin 2015; Fabinyi et al. 2012; Taylor 2015).

China is the world's largest e-commerce market and it has recently experienced a rapid increase in online grocery shopping (Perez 2016; Tong 2017; Xu and Zhao 2016; Wang and Somogyi, 2018; Yuan 2017). In particular, there has been dramatic growth in China's online seafood shopping, which experienced a growth rate of 300% in 2016 (Harkell 2017; ITE Food & Drink 2017). This new trend provides an innovative channel for global seafood products to reach Chinese consumers. Consequently, global seafood marketers need to gain a better understanding of Chinese consumers (in general) and online purchase behaviours for luxury seafood (in particular) if they wish to develop effective online retail strategies for their products in this huge and emerging market.

Only a few empirical studies have identified the important factors that influence the consumer's luxury seafood consumption. These studies were all published in recent years and focused on Chinese consumers, due to the significant and emerging role of China in global luxury seafood consumption. For example, Wang and Somogyi (2020) explored the consumer's choice motives for luxury seafood as a general food type and indicated that symbolic values had a more important influence on luxury seafood consumption than food values in China. Wang et al. (2018) recognised that Chinese consumer's general image of lobster was significantly linked to their lobster perceptions, including *delicious, Western flavour, umami, nutritious, high in protein, enjoy, upscale, appetite, spicy/hot, Chinese flavour* and *risk in illness*. Zheng et al. (2018) noted that *seafood consumption habits*, and *perceived intrinsic and extrinsic attributes* had significant effects on the Chinese consumer's purchase intentions towards Alaskan salmon parts (e.g. head, bone and fillets). Furthermore, these studies found that socio-demographic characteristics played important roles in luxury seafood consumption in China, including *income, education, household size, region, marital status, occupation* and *age* (Wang and Somogyi, 2020; Wang et al., 2018; Zheng et al., 2018). While there is still a lack of understanding of the consumer's quality perceptions and preferences regarding luxury seafood, the consumer's expected or experienced quality has an important impact on their consumption behaviours for food and seafood products (Almli et al. 2011; Cicerale et al. 2016; Lee and Yun 2015; Ophuis and Van Trijp, 1995; Wang and Somogyi 2018; Wang et al. 2018).

A number of studies have aimed to find the important factors that have influenced the consumer's online food shopping behaviours in the past decade or so. The consumer's online food purchases were significantly influenced by their psychological motivations (i.e. *innovation-adoption characteristics* and *food choice motives*), perceived product attributes (i.e. *price* and *convenience*) and socio-demographic characteristics (i.e. *income, marital status, occupation, age, gender* and *household size*) (Chintagunta et al. 2012; Chu et al. 2010; Degeratu et al. 2000; Hansen

et al. 2004, 2005, 2008; Lian and Lin 2008; Mortimer et al. 2016; Schnellbächer et al. 2015; Ramus and Asger Nielsen 2005). The Chinese consumers who are most likely to become frequent users of online food shopping are married and aged between 31 and 40. They have a medium or high income level and a high occupational level (Wang and Somogyi, 2018). However, to our knowledge, no study has examined the consumer's online shopping behaviours with respect to luxury seafood (especially luxury shellfish).

This study will explore this area to examine the influences of quality attributes on the Chinese consumer's general and online consumptions of Australian, Canadian and U.S. (Boston) lobsters. Meanwhile, due to the significant role played by socio-demographic characteristics in luxury seafood consumption and online food shopping, the current study will also explore the influence of socio-demographics on the general and online consumptions of these three categories of lobsters in China. Lobster is selected as the focal luxury seafood product because it has experienced dramatic growth in recent years in the Chinese seafood market, and had an import value of USD 529 million in 2016 (Burman 2017). Australian, Canadian and U.S. lobsters have experienced dramatic growth in import values and have experienced the greatest volume of purchases on Chinese business to consumer (B2C) online platforms (e.g. Tmall.com and JD.com) in recent years (Burrell 2017; Phippen 2017; Statista 2017; Whittle 2015; Xiao 2015).

## 2. Theoretical background

This study associates Chinese consumer's willingness to pay (WTP) for qualitative attributes and their socio-demographics with their general consumption and online purchase of lobster. In particular, this study aims to identify the significant socio-demographic characteristics and quality attributes for the online and general consumption of lobster. This hypothesis is developed based on the significant influence of product quality attributes and socio-demographics on consumer adoption of online food shopping and (luxury) seafood. The following subsections will indicate the theoretical and empirical background of the hypothesis.

### 2.1 Willingness to pay for lobster quality attributes

The consumer's expected or experienced quality is greatly influenced by, or composed of their product attribute perceptions and has an important impact on their consumption behaviours for food and seafood products (Almli et al. 2011; Cicerale et al. 2016; Lee and Yun 2015; Ophuis and Van Trijp, 1995; Wang and Somogyi 2018a; Wang et al. 2018). Previous studies have recognised some of the important product attributes that influence the consumer's attitudes, general image, and consumption concerning shellfish, including *sensory attributes*, *nutrition*, *price*, *farmed/wild*, *safety*, *convenience*, *freshness*, *consumption place*, *consumption accompany*, *mood*, and *origin* (Batzios et al. 2003; Gomez-Jimenez and Rodriguez 2001; Lin and Milon 1993; Manalo and Gempesaw 1997; Wang and Somogyi 2018a; Wang et al. 2018). However, we still do not understand the consumer's quality perceptions and preferences regarding shellfish (especially luxury shellfish); in particular, which product attribute perceptions have the most significant influence on the consumer's quality perceptions of shellfish? Most researchers consider *freshness* to be a vital indicator in the evaluation of shellfish quality (Batzios et al. 2003; Gomez-Jimenez and Rodriguez 2001; Lin and Milon 1993; Manalo and Gempesaw 1997). Wang and Somogyi (2018a) find statistically significant relationships between the Chinese consumer's quality perceptions and their three product attribute perceptions of shellfish (i.e. *freshness*, *mood*, and *perceived ethics*). However, the previous studies have mostly been designed based on second-hand literature reviews, and no consumer-based study can be found that identifies significant shellfish

quality attributes based on a qualitative design (i.e. eliciting relevant product attributes directly from consumers themselves and validly relating them to their quality perceptions).

This quantitative study aims to fill this gap and examine the Chinese consumer's WTP for nine lobster quality attributes: *vitality*, *texture*, *safety*, *size*, *appearance*, *nutrition*, *shell hardness*, *body integrity*, and *meat content*. The nine quality attributes were included based on a prior qualitative survey (November 2016) that elicited Chinese consumer's quality perceptions of lobster and on brainstorming meetings that were held with stakeholders in the Canadian lobster industry (August and October 2016). The definition of WTP is the sum of money that reflects the discrepancies between the consumer's surplus with and without adding or improving a food product attribute, in this case the nine quality attributes of lobster that were used in this study (Rodriguez et al. 2007; Verbeke et al. 2013). The consumer's WTP decisions are composed of two successive stages: first, making the decision to pay a price premium and then deciding how much more they are willing to pay if they desire to purchase the product (Verbeke et al. 2013; Wu et al. 2014). Consequently, a two-stage method was employed in this study to elicit WTP for the lobster quality attributes.

*2.2 Socio-demographics*

Previous studies have indicated some of the significant socio-demographic characteristics that influence the consumer's seafood consumption, including age, gender, education, income, household size, occupation and place of residence (Batzios et al. 2003; Cardoso et al., 2013; Lin and Milon 1993; Myrland et al., 2000; Pieniak et al., 2010; Skallerud et al., 2012; Verbeke and Vackier, 2005; Wang and Somogyi 2018a; Wang et al. 2018). More recent studies have indicated the significant differences in socio-demographic distributions between different consumer segments for luxury seafood consumption, including income, marital status, education, occupation, age and place of residence (Wang et al., 2018; Wang and Somogyi, 2020). Meanwhile, previous studies have also identified some of the significant socio-demographics that drive consumer adoption of online food shopping, including income, marital status, occupation, age, place of residence, gender and household size (Wang and Somogyi, 2018b; Wang et al., 2020).

However, there is still a lack of understanding of the significant socio-demographics that have an effect on the consumer's online purchase of seafood, particularly luxury seafood. Given the important impact of socio-demographic characteristics on (luxury) seafood consumption and online food shopping, this study will examine how socio-demographic characteristics influence the Chinese consumer's general consumption and online purchase of lobster. Eight socio-demographics will be used in this study, as follows: income, gender, household size, marital status, education, occupation, age and place of residence.

## 3. Methods and materials
### 3.1 Participants
A questionnaire was developed in English and translated into Chinese. It was then programmed into an online questionnaire and sent to registered members of a consumer panel owned by a Chinese research agency (with strict identification practices based on the panel member's national ID card and IP address). A convenient sampling method was applied. Only those participants who had eaten or consumed lobster before and who had carefully finished the questionnaire were kept by the survey platform.

Two cities, Shanghai and Qingdao, were selected for data collection to observe the similarities and differences in the consumer's general and online consumptions of lobster between

184  first-tier and second-tier cities. We made this decision because there are many differences in
185  dietary habits, lifestyles, and development levels between different tiered cities in China (Liu et
186  al. 2011; Wang et al. 2017a; Xiao and North 2017). Shanghai is one of China's four first-tier cities,
187  with a population of 24.2 million and per capita monthly disposable income of RMB 4525.
188  Qingdao is one of China's 15 second-tier cities, with a population of 9.2 million and a per capita
189  monthly disposable income of RMB 2973 (Qingdao Statistics Bureau 2017; National Bureau of
190  Statistics of the People's Republic of China 2017; Xiao and North 2017). A total of 981 valid
191  responses were obtained for this survey—511 from Shanghai and 470 from Qingdao. All of the
192  valid participants received a monetary incentive from the research agency and had consumed
193  lobster before. Table 1 shows the socio-demographic characteristics of the sample.
194
195  *3.2 Procedures and measures*
196  The participants were asked to imagine that they were shopping for live lobster in an online shop
197  selling three origin-specific lobsters. They were shown a picture scenario that presented the prices
198  and sizes of the three origin-specific lobsters that they could choose: Canadian lobster, Boston
199  (U.S.) lobster, and Australian lobster (Figure 1). Prices and sizes were formulated based on the
200  average selling prices and sizes of the three origin-specific lobsters in December 2016 on
201  Tmall.com, which is China's largest B2C online platform. The respondents then had to indicate
202  their readiness to purchase these three types of lobster in an online shop, with four choice
203  categories: (1) I do not want to buy any of them, (2) I want to buy Canadian live lobster, (3) I want
204  to buy Boston (U.S.) lobster, and (4) I want to buy Australian live lobster. The variable was first
205  recoded as a binary variable in the total sample to represent whether or not (yes, $n = 756$; no, $n = $
206  225) the consumers were ready to pay for lobster as a general food type from an online shop. Those
207  consumers who chose to purchase one of the three origin-specific lobsters were coded as "yes" to
208  purchasing lobster as a general food type in this study. A categorical variable with three categories
209  was then selected based on the "yes" sub-sample ($n = 756$) to represent the consumer's readiness
210  to purchase one of the three origin-specific lobsters: Canadian lobster ($n = 202$), U.S. lobster ($n = $
211  252), and Australian lobster ($n = 302$).
212      Participants who chose to buy one of the three lobsters were asked to indicate their WTP for
213  nine quality attributes for the lobster that they had chosen. The participants were then presented
214  with definitions of the nine quality attributes in the survey (shown in Table 2).
215      To elicit WTP for the quality attributes, a two-stage method was employed: the participants
216  were first asked to indicate their WTP for each of the nine quality attributes of lobster; they were
217  then asked to indicate how much more they would be willing to pay for the quality attributes that
218  they had expressed WTP for in the first stage. The variables of WTP for the quality attributes of
219  the three lobsters were recoded into WTP variables for lobster quality (binary variables for the first
220  WTP stage, and continuous variables for the second WTP stage). The continuous WTP variables
221  were recoded and represented as additional percentages that the participants were willing to pay
222  for the quality attributes over the original lobster prices (based on the original prices RMB
223  130/500g for Canadian and U.S. lobsters, and RMB 540/500g for Australian lobster; as shown in
224  the picture scenario in Figure 1).
225      The participant's experience of online purchase of live lobster was measured by the question:
226  "How would you describe your online purchase of live lobster?" The answer categories were
227  presented on a four-point ordered scale, as follows: (1) I have never purchased live lobster online,
228  (2) I stopped purchasing live lobster online for a long time, (3) I sometimes purchase live lobster
229  online (less than once a month), and (4) I often purchase live lobster online (more than once a

month). This design was developed based on a previous study that assessed the Chinese consumer's purchase experiences of European beer (Wang et al. 2017). Due to the relatively low response rates for other answer categories, the responses were recoded into a binary variable with three categories for further data analysis, as follows: (0) I have never purchased live lobster online ($n$ = 665) and (1) I stopped, sometimes or often purchasing live lobster online (n=316).

The participant's general consumption experience of lobster was measured by the question: "In how many meals per week (or per month) did you eat lobster in the past year?" The answer categories were presented on a nine-point ordered scale, as follows: (1) almost never, (2) once a month, (3) two to three times a month, (4) once each week, (5) twice a week, (6) three times a week, (7) four to five times a week, (8) six to seven times a week, and (9) eight times and above a week. This design was developed based on a previous study that examined the consumer's consumption experiences of seafood (Olsen 2003). Due to the relatively low response rates for the other answer categories, the responses were recoded into a binary variable with three categories for further data analysis, as follows: (0) almost never ($n$ = 460), (1) once a month or more ($n$ = 521).

>> Insert Figure 1

>> Insert Table 1

>> Insert Table 2

*3.3 Data analysis*

The statistical software tool Stata 14.0 was used to perform all of the analyses in this study. Descriptive analyses were conducted by calculating the percentage of participants who were willing to pay for each of the nine quality attributes and the additional percentages of WTP for the quality attributes over the original prices (Diagne et al. 2017; Koppmair et al. 2017; Verbeke et al. 2013). This aimed to identify the most important product attributes for Chinese consumers in evaluating lobster quality (i.e. those quality attributes with the largest percentages).

Binary logistic regression was employed to associate the Chinese consumer's general and online lobster consumption experiences as dependent variables, with their socio-demographic characteristics and WTP concerning the nine lobster quality attributes (i.e. the binary decision and the decision to pay more than original price) as independent variables. The adoption of a limited dependent variable makes this binary decision appropriate for modelling, in this case concerning the general consumption and online purchase of lobster (Verbeke 2005; Verbeke 2015). Binary logistic regression is a common approach to solve this problem (Verbeke 2005; Verbeke 2015). The binary dependent variable $y_i$ takes the value 1 for a "yes" response to the general consumption and online purchase of lobster by $participant_i$ if a latent continuous variable $w_i$ is larger than 0; otherwise, $y_i$ takes the value zero, representing a "no" response to the general consumption and online purchase of lobster by $participant_i$, as in Equation (1):

$$y_i = \begin{cases} 1 \ if \ w_i > 0 \\ 0 \ Otherwise \end{cases} \quad (1)$$

The latent continuous variable $w_i$ is specified as in a usual regression model, where $x_i$ is a vector of explanatory variables explaining the general consumption and online purchase of lobster by $participant_i$, with $\alpha$ denoting a vector of coefficients and $\varepsilon_i$ denoting the unobserved error term (with the standard logistic distribution) for $participant_i$, as follows:

6

271 $$w_i = \alpha' x_i + \varepsilon_i \quad (2)$$

272 Consequently, a logistic function is gained with the transformation of $y_i$ creating $w_i$. The
273 probability of choosing to buy lobster online ($y_i = 1$) is given by:

274 $$Prob(y_i = 1) = \frac{e^{\alpha' x_i}}{1 + e^{\alpha' x_i}} \quad (3)$$

275 Based on the variables of the general consumption and online purchase of lobster, the
276 socio-demographic variables, and the WTP for lobster quality attributes, the complete empirical
277 specification of the regression model $w_i$ is as follows:

278

279 $$\begin{aligned} w_i = {} & \alpha_0 + \alpha_1 Vitality_i + \alpha_2 Meat\ content_i + \alpha_3 Shell\ hardness_i + \alpha_4 Size_i \\ & + \alpha_5 Texture_i + \alpha_6 Body\ integrity_i + \alpha_7 Appearance_i + \alpha_8 Safety_i \\ & + \alpha_9 Nutrition_i + \alpha_{10} Gender_i + \alpha_{11} Age_i + \alpha_{12} Income_i + \alpha_{13} Education_i \\ & \quad (4) \\ & + \alpha_{14} Occupation1_i + \alpha_{15} Occupation2_i + \alpha_{16} Occupation3_i + \alpha_{17} Occupation4_i \\ & + \alpha_{18} Occupation5_i + \alpha_{19} Place\ of\ residence_i + \alpha_{20} Household\ size_i \\ & + \alpha_{21} Marital\ status1_i + \alpha_{22} Marital\ status2_i + \varepsilon_i \end{aligned}$$

285
286 **4. Results and discussion**
287 *4.1 WTP for the quality attributes of lobster (descriptive analysis)*
288 Tables 3 presents the results of the descriptive analyses for the participant's WTP for the three
289 origin-specific lobsters. More than 50% of participants were willing to pay for the quality attributes
290 *vitality*, *meat content*, *texture*, and *safety* for all of the three specific lobsters. Moreover, the
291 participants were willing to pay more than 10% of the original prices for the quality attributes
292 *vitality*, *meat content*, *texture*, and *size* for all of the three specific lobsters. Therefore, *vitality*, *meat*
293 *content*, *texture*, *size*, and *safety* are the most significant product attributes for Chinese consumers
294 in terms of evaluating lobster quality.
295 Previous studies have indicated the important effect of taste and freshness on consumer
296 behaviour when purchasing shellfish and seafood (Batzios et al. 2003; Birch et al. 2012; Ding
297 2012; Gomez-Jimenez and Rodriguez 2001; Hu et al. 2014; Li and Wu 2015; Lin and Milon 1993;
298 Manalo and Gempesaw 1997; Wang et al. 2018; Wang and Somogyi 2018a). In particular,
299 freshness is an extremely important factor for Chinese consumer's consumption and quality
300 evaluation in terms of seafood and shellfish (Fabinyi and Liu 2014a, b; Fabinyi et al. 2016; Hu et
301 al. 2014; Li and Wu 2015; Wang et al. 2018; Wang and Somogyi 2018a). Consequently, it is
302 reasonable to expect that Chinese consumers will be more willing to pay for freshness-based and
303 taste-related quality attributes (e.g., *vitality*, *meat content*, and *texture*) than other quality attributes
304 of lobster. Furthermore, Chinese consumers are more likely to pay for the quality attribute *safety*.
305 This corresponds to the rising safety concerns regarding seafood among Chinese consumers, due
306 mostly to costal pollution and the frequent food safety events arising in China (Lin et al. 2015; Xu
307 et al. 2012; Wang et al. 2018; Wang and Somogyi 2018a). In addition, Chinese consumers are
308 willing to pay a higher percentage on top of the original price for the quality attribute *size*, possible
309 because lobsters are sold at a higher price with increasing size/weight. Moreover, more than 40%
310 of participants were willing to pay for the quality attribute *body integrity* for both lobster as a
311 general food type and for the three origin-specific lobsters. This importance of *body integrity* might

312 be due to consumers evaluating the vitality of lobster based on its body integrity—lobsters with
313 the loss of claws or feet may be dead or have less vitality.
314
315 >> Insert Table 3
316 >> Insert Table 4
317 >> Insert Table 5
318

319 *4.2 Significant quality attributes for the general and online consumption of lobster (binary*
320 *regression)*
321 Table 4 indicates the results of the binary logistic regression analyses that associate the Chinese
322 consumer's general lobster consumption experience with their socio-demographic characteristics
323 and WTP concerning the nine lobster quality attributes (respectively, for the binary decision and
324 the decision to pay more than original price). Regarding quality attributes, *meat content* and
325 *nutrition* have a significantly positive influence on the Chinese consumer's general consumption
326 of Canadian lobster. *Safety* has a significantly positive influence on their general consumption of
327 Boston lobster. *Size* has a significantly negative influence on their general consumption of
328 Canadian lobster. No quality attribute can be found to have a significant influence on the Chinese
329 consumer's general consumption of Australian lobster.
330       Table 5 indicates the results of the binary logistic regression analyses that associate the
331 Chinese consumer's online lobster consumption experience with their socio-demographic
332 characteristics and WTP concerning the nine lobster quality attributes (respectively, for the binary
333 decision and the decision to pay more than original price). *Nutrition* has a significantly positive
334 influence on the Chinese consumer's online consumption of Canadian lobster. *Texture* has a
335 significantly positive influence on their online consumption of Boston lobster. *Shell hardness* has
336 a significantly negative influence on their online consumption of Canadian lobster. No quality
337 attribute can be found to have a significant influence on the Chinese consumer's online
338 consumption of Australian lobster.
339       In general, *meat content, texture, size,* and *safety* have a significant influence on the
340 Chinese consumer's general or online purchase of lobster. This is in line with our findings that
341 they are the most significant product attributes for Chinese consumers in terms of evaluating
342 lobster quality. While *vitality* has no significant influence on the Chinese consumer's general
343 consumption of lobster, this might be caused because most luxury seafood products are consumed
344 when eating out rather than at home in China. In this case, the food service sector takes on the
345 majority of the responsibility to ensure the freshness of the luxury seafood (e.g. vitality) rather
346 than the consumers themselves (Fabinyi et al., 2016; Wang and Somogyi, 2018a). Furthermore,
347 *nutrition* has a significant influence on both the general and online lobster consumption. This is in
348 line with the significant role that Chinese consumers place on nutritional values in luxury seafood
349 consumption (Wang et al., 2018; Wang and Somogyi, 2020). In addition, this study is the first to
350 recognise that shell hardness has a significantly negative influence on the online consumption of
351 lobster in China. Consequently, lobster marketers should ensure the shell hardness attribute of their
352 products to meet the consumer's needs in China.
353       No quality attribute can be found to have a significant influence on the Chinese consumer's
354 general and online consumption of Australian lobster. This might be a reflection of fact that U.S.
355 and Canadian lobsters have much higher sales volumes than lobsters of other origins (e.g.

356 Australian lobster) in China (Chen 2016). Consequently, although the quality attributes that are
357 linked to real consumption experiences cannot be identified as the important influencing factors
358 for Australian lobster consumption by Chinese consumers, the quality attributes may become
359 significant factors in the future when the Australian lobster market is as mature as U.S. and
360 Canadian lobsters in China.
361
362
363 *4.3 Significant socio-demographics for the general and online consumption of lobster* <mark>*(binary*</mark>
364 <mark>*regression)*</mark>
365 Regarding the influence of socio-demographics on general lobster consumption, *age* has a
366 significantly negative influence on Chinese consumer's general consumption of Australian lobster.
367 *Income* and *managing employee* have a significantly positive influence on their general
368 consumption of Australian lobster. *Shanghai* is significantly and positively linked to the general
369 consumer for lobster with all three countries of origin. Education has a significantly positive
370 influence on the general consumption of Australian lobster, while it has a negative influence on
371 that of Canadian lobster.
372     Regarding the influence of socio-demographics on the online consumption of lobster, *age*
373 has a significantly negative influence on the online consumption of Canadian and U.S. lobsters.
374 *Income* has a significantly positive influence on the consumption of U.S. lobster. *Worker* has a
375 significantly positive influence on that of Canadian lobster. *Marital status- No, but with a partner*
376 has a significantly positive influence on the online consumption of Australian lobster in China.
377     The findings show that *Shanghai* consumers have more general consumption experiences
378 for lobster with all three countries of origin. This is expected because consumers living in first-
379 tiered cities (e.g. Shanghai and Beijing) are more experienced in luxury seafood consumption
380 because of their higher income levels and more developed living environment (e.g. economic and
381 other social sectors) than their counterparts living in other tiered cities in China (Fabinyi et al.,
382 2016; Wang and Somogyi, 2018a; Wang and Somogyi, 2020). While the significant influence of
383 residential place is not found for the online consumption of the lobsters from all the three countries
384 of origin. Given that online shopping can break geographical restrictions for food shopping,
385 residential place is not a significant influencing factor for Chinese consumer's online luxury
386 seafood shopping, unlike that for their general luxury seafood consumption (which is mostly
387 offline).
388     *Young age* has a positive influence on the general consumption of Australian lobster and
389 the only consumption of U.S. and Canadian lobsters. This is in line with the previous findings that
390 young consumers are more likely to purchase food online because of their higher adaptive ability
391 to innovative technologies than older consumers (Hanse, 2005; Wang et al., 2020). Furthermore,
392 previous studies indicate the significant effect of *age* on consumer behaviours related to seafood
393 purchase; that is, older people are more willing to consume seafood and lobster (Cardoso et al.
394 2013; Myrland et al. 2000; Olsen 2003; Pieniak et al. 2010; Wang et al. 2018). However, there are
395 no extant studies regarding the effect of age on consumer choice related to seafood of foreign
396 origin. However, the findings of this study indicate that age has a significant influence on the
397 Chinese consumer's choice of foreign origin related to luxury shellfish (i.e. lobster).
398     *Income* has a significantly positive influence on the Chinese consumer's general consumption
399 of Australian lobster, and their only consumption of U.S. lobster. This confirms the previous
400 findings that consumers with a higher income level are more likely to become frequent luxury
401 seafood consumers (Wang and Somogyi, 2018a; Wang et al., 2018; Wang and Somogyi, 2020).

The findings also reflect the fact that Boston lobster has a much higher online sales volume and Australian lobster has a much higher price than lobsters of other origins in China.

Although previous studies have pointed to the important effects of *education, occupation,* and *marital status* on the consumer's luxury seafood consumption and online food shopping (Wang and Somogyi 2018 a; b; Wang et al., 2018; Wang and Somogyi, 2020), no study has focused on how these socio-demographic characteristics influence the Chinese consumer's general and online consumption related to luxury seafood from different countries of origin. The current study is the first to fill this gap and contribute to our understanding of this market. Consequently, these findings should carefully be considered when developing marketing strategies and promotions for luxury seafood from different origins to meet the right socio-demographic groups in China; for example, the general consumer of Canadian lobster for people with a lower educational level and self-employed people, or the online consumption of Australian lobster for people with a higher educational level and a marital status of 'no, but with a partner'.

## 4.4 Limitations
This study has observed some limitations. First, all of the participants in our study have previously eaten or consumed lobster. Consequently, the sample does not fully represent the general consumers of these two cities. Second, the general consumption experience question—*'For how many meals per week (or per month) did you have lobster in the past year?'*—demands a memory exercise, which might lead to incorrect answers. Third, our sample was collected in 2016. However, the majority of the participants had no online shopping experience of lobster at that time. Given the rapid growth of online seafood market in recent years, there may now be a higher percentage of Chinese consumers who have online purchase experience of lobster.

## 5. Conclusions
Online food shopping is currently a popular research topic and many relevant consumer studies have been published in recent years. In particular, e-commerce increased the availability and accessibility to food resources during the Covid-19 epidemic of 2020. However, there is still a lack of empirical consumer studies in the field of online seafood shopping. Seafood is an extremely perishable food product and needs special consideration for e-commercialisation compared to other food categories that are more easily e-commercialised (e.g. snacks and packaged food). Therefore, understanding the consumer's quality expectation and their significant socio-demographics for shopping seafood online is essential for the success of its e-commercialisation. As far as we know, this is the first study to explore the influence of quality attributes and socio-demographics on the consumer's online consumption of luxury seafood. This is also the first study to recognise significant quality attributes for luxury seafood consumption through a highly reliable approach, including a qualitative consumer survey and the brainstorming among lobster industry stakeholders, which has been confirmed by the quantitative consumer survey. This is an improvement on the previous consumer studies, which only include seafood quality attributes based on literature review and second-hand materials. Our findings are exploratory in nature and have significance for future research that aims to develop reliable confirmatory models to explore the lack of understanding of consumer behaviour for online (luxury) seafood shopping, particularly in East Asia and Chinese-speaking regions (e.g. Malaysia and Singapore) that have similar seafood consumption patterns and cultures.

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447 The empirical findings reported in this study also provide valuable insights in bridging the current
448 gap in understanding the consumer's online purchase behaviour and quality evaluations of luxury
449 seafood in China, which is one of the most desired markets by global seafood producers and is
450 currently experiencing a rising demand for imported high-quality luxury shellfish. The authors
451 have attended many industry and academic conferences in recent years. When they have attended
452 these events in Nova Scotia or in Western Australia, they have always met lobster producers who
453 have expressed their concerns and inquired about the Chinese market. From that perspective, our
454 findings have significant industry implications and can enlighten global lobster or other seafood
455 producers, marketers and exporters to make effective online and offline promotion strategies for
456 their products in the huge Chinese market. For example, they can recognise the correct target
457 groups for online or general consumption of luxury seafood based on the significant socio-
458 demographics of the Chinese consumer's general and online purchase of lobster (e.g. younger
459 consumers for more online shopping of lobster, and living in a first-tier city for more general
460 consumption of lobster). These producers can also improve the quality of their luxury seafood to
461 meet Chinese consumer's expectations based on the significant quality attributes for lobster
462 consumption in China (i.e. safety, shell hardness, texture, and nutrition).
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Table 1. Socio-demographics of the sample

| | | Shanghai | Qingdao | Total sample |
|---|---|---|---|---|
| Sample size (*n*) | | 511 | 470 | 981 |
| Gender | Male | 45.0% | 54.7% | 49.6% |
| | Female | 55.0% | 45.3% | 50.4% |
| Marital status | Married | 60.7% | 61.7% | 61.2% |
| | No, but has a partner | 13.7% | 16.6% | 15.1% |
| | Single | 25.6% | 21.7% | 23.8% |
| Age | Mean value | 32.9 | 31.1 | 32.1 |
| Personal income (RMB, monthly) | 0–5000 | 37.2% | 64.7% | 48.7% |
| | 5001–10000 | 42.7% | 33.4% | 38.3% |
| | ≥ 10001 | 20.2% | 5.5% | 13.0% |
| Education | Junior college and below | 27.6% | 42.8% | 34.9% |
| | Bachelor degree | 56.6% | 46.2% | 51.6% |
| | Master degree and above | 15.9% | 11.1% | 13.5% |
| Occupation | Managing employee | 29.9% | 25.3% | 27.7% |
| | Salaried employee | 38.0% | 28.3% | 33.3% |
| | Student | 14.5% | 15.5% | 15.0% |
| | Worker | 6.7% | 8.9% | 7.7 % |
| | Self-employed | 3.5% | 12.1% | 7.6% |
| | Other | 7.4% | 9.8% | 8.5% |
| Household size | Mean value | 3.44 | 3.72 | 3.57 |
| Have eaten or consumed lobster? | Yes | 100% | 100% | 100% |
| | No | 0% | 0% | 0% |

Table 2. Statements defining the nine quality attributes of lobster shown to participants in the survey

| Quality attribute | Statement |
|---|---|
| Vitality | Vitality is related to the quality of lobsters. "Vitality" means "lobsters move a lot." The more vitality a lobster has, the more the lobster moves around, and the higher is its perceived quality. Are you willing to pay an extra amount of money to buy Canadian/Boston/Australian live lobsters online that have a high level of vitality when they are delivered to your place of residence? |
| Texture | The texture of the meat is related to the quality of lobsters. "Good texture" means the lobster is less chewy and is easier to swallow. The better the meat texture of a lobster, the less chewy it is, and the higher the quality. Are you willing to pay an extra amount of money to buy Canadian/Boston/Australian lobsters that have a high grade of meat texture? |
| Safety | Hygiene and safety assurance of lobster is important for consumers' health (to avoid becoming ill by eating lobster). Lobster can be given a certificate of hygiene and safety assurance from professional organizations after inspection and confirmation (e.g., pollution-free and of reliable origin). Are you willing to pay an extra amount of money to buy Canadian/Boston/Australian live lobsters online that have certificates of hygiene and safety assurance? |
| Size | Size is an important factor for lobster. Smaller lobsters are usually sweeter and tenderer, but a bigger lobster means you get more meat. Are you willing to pay an extra amount of money to buy Canadian/Boston/Australian live lobsters of large sizes (over 600 g each for Canadian or Boston lobster, and over 850 g for Australian lobster)? |
| Appearance | Appearance is an important factor for lobster. Good appearance means that the lobster has a replete body and the shell has a bright color. Are you willing to pay an extra amount of money to ensure getting Canadian/Boston/Australian live lobsters with a good appearance from an online shop? |
| Nutrition | Lobster is high in nutritional value, containing plenty of nutrients, such as protein, copper, selenium, vitamin B12, and so on. Lobster can be given a nutritional label (with a list of all its nutrient contents) from professional organizations after inspection and confirmation. Are you willing to pay an extra amount of money to buy Canadian/Boston/Australian live lobsters online that have nutritional labels? |
| Shell hardness | Shell hardness is related to the quality of lobsters. The harder the shell of a lobster among lobsters of the same size, the higher the quality. Are you willing to pay an extra amount of money to buy Canadian/Boston/Australian live lobsters online that have a high level of shell hardness? |
| Body integrity | Body integrity is related to the quality of lobsters. A lobster that is not missing legs, claws, or other parts is higher in body integrity and is higher in quality. Are you willing to pay an extra amount of money to buy Canadian/Boston/Australian live lobsters online that have a high grade of body integrity? |
| Meat content | Meat content is related to the quality of lobsters. The more meat a lobster has compared to lobsters of the same size, the higher its quality. Are you willing to pay an extra amount of money to buy Canadian/Boston/Australian live lobsters online that have a high level of meat content? |

Table 3. Descriptive statistics of WTP for quality attributes of the three origin-specific lobsters

| Quality attribute | Canadian lobster (*n* = 202) | | | U.S. lobster (*n* = 252) | | | Australian lobster (*n* = 302) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Participants (%) | Mean (RMB) | Percent (%) | Participants (%) | Mean (RMB) | Percent (%) | Participants (%) | Mean (RMB) | Percent (%) |
| Vitality | 69.8 | 21.0 | 16.2 | 71.0 | 19.4 | 14.9 | 71.2 | 39.3 | 7.2 |
| Meat content | 63.9 | 19.3 | 14.8 | 61.1 | 21.1 | 16.2 | 61.9 | 38.5 | 7.1 |
| Shell hardness | 26.7 | 13.8 | 10.6 | 29.4 | 15.8 | 12.2 | 34.8 | 35.7 | 6.6 |
| Size | 38.6 | 20.9 | 16.1 | 46.0 | 20.8 | 16.0 | 46.0 | 43.1 | 8.0 |
| Texture | 55.9 | 17.5 | 13.5 | 56.4 | 19.2 | 14.8 | 60.6 | 42.2 | 7.8 |
| Body integrity | 43.0 | 14.2 | 10.9 | 43.2 | 14.4 | 11.1 | 46.7 | 34.0 | 6.3 |
| Appearance | 21.3 | 12.2 | 9.4 | 23.4 | 12.5 | 9.6 | 29.1 | 29.7 | 5.5 |
| Safety | 68.8 | 15.7 | 12.1 | 65.1 | 16.0 | 12.3 | 66.2 | 32.2 | 6.0 |
| Nutrition | 21.3 | 10.8 | 8.3 | 21.0 | 12.3 | 9.5 | 31.8 | 29.6 | 5.5 |

*Notes: Participants = those willing to pay for a quality attribute; mean = the mean value of the extra amount participants are willing to pay for a quality attribute; percent = the average additional percentage participants are willing to pay for a quality attribute (based on the original prices RMB 130/500 g for Canadian and Boston lobsters, and RMB 540/500 g for Australian lobster).*

Table 4. Coefficient estimates from binary logistic regression analyses explaining the influences of consumers' socio-demographics and willingness-to-pay (respectively for the two stages of decisions) for quality attributes on their general consumption of the three specific lobsters

| Independent variable | General consumption (with the binary decision for quality attributes) | | | General consumption (with the decision to pay an extra amount of the original price for quality attributes) | | |
|---|---|---|---|---|---|---|
| | Canadian lobster | Boston lobster | Australian lobster | Canadian lobster | Boston lobster | Australian lobster |
| | Coefficients (Standard errors) | | | | | |
| Vitality | 0.34 (0.39) | 0.01 (0.38) | 0.54 (0.37) | 0.01 (0.01) | -0.005 (0.01) | -0.002 (0.006) |
| Meat content | 0.99* (0.42) | -0.28 (0.39) | 0.71 (0.39) | 0.02(0.01) | -0.01 (0.01) | 0.01 (0.009) |
| Shell hardness | -0.35 (0.45) | -0.19 (0.41) | -0.03 (0.39) | -0.03 (0.02) | -0.005 (0.02) | -0.01 (0.009) |
| Size | -0.28 (0.37) | -0.13 (0.32) | -0.03 (0.33) | -0.03** (0.01) | -0.009 (0.01) | -0.004 (0.006) |
| Texture | -0.43 (0.40) | 0.19 (0.36) | 0.33 (0.35) | -0.008 (0.01) | 0.01 (0.01) | 0.007 (0.006) |
| Body integrity | 0.52 (0.43) | 0.41 (0.37) | -0.01 (0.37) | 0.004 (0.02) | 0.004 (0.02) | 0.0003 (0.007) |
| Appearance | - 0.89 (0.54) | -0.26 (0.42) | 0.17 (0.41) | -0.004 (0.03) | -0.02 (0.02) | -0.0001 (0.01) |
| Safety | -0.16 (0.39) | 1.31** (0.37) | -0.61 (0.35) | -0.01 (0.01) | 0.03* (0.01) | -0.006 (0.007) |
| Nutrition | 1.18* (0.53) | 0.12 (0.43) | 0.07 (0.36) | 0.09* (0.04) | 0.01 (0.02) | 0.01 (0.009) |
| Gender (Male) | 0.16 (0.35) | 0.05 (0.34) | 0.45 (0.30) | 0.22 (0.35) | 0.02 (0.33) | 0.40 (0.30) |
| Age | -0.03 (0.02) | -0.006 (0.02) | -0.05* (0.02) | -0.02 (0.02) | -0.007 (0.02) | -0.04 (0.02) |
| Income | 0.55 (0.31) | 0.39 (0.28) | 0.65* (0.25) | 0.36 (0.31) | 0.34 (0.28) | 0.68** (0.25) |
| Education | -0.80** (0.29) | -0.09 (0.26) | 0.48* (0.23) | -0.67* (0.29) | -0.007 (0.25) | 0.44 (0.23) |
| Occupation1(Managing employee) | 1.58* (0.65) | 0.99 (0.70) | 1.33* (0.61) | 1.67* (0.67) | 1.41* (0.70) | 1.38* (0.60) |
| Occupation2 (Salaried employee) | 0.53 (0.63) | 0.62 (0.65) | 0.55 (0.62) | 0.63 (0.64) | 1.12 (0.65) | 0.78 (0.60) |
| Occupation3 (Student) | -0.98 (0.88) | 0.32 (0.78) | -0.46 (0.77) | -0.95 (0.90) | 0.75 (0.78) | -0.33 (0.75) |
| Occupation4 (Worker) | 0.05 (0.84) | 1.26 (0.86) | 0.57 (0.74) | 0.05 (0.83) | 1.77* (0.87) | 0.69 (0.72) |
| Occupation5 (Self-employed | 1.59 (0.83) | 0.92 (0.97) | 1.42 (0.74) | 1.74* (0.84) | 1.13 (0.96) | 1.54* (0.74) |
| City (Shanghai) | 0.97* (0.37) | 1.28*** (0.35) | 1.36*** (0.33) | 0.96* (0.37) | 1.18** (0.34) | 1.35*** (0.32) |
| Household size | -0.19 (0.15) | 0.20 (0.15) | -0.07 (0.13) | -0.17 (0.15) | 0.20 (0.14) | -0.04 (0.13) |
| Marital status1 (No, but with a partner) | 0.66 (0.68) | -0.00002 (0.46) | 0.92 (0.49) | 0.60 (0.69) | -0.31 (0.47) | 1.28* (0.49) |
| Marital status2 (Married) | -0.15 (0.59) | 0.20 (0.44) | -0.04 (0.49) | -0.32 (0.60) | 0.16 (0.44) | 0.03 (0.48) |
| Sample size ($n$) | 202 | 252 | 302 | 202 | 252 | 302 |
| Prob > Chi$^2$ | 0.0002 | 0.0006 | 0.0000 | 0.0001 | 0.0039 | 0.0000 |
| Pseudo R$^2$ | 0.1901 | 0.1538 | 0.2700 | 0.1970 | 0.1340 | 0.2493 |

*Note: \*\*\* $p < 0.001$; \*\* $p < 0.01$; \* $p < 0.05$.*

Table 5. Coefficient estimates from binary logistic regression analyses explaining the influences of consumers' socio-demographics and willingness-to-pay (respectively for the two stages of decisions) for quality attributes on their online purchase of the three specific lobsters

| Independent variable | Online purchase (with the binary decision for quality attributes) | | | Online purchase (with the decision to pay an extra amount of the original price for quality attributes) | | |
|---|---|---|---|---|---|---|
| | Canadian lobster | Boston lobster | Australian lobster | Canadian lobster | Boston lobster | Australian lobster |
| | Coefficients (Standard errors) | | | | | |
| Vitality | -0.23 (0.39) | 0.04 (0.37) | 0.08 (0.35) | -0.001 (0.01) | -0.02 (0.01) | 0.001 (0.005) |
| Meat content | 0.35 (0.40) | 0.007 (0.37) | 0.32 (0.36) | 0.002 (0.01) | 0.006 (0.01) | 0.00005 (0.007) |
| Shell hardness | -0.92* (0.46) | -0.02 (0.40) | -0.15 (0.34) | -0.04 (0.02) | -0.01 (0.02) | -0.001 (0.008) |
| Size | 0.22 (0.36) | -0.60 (0.31) | -0.05 (0.30) | 0.01 (0.01) | -0.01 (0.01) | -0.008 (0.005) |
| Texture | 0.16 (0.39) | 0.73* (0.35) | 0.52 (0.33) | 0.01 (0.01) | 0.03* (0.01) | 0.005 (0.005) |
| Body integrity | 0.48 (0.42) | -0.18 (0.35) | 0.24 (0.33) | -0.004 (0.02) | 0.004 (0.01) | 0.005 (0.007) |
| Appearance | -0.33 (0.51) | 0.73 (0.40) | 0.61 (0.36) | 0.007 (0.03) | 0.03 (0.02) | 0.01 (0.009) |
| Safety | -0.65 (0.40) | 0.32 (0.35) | -0.08 (0.33) | 0.003 (0.01) | -0.01 (0.01) | 0.002 (0.006) |
| Nutrition | 1.19* (0.52) | -0.04 (0.39) | 0.10 (0.32) | 0.06 (0.03) | 0.02 (0.02) | -0.002 (0.007) |
| Gender (Male) | -0.10 (0.34) | 0.02 (0.32) | -0.10 (0.29) | -0.02 (0.34) | -0.04 (0.32) | 0.02 (0.28) |
| Age | -0.11*** (0.03) | -0.09*** (0.02) | -0.02 (0.02) | -0.10*** (0.02) | -0.08** (0.02) | -0.02 (0.02) |
| Income | 0.59 (0.32) | 1.02*** (0.28) | 0.05 (0.22) | 0.49 (0.31) | 1.09*** (0.28) | 0.06 (0.22) |
| Education | -0.31 (0.28) | 0.19 (0.26) | 0.42 (0.21) | -0.18 (0.28) | 0.22 (0.26) | 0.44* (0.22) |
| Occupation1(Managing employee) | 0.87 (0.72) | -0.86 (0.71) | 0.88 (0.57) | 0.84 (0.71) | -0.79 (0.72) | 0.85 (0.55) |
| Occupation2 (Salaried employee) | 0.73 (0.70) | -0.82 (0.67) | 0.40 (0.58) | 0.65 (0.69) | -0.73 (0.67) | 0.36 (0.56) |
| Occupation3 (Student) | -0.69 (0.91) | -1.41 (0.81) | -1.48 (0.80) | -0.96 (0.93) | -1.41 (0.82) | -1.44 (0.79) |
| Occupation4 (Worker) | 1.94* (0.90) | 0.23 (0.84) | 0.95 (0.67) | 1.74* (0.88) | 0.31 (0.85) | 0.79 (0.65) |
| Occupation5 (Self-employed | 0.64 (0.86) | 0.11 (0.97) | 0.34 (0.69) | 0.76 (0.85) | 0.25 (1.01) | 0.32 (0.69) |
| City (Shanghai) | 0.59 (0.37) | 0.67 (0.35) | 0.12 (0.29) | 0.48 (0.36) | 0.62 (0.35) | 0.14 (0.29) |
| Household size | -0.07 (0.15) | -0.03 (0.14) | 0.0005 (0.12) | -0.11 (0.15) | -0.03 (0.14) | -0.01 (0.12) |
| Marital status1 (No, but with a partner) | 1.17 (0.65) | -0.68 (0.47) | 1.13* (0.48) | 1.19 (0.64) | -0.86 (0.49) | 1.13* (0.47) |
| Marital status2 (Married) | 1.18 (0.61) | 0.00007 (0.43) | 0.52 (0.46) | 1.08 (0.60) | -0.16 (0.42) | 0.51 (0.45) |
| Sample size ($n$) | 202 | 252 | 302 | 202 | 252 | 302 |
| Prob > Chi$^2$ | 0.0040 | 0.0004 | 0.0000 | 0.0159 | 0.0003 | 0.0002 |
| Pseudo R$^2$ | 0.1616 | 0.1504 | 0.1517 | 0.1430 | 0.1509 | 0.1318 |

*Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.*

- Canadian live lobster (weighing 500g to 600g each, priced at RMB 130 per 500g, with free shipping).



- Boston (U.S.) live lobster (weighing 500g to 600g each, priced at RMB 130 per 500g, with free shipping).
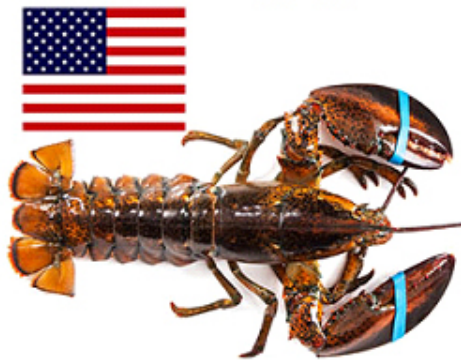


- Australian lobster (weighing 750g to 850g each, priced at RMB 540 per 500g, with free shipping).



Figure 1. Picture scenario with three origin-specific lobsters shown to participants in the survey