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[Article title]

Food choice in the e-commerce era: A comparison between Business-To-Consumer (B2C), Online-To-Offline (O2O) and New Retail

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1 **Food choice in the e-commerce era: A comparison between Business-To-**
2 **Consumer (B2C), Online-To-Offline (O2O) and New Retail**

3
4 **Structured Abstract:**

5
6 **Purpose:** This study associated consumers' food choice motives and socio-demographic
7 characteristics with their attitudes and consumptions towards food shopping with four e-
8 commerce modes: Business-To-Consumer (B2C), Online-To-Offline Delivery (O2O
9 Delivery), Online-To-Offline In-store (O2O In-store) and New Retail. It also explored
10 consumer preferences for specific food categories within the four e-commerce modes.

11
12 **Design/methodology/approach:** An online survey was administered to 954 participants from
13 three Chinese cities: Beijing, Shanghai and Shenzhen. Descriptive analysis and linear
14 regression were used in the data analysis.

15
16 **Findings:** The following food choice motives (FCMs) and socio-demographic characteristics
17 had a significant effect on food e-commerce attitudes and/or consumption, with some or all of
18 the four e-commerce modes: Taste Appeal, Value for Money, Safety Concerns, Quality
19 Concerns, Processed Convenience, Purchase Convenience, Others' Reviews, City, Gender,
20 Household Size, Age, Income, Occupation, and Marital Status. Consumers also have different
21 consumption preferences for food categories in the four e-commerce modes.

22
23 **Originality/value:** This is the first study to associate consumer FCMs and socio-demographics
24 with their e-commerce attitudes and consumption regarding food in four e-commerce modes:
25 B2C, O2O Delivery, O2O In-store and New Retail.

26
27 **Keywords:** consumer; e-commerce, B2C, O2O, New Retail, food choice

51 Introduction

52 The rapid development of e-commerce is changing the food consumption patterns of
53 consumers, as more and more people consider food purchase through various e-commerce
54 modes, including, Business-to-Consumer (B2C) food shopping, Online-To-Offline Delivery
55 (O2O Delivery) and in-store (O2O In-store) meal services, and new retail (Amir and Rizvi,
56 2017; Xiao et al., 2018; Wang and Somogyi, 2018).

57 B2C food shopping is a process that allows consumers to purchase and make payment for
58 food products directly from business-sellers through B2C e-commerce platforms (e.g.
59 *Amazon.com*, and China's *JD.com* and *Tmall.com*), where the food products are delivered to
60 consumers (CIW Team, 2018; Gefen and Straub, 2004; Mokhtarian, 2004). As a traditional
61 mode of e-commerce for food purchase, B2C food shopping had global sales of 74.13 billion
62 US dollars in 2016, with an annual growth rate of 19.4% from 2012 to 2016 (Agriculture and
63 Agri-Food Canada, 2017). Packaged food dominated sales and consumers' preferences for food
64 categories for B2C food shopping. For example, this trend is seen in baby food, snacks and
65 dairy products (Agriculture and Agri-Food Canada, 2017; Chu et al., 2010; Lau et al., 2015;
66 Wang and Somogyi, 2018). China plays an important role in the global B2C food market,
67 amassing sales of 23.91 billion US dollars in 2016 with a dramatic annual growth rate of 52.9%
68 from 2012 to 2016 (Agriculture and Agri-Food Canada, 2017; Wang and Somogyi, 2018).

69 Researchers have conducted a number of studies related to the behaviour of food
70 consumers in the B2C platform in the last decade or so (Wang and Somogyi, 2018). Many of
71 the studies either fully or partly confirmed the significant effects of innovation-adoption
72 characteristics (perceived social norm, perceived incentive, perceived complexity, perceived
73 relative advantage, perceived compatibility, and perceived risk) on consumer attitudes,
74 behaviours or behaviour intentions regarding B2C food purchase (Anesbury et al., 2016; Bryła,
75 2018; Kang et al., 2016; Kaur and Shukla, 2016; Morganosky and Cude, 2000; Mortimer et al.,
76 2016; Hansen et al., 2004; Hansen, 2008; Ramus and Asger Nielsen, 2005; Wang and Somogyi,
77 2018; Sreeram et al., 2017; Yeo et al., 2017; Zhao et al., 2017). Some of these studies indicated
78 the significant effect of choice motives (e.g. convenience, quality concern and price), consumer
79 segments (e.g. frequent and non-frequent online shoppers), socio-demographic characteristics
80 (e.g. income, marital status and occupation), reference effect (e.g. others' reviews), and food
81 categories (e.g. packed food and fresh food) on consumer adoption of the B2C platform for
82 food purchase (Chintagunta et al., 2012; Chu et al., 2010; Degeratu et al., 2000; Hansen, 2005;
83 Hansen, 2008; Heng et al., 2018; Jin et al., 2017; Kang et al., 2016; Kaur and Shukla, 2016;
84 Morganosky and Cude, 2000; Mortimer et al., 2016; Ramus and Asger Nielsen, 2005; Wang
85 and Somogyi, 2018a; b; Wang et al., 2019; Zhao et al., 2017).

86 With one fifth of the world's mobile phone users and a high saturation of smartphone and
87 mobile payment, China is leading the revolution in e-commerce food consumption, with the
88 explosion of the O2O catering industry (Cho et al., 2018; Xiao et al., 2018). China's O2O food
89 catering sales reached 102.2 billion US dollars in 2017, with a staggering annual growth rate
90 in excess of 70% from 2013 to 2017 (iResearch, 2018). Unlike food sales on B2C platforms,
91 O2O platforms focus on catering services (Xiao et al., 2018). There are two types of O2O
92 platforms in China: O2O Delivery platforms and O2O in-store platforms. Chinese consumers
93 mainly use O2O Delivery platforms (e.g. *Waimai.meituan.com*, *Ele.me* and
94 *Waimai.baidu.com*) to order and to make payment for meals from local restaurants or other
95 food service sectors, with those meals delivered to them (Chen, 2018; Ritchie et al., 2013).
96 Recently, global internet giants are trying to copy China's success of the O2O Delivery food
97 shopping to other countries (e.g. Uber Eats) (Eadicicco, 2019). Regarding the O2O In-store
98 platforms (*Meituan.com*, *Koubei.com*, *Dianping.com* or *Nuomi.com*), Chinese consumers also
99 mainly order local catering services (e.g. meals and restaurant seats) from it but offline
100 consume it at food service sectors (e.g. restaurants and hotels) (Chen, 2018; Ritchie et al.,

101 2013). There are many e-commerce platforms with similar functions globally (e.g.
102 TripAdvisor.com and Yelp.com).

103 Only a few studies could be found related to food consumer behaviour on the O2O mode,
104 all published in recent years and half using Chinese consumers in their research samples due
105 to the major market size and quick development of the O2O catering industry in China (Cho et
106 al., 2018; Xiao et al., 2018). More studies focus on the consumer adoption of food shopping
107 with the O2O delivery mode than that of the O2O in-store mode. The O2O in-store food
108 shopping is significantly influenced by consumer trust, perceived social norms and perceived
109 complementarity, others' reviews, performance expectancy of apps, hedonic motivation, and
110 price saving motivations (Alalwan, 2020; Xiao et al. 2017; 2018). The O2O delivery food
111 shopping is significantly affected by perceived usefulness, perceived value, perceived ease of
112 use, mobile anxiety (non-rational feelings and impressions originated from previous difficulties
113 when use mobile hardware or software), price, trust, food variety, app design, convenience,
114 hedonic motivation, social norm, online purchase experience, household size, food quality,
115 delivery efficiencies, information quality and others' reviews (Cho et al., 2018; He et al., 2018;
116 Kang and Namkung, 2019; Lee et al., 2019; Ray et al., 2019; Roh and Park, 2019; Suhartanto
117 et al., 2019; Wu et al., 2015; Xu and Huang, 2019).

118 In recent years, a new e-commerce mode called New Retail has started to appear across
119 the world, which is defined as: '*a consumer-centric mode of retailing that relies on advanced*
120 *technologies to upgrade the process of production, circulation and sales for retailing*
121 *ecosystems*' (Zhang et al., 2018). The New Retail e-commerce mode is an updated version of
122 the O2O e-commerce mode: the O2O e-commerce digitalises traditional offline food service
123 sectors with information technologies for mobile payment and ordering (Chen, 2018; Ritchie
124 et al., 2013); the New Retail e-commerce mode digitalises traditional offline retail stores with
125 more information technologies such as big data, cloud computing, the Internet of Things,
126 mobile payment and artificial intelligence (Ding et al., 2018; Tung, 2017; Walton, 2018; Zhang
127 et al., 2018). Major e-commerce giants are aggressively investing in this new business mode
128 and have opened New Retail stores such as Amazon Go and Alibaba's Fresh Hema (Ding et
129 al., 2018; Tung, 2017; Zhang et al., 2018). Alibaba is a pioneer of the New Retail food mode
130 and has opened nearly 60 Fresh Hema stores in China's large cities since 2016, providing
131 "three-in-one" service including, online delivery, in-store purchase, and in-store cooking and
132 dining, in particular for fresh food products such as seafood, meat and vegetables (Mitchell,
133 2018; Peterson, 2018). There are few similar New Retail food stores in other parts of the world.
134 To our knowledge, there has been no study related to food consumer behaviour regarding the
135 New Retail mode. This is probably because New Retail is a relatively new e-business mode
136 and it is still embryonic as an academic research topic.

137 There is a general currently a lack of understanding regarding consumer perceptions,
138 motives, attitudes, categorical preferences, and behaviours towards e-commerce food
139 shopping. Particularly for the O2O and New Retail modes and consequently there are a number
140 of questions that need to be answered: What are the important motives and the similarities and
141 differences between food consumption using different e-commerce modes? What are the most
142 popular categories and significant socio-demographics of O2O delivery, O2O in-store and New
143 Retail mode food consumers, and the similarities and differences between those modes and the
144 B2C mode?

145 In order to address the knowledge gaps, this study will attempt to explore significant
146 influences of consumers' Food Choice Motives (FCMs) and socio-demographics on their
147 attitudes and consumptions towards purchasing food through the B2C, O2O Delivery, O2O In-
148 store and New Retail modes. It will also explore the favourite food categories of consumers for
149 each of the four e-commerce modes.

150

151 Hypothesis

152 Previous studies have indicated many important motives for people's daily food choices, for
153 example convenience, sensory appeal, price and food safety concerns (Brunner et al., 2010;
154 Honkanen and Frewer, 2009; Lindeman and Väänänen, 2000; Steptoe et al., 1995; Wang et al.,
155 2015). Scholars have examined the associations between these FCMs and a wide variety of
156 dietary attitudes, behaviours, and behaviour intentions. For example, consumer attitudes and
157 consumption towards traditional food, European food, sustainable food concerns, the adoption
158 of personalised nutrition, social network related diet-quality, and the food choices of athletes
159 at international competition events (e.g. Baudry et al., 2017; Kim, 2016; Pelly et al., 2018;
160 Pieniak et al., 2009; Rankin et al., 2018; Wang et al., 2015). There is still, however, a lack of
161 understanding about the associations between food choice motives and e-commerce food
162 consumption behaviour (in particular for O2O and New Retail modes).

163 Those studies have proven that consumer FCMs have direct effects on consumer dietary
164 attitudes, consumptions or consumption intentions, and indirect effects on consumer dietary
165 consumption or consumption intentions through their attitudes towards food products or
166 services (Rankin et al., 2018; Pieniak et al., 2009). Consumer attitudes comprise their total
167 evaluation (positive or negative) of a food product or service and have direct effects on their
168 consumption or consumption intentions towards the food product (Rankin et al., 2018; Pieniak
169 et al., 2009).

170 Previous studies of e-commerce food consumption have confirmed the significant effects
171 of some consumer choice motives on their attitudes, consumption or consumption intentions
172 towards food purchase via B2C and/or O2O platforms including innovation-adoption
173 characteristics, convenience, price, others' reviews, appearance, quality concern, trust,
174 perceived social norms, perceived complementarity, environmental concerns and food variety
175 (Cho et al., 2018; Chintagunta et al., 2012; Chu et al., 2010; Degeratu et al., 2000; Hansen,
176 2005; Hansen, 2008; Heng et al., 2018; Jin et al., 2017; Kang et al., 2016; Morganosky and
177 Cude, 2000; Mortimer et al., 2016; Ramus and Asger Nielsen, 2005; Wang and Somogyi,
178 2018; Xiao et al., 2017; 2018; Wu et al., 2015; He et al., 2018; Zhao et al., 2017).

179 A total of ten FCMs were included as variables in this study, for the construct of
180 consumer FCMs related to their food consumption through the different e-commerce modes:
181 Taste Appeal, Value for Money, Cheap, Variety, Safety Concerns, Quality Concerns,
182 Processed Convenience, Purchase Convenience, Others' Reviews and Discount. These FCMs
183 were selected and developed based on a literature review and a qualitative study. Prior to this
184 quantitative study, an online qualitative survey (n=205) was conducted to qualitatively examine
185 consumer choice motives for food consumption via the different e-commerce modes. A
186 questionnaire was randomly distributed across China among registered members of a sample
187 panel from a Chinese research agency during April 2018. Three open-ended questions were
188 used to explore the motives for participant choices when consuming food via China's dominant
189 B2C, O2O Delivery and O2O In-store platforms (Chen, 2018; CIW Team, 2018; Ritchie et al.,
190 2013). For instance, "1) In your opinion, why do people purchase food products through
191 Tabao.com, Tmall.com or JD.com?; 2) In your opinion, why do people order meals or purchase
192 food products through Waimai.meituan.com, Ele.me or Waimai.baidu.com?; and 3) In your
193 opinion, why do people order meals or purchase food products through Meituan.com,
194 Koubei.com, Dianping.com or Nuomi.com, via online ordering and offline consuming at
195 restaurants, supermarkets or other business locations?" New Retail was not involved in the
196 qualitative survey because it is a relatively new business mode and only consumers in some of
197 the largest Chinese cities have food consumption experiences with it. For example, Alibaba
198 has opened most of its Fresh Hema stores in China's big cities such as Beijing, Shanghai and
199 Shenzhen (Mitchell, 2018; Peterson, 2018). The responses were analysed using content
200 analysis which was broken into text-fragments and later grouped into word-codes and named

201 (Berelson, 1952; Ritchie et al., 2013). The ten FCMs were developed based on: 1) the relevant
202 word-codes appearing in the answers of at least ten participants to the questions about B2C
203 (including: convenience, wide-variety, low-price, good-value-for-money, discount and quality-
204 assured), O2O Delivery (including: convenience, low-price, good-value-for-money, wide-
205 variety and *delicious*) and/or O2O In-store (including: convenience, low-price, discount, good-
206 value-for-money, discounts, others-reviews, delicious and quality-assured) modes; and 2) that
207 which was related to choice motives in the FCM literature or the e-commerce food consumer
208 behaviour noted above.

209 The qualitative consumer study also explored participants' consumption preferences for
210 food categories in different e-commerce modes. They were asked to indicate three specific food
211 products or meals that they most frequently purchased or ordered through the major Chinese
212 B2C, O2O Delivery and O2O In-store platforms. The responses were grouped into food or
213 meal categories for each of the three e-commerce modes. Also, a number of categories, shown
214 in Table 1, were selected in this study to explore the food category preferences for the three e-
215 commerce modes, based on the most frequently used categories and a review of food or meal
216 products in the apps of major Chinese B2C, O2O Delivery and O2O In-store platforms. Table
217 1 also shows the food categories for the New Retail mode, which were selected by reviewing
218 food products in the app of China's major New Retail store, Fresh Hema (Mitchell, 2018;
219 Peterson, 2018).

220 Previous studies have also indicated the significant effects of socio-demographics on
221 consumer dietary attitudes, consumption or consumption intentions (Sun, 2008; Verbeke,
222 2015). Some socio-demographics were confirmed to have significant effects on food consumer
223 behaviours via B2C and/or O2O platforms, including, income, age, marital status, gender,
224 education, household size and occupation (Cho et al., 2018; Hansen, 2005; Jin et al., 2017;
225 Kang et al., 2016; Kaur and Shukla, 2016; Morganosky and Cude, 2000; Wang and Somogyi,
226 2018).

227 Therefore, consumer food choice motives and socio-demographics are assumed to directly
228 affect their attitudes towards food consumption in the four e-commerce modes. Four hypothesis
229 (H) were developed for each of the four e-commerce modes, as follows:

230
231 **H1:** A consumer's food choice motives and socio-demographics have significant effects on
232 their attitudes towards food consumption in the B2C e-commerce mode (B2C attitudes).

233
234 **H2:** A consumer's food choice motives and socio-demographics have significant effects on
235 their attitudes towards food consumption via the O2O Delivery e-commerce mode (O2O
236 Delivery attitudes).

237
238 **H3:** A consumer's food choice motives and socio-demographics have significant effects on
239 their attitudes towards food consumption via the O2O In-store e-commerce mode (O2O In-
240 store attitudes).

241
242 **H4:** A consumer's food choice motives and socio-demographics have significant effects on
243 their attitudes towards food consumption via the New Retail e-commerce mode (New Retail
244 attitudes).

245
246 In addition, food choice motives, socio-demographics and food e-commerce attitudes
247 are expected to have a direct effect on e-commerce food consumption in the four e-commerce
248 modes. Other four hypothesis were developed for each of the four e-commerce modes as
249 follows:

250 **H5:** A consumer's food choice motives, socio-demographics and B2C attitudes have
251 significant effects on their food consumption via the B2C e-commerce mode (B2C
252 consumption).

253

254 **H6:** A consumer's food choice motives, socio-demographics and O2O Delivery attitudes have
255 significant effects on their food consumption via the O2O Delivery e-commerce mode (O2O
256 Delivery consumption).

257

258 **H7:** A consumer's food choice motives, socio-demographics and O2O In-store attitudes have
259 significant effects on their food consumption via the O2O In-store e-commerce mode (O2O In-
260 store consumption).

261

262 **H8:** A consumer's food choice motives, socio-demographics and New Retail attitudes have
263 significant effects on their food consumption via the New Retail e-commerce mode (New
264 Retail consumption).

265

266 >> Insert Table 1

267

268 **Methods and materials**

269 *Participants and procedures*

270 The data for this study was collected through an online quantitative survey in May 2018. A
271 questionnaire was developed in English and translated into Chinese. The questionnaire
272 consisted of two main sections: first, motivational, attitudinal and behavioural items related to
273 e-commerce food shopping (used in this study); second, motivational and behavioural items
274 related to luxury seafood consumption (published in Wang and Somogyi, 2020). An online
275 pre-test (n=52) was conducted with Chinese participants who were registered members on the
276 panel of a Chinese research agency, in order to improve the language expression and question
277 design. The final questionnaire was distributed in three Chinese cities, Beijing, Shanghai and
278 Shenzhen, through the same sample panel. Participants were required to give consent for their
279 participation online before being given the survey questions. The data collected was kept in a
280 non-identifiable file and processed anonymously. Only those participants who had purchased
281 food via the B2C, O2O Delivery and O2O In-store platforms in the past were retained as valid
282 participants of this study and were shown the full questions. All valid participants received a
283 monetary incentive from the Chinese research agency. These three cities were selected because
284 they have the most Fresh Hema stores and are therefore more likely to have a number of
285 consumers who have experienced New Retail (a relatively new business mode) than other
286 Chinese cities (Mitchell, 2018; Peterson, 2018).

287 A total of 954 valid samples were obtained for this study, 319 from Beijing, 326 from
288 Shanghai and 309 from Shenzhen. The participants all had food consumption experiences with
289 B2C, O2O Delivery and O2O In-store platforms. 45.6% (n=435) had consumed food from New
290 Retail stores (Fresh Hema). Shanghai had a higher percentage of participants with New Retail
291 food consumption experiences (62.3%) than Beijing (42.6%) and Shenzhen (31.0%),
292 presumably because Shanghai has more Fresh Hema stores (n=20) than Beijing (n=16) and
293 Shenzhen (n=10) (current to August 2018, please refer to the official website of Fresh Hema,
294 available at <https://www.freshhema.com/>). Table 2 shows the socio-demographics of the total
295 sample and the sub-samples of the three cities.

296

297 >> Insert Table 2

298

299

300 *Measures*

301 Participant FCMs were measured with ten items, shown in Table 3. The items were developed
302 based on the qualitative study and previous studies related to FCM and e-commerce food
303 consumer behaviour (see Section 2) (Cho et al., 2018; Kang et al., 2016; Pieniak et al., 2009;
304 Zhao et al., 2017). Participants were required to assess the importance of the ten items in their
305 daily dietary choices as: “It is important to me that the food/meal I eat on a typical day [each
306 of the items/]” and on seven-point Likert agreement scales from “7=Totally agree” to “1=
307 Totally disagree”. Table 3 also shows the correlation matrix of the ten FCM variables. All
308 correlation coefficients were lower than 0.65. There was no severe multi-collinearity in this
309 FCM construct (Pieniak et al., 2009).

310

311 >> Insert Table 3

312

313 Participant attitudes towards food consumption via different e-commerce modes were
314 measured by four items, respectively: “**1) B2C attitudes-** When I think about purchasing food
315 from online shops (e.g. Taobao.com, Tmall.com and JD.com), I feel ...; **2) O2O Delivery**
316 **attitudes:** When I think about ordering meals through take-away apps (e.g.
317 Waimai.meituan.com, Ele.me or Waimai.baidu.com) and physically eat them at my home or
318 workplace, I feel ...; **3) O2O In-store attitudes:** When I think about ordering meals through
319 group-buying apps (e.g. Meituan.com, Koubei.com, Dianping.com or Nuomi.com) and
320 physically consume them at restaurants, hotels and food stalls, I feel...; **4) New Retail**
321 **attitudes:** When I think about purchasing food from Fresh Hema, I feel ...” and on seven-point
322 semantic differential scales with the bipolar adjectives: “unhappy/happy”. The approach was
323 developed from previous studies that explored consumer attitudes towards different food
324 products and food purchase via e-commerce (Pieniak et al., 2009; Wang and Somogyi, 2018).

325 Participant food consumption via different e-commerce modes was measured using four
326 self-reported items: “**1) B2C consumption:** To what extent do you consider yourself a
327 consumer who purchases food from online shops (e.g. Taobao.com, Tmall.com and JD.com)?
328 **2) O2O Delivery consumption:** To what extent do you consider yourself a consumer who
329 orders meals using take-away apps (Waimai.meituan.com, Ele.me or Waimai.baidu.com)? **3)**
330 **O2O In-store consumption:** To what extent do you consider yourself a consumer who orders,
331 makes payment or uses e-coupon using group-buying apps (e.g. Meituan.com, Koubei.com,
332 Dianping.com or Nuomi.com) and physically eats meals/foods at food service providers (e.g.
333 restaurants, hotels and food stall)? **4) New Retail consumption:** To what extent do you
334 consider yourself a consumer who purchases food products from Fresh Hema?” and on seven-
335 point Likert scales ranging from “1= Not at all” to “7= Very much”. This approach was
336 developed from previous studies that examined consumer consumption towards different food
337 products (Pieniak et al., 2009).

338 Participants were also asked to indicate their three most frequently consumed food/meal
339 categories over the past year for each of the four e-commerce modes based on the food/meal
340 selection categories shown in Table 1. The food selection categories were developed from the
341 qualitative study and a review of food categories on the apps of China’s major e-commerce
342 platforms (see Section Hypothesis).

343

344 *Data analysis*

345 The statistical software tools SPSS 24.0 and Stata 14.0 were used to perform analyses in this
346 study. The analyses were conducted with the total sample (n=954) for the B2C, O2O Delivery
347 and O2O In-stores hypothesis (**H 1-3** and **5-7**), and with the sub-sample who had New Retail
348 food consumption experiences (n=435) for the New Retail hypothesis (**H 4** and **8**). Linear
349 regression analyses were undertaken for the eight specific exploratory hypothesis (see Section

2) in line with the linear nature of the dependent variables, consumer food consumption via different e-commerce modes and their attitudes towards e-commerce consumption (Darlington and Hayes, 2016). Three categorical variables were dummy coded including City- City1 (Beijing=1, Shanghai=0, Shenzhen=0) and City2 (Beijing=0, Shanghai=1, Shenzhen=0), Marital status- Marital status1 (Married=1, With a partner=0, Single=0) and Marital status 2 (Married=0, With a partner=1, Single=0), and Occupation- Occupation1 (Managing employee=1, Salaried employee=0, Student=0, Other=0), Occupation2 (Managing employee=0, Salaried employee=1, Student=0, Other=0) and Occupation3 (Managing employee=0, Salaried employee=0, Student=1, Other=0) (Alkharusi, 2012). Descriptive analyses (by mean values) were then undertaken to identify differences between e-commerce consumption and attitudes between the categorical socio-demographic groups with significant relationships to the dependent variables in the linear regression analyses. Thirdly, descriptive analyses (by percentage of total sample) were carried out to understand the food/meal categories most frequently consumed by participants in the past year, for each of the four e-commerce modes.

365

366 **Results**

367 Table 4 shows results of the linear regression analysis for the eight Hypotheses used to explore the effects of consumers' motives and socio-demographics on their e-commerce food attitudes and consumptions with the four modes. Table 5 shows the results of the descriptive analyses exploring the differences between categorical socio-demographic groups that have a significant influence on the e-commerce food attitudes and consumptions in the linear regression analyses. These are City, Marital status and Occupation. Figure 1 shows the results of the descriptive analyses of participants the most frequently consumed food categories in the past year for each of the four e-commerce modes. The following section will summarize these results for each e-commerce mode.

376

377 >> Insert Figure 1

378 >> Insert Table 4

379 >> Insert Table 5

380

381 *Food choice with the B2C mode*

382 B2C attitudes have a significantly negative relationship with the FCM: *Value for money* and positive relationships with four FCMs *Safety concern*, *Quality concern*, *Purchase convenience* and *Others' reviews* (**H1**). In other words, participants who attach more significance to the food consumption concerning quality, safety, purchase convenience and others' reviews, have more positive attitudes towards B2C food shopping than other participants. While those participants, who attach more significance to food consumption with value for money, have more negative attitudes towards B2C than other participants. Furthermore, the B2C attitudes also have significant relationships with socio-demographic characteristics: City1 and Age. The B2C attitudes are negatively linked to age. Table 5 indicates that the B2C attitude variables for Shanghai and Beijing have similar mean values that are higher than the value for Shenzhen. Therefore those participants who live in Beijing and Shanghai and are younger in age have more positive attitudes towards the B2C food shopping than Shenzhen residents and older participants.

395 B2C consumption has a significantly positive relationship with three socio-demographic variables *Gender (female)*, *Marital status1* and *Income*, and the variable of B2C attitudes (**H5**). It also has a significantly negative relationship with *Age*. Table 5 shows that married participants have a slightly higher mean value for B2C consumption than that for the participants with a partner or those who are single. So those participants who are female,

400 married, have a higher income, are younger in age or have more positive attitudes toward B2C,
401 are more experienced with the B2C food consumption than other participants.

402 Figure 1 shows that snacks dominate B2C food consumption, with more than 66% of
403 participants indicating frequent B2C snack consumption within the past year. Snacks are
404 followed by nut and dairy products with more than 35% of participants reporting frequent B2C
405 consumption of these food products in the past year. At a lower level, but nonetheless
406 noteworthy, in excess of 10% of participants indicate B2C consumption of rice, cooking oil,
407 beverage and fresh fruit during the past year.

408

409 *Food choice with the O2O Delivery mode*

410 O2O Delivery attitudes have a significantly positive relationship with two FCMs *Quality*
411 *concern* and *Purchase convenience* and a socio-demographic variable *Marital status1*. While
412 it has a negative relationship with three socio-demographic variables *Occupation3*, *Gender*
413 (*female*) and *Age* (**H2**). Table 5 shows that the O2O Delivery attitude variables for married
414 participants have a higher mean value than that for the participants that have a partner or are
415 single. The variables of managerial or salaried employees participants have a higher mean
416 value than that for students or participants with other occupations.

417 The O2O Delivery consumption has a significantly positive relationship with a FCM
418 *Processed convenience*, an socio-demographic variable *Marital status1*, and the O2O Delivery
419 attitudes (**H6**). It also has significantly negative relationships with an FCM *Taste appeal* and a
420 socio-demographic characteristic *Age*. Table 5 shows that the O2O Delivery consumption
421 variables for married participants and participants with a partner have mean values that are
422 higher than the values for single participants.

423 Figure 1 indicates that Chinese “simple meal” dominates the O2O Delivery food
424 consumption with more than 78% of participants indicating their frequent O2O Delivery
425 consumption of it in the past year, followed by Western fast food, with over 47% of participants
426 reporting it as part of their O2O Delivery consumption. 28% of the participants indicate their
427 frequent O2O Delivery consumption with “non-simple meal” Chinese dish and above 10% of
428 participants reporting consumption of beverage, Chinese traditional food, Western dishes (non-
429 fast food) and desserts.

430

431 *Food choice with the O2O In-store mode*

432 O2O In-store attitudes have significantly positive relationships with two FCMs *Taste appeal*
433 and *Others’ reviews* and the socio-demographic variable *Occupation2* (**H3**). Table 5 shows
434 that The O2O In-store attitudes for managerial or salaried employees participants have a higher
435 mean value than that of students or participants with other occupations.

436 O2O In-store consumption has a significantly positive relationship with two socio-
437 demographic variable *Marital status1* and *2*, and the O2O In-store attitudes. It also has
438 significantly negative relationships with an FCM *Taste appeal*, and two socio-demographic
439 variables *Household size* and *Age* (**H7**). Table 5 shows that the O2O In-store consumption
440 variables for married participants and participants with a partner have similar mean values that
441 are higher than that for single participants.

442 Figure 1 indicates that Chinese dish (non-simple meal) dominates the O2O Delivery food
443 consumption, with more that 51% of participants indicating their O2O In-store consumption of
444 it within the past year, followed by hot pot with over 30% of participants reporting its
445 consumption. Over 20% of participants noted their O2O In-store consumption with Western
446 dish (non-fast food), Buffet and Chinese simple meal and over 10% of them reported
447 consumption of Western fast food, Chinese traditional food and Barbecue.

448

449

450 *Food choice with the New Retail mode*

451 New Retail attitudes have significantly positive relationships with three FCMs *Taste appeal*,
452 *Quality concern* and *Others' reviews* and two socio-demographic variables *Gender (female)*
453 and *Household size*, and the New Retail attitudes (**H4**).

454 New Retail consumption has a significantly positive relationship with New Retail attitudes
455 and significantly negative relationships with two socio-demographic variables *Age* and
456 *Occupation3* (**H8**). Table 5 shows that the New Retail consumption variable for students has a
457 lower mean value than that for participants with other occupations.

458 Figure 1 shows that live aquatic products and fresh fruits dominate New Retail food
459 consumption, with over 40% of participants indicating those categories for in the past year.
460 Approximately 20% of participants indicate the consumption of dairy products, fresh meat and
461 frozen aquatic products in the New Retail mode, and over 10% of them report that for snack,
462 fresh vegetable, cooked aquatic product and imported foods.

463

464 **Discussion**

465 In regards to the preferred e-commerce food categories, the findings indicate that snacks
466 dominate B2C food consumption, followed by nut and dairy products. This is in line with
467 previous findings that consumers mainly purchase packaged and bulky foods through B2C
468 platforms (Chintagunta et al., 2012; Jin et al., 2016; Kang et al., 2016; Ramus and Nielsen,
469 2005; Wang and Somogyi, 2018). Meanwhile this is the first study to show the preferred food
470 categories of consumers within the e-commerce modes of O2O Delivery (simple meals such
471 as Chinese simple meals and Western fast food), O2O In-store (non-simple meals such as
472 Chinese and Western dishes) and New Retail (fresh food such as live aquatic products and
473 fresh fruits). In general, consumers have different preferences of food categories in the four e-
474 commerce modes.

475 Consumer food e-commerce attitudes showed a strongly positive relationship with their
476 food e-commerce consumption in all the four e-commerce models. This is in line with previous
477 findings that consumer attitudes have significantly positive effects on their food consumption
478 in both offline and online environments (Cho et al., 2018; Hansen, 2008; Pieniak et al., 2009;
479 Wang and Somogyi, 2018). This indicates that the FCMs and socio-demographic
480 characteristics with direct effects on food e-commerce attitudes, have indirect effects on food
481 e-commerce consumption (Pieniak et al., 2009; Wang and Somogyi, 2018). It should be
482 mentioned that most of FCMs only have this indirect influence to the e-commerce food
483 consumption including, *Value for money*, *Safety concern*, *Quality concern*, *Purchase*
484 *convenience* and *Others' reviews*.

485 It is the first study to determine that consumers are not satisfied by *Value for Money* in
486 food products purchased from B2C platforms. This may be because B2C platforms encourage
487 more impulse buying due to its highly convenient shopping mode and the frequent
488 promotions/discounts (Childers et al., 2001; Dawson and Kim, 2009). As such, consumers
489 frequently purchase non-essential and subsequently wasted food products, and thus consider
490 them *low value for money* (Childers et al., 2001; Dawson and Kim, 2009). That might also be
491 a reflection of the reality that many Chinese consumers are not satisfied with their shopping
492 experience on B2C platforms because there is a greater likelihood that they will receive
493 products of low quality, fake brands, and with differences from the online images (Liu, He,
494 Gao, and Xie, 2008; Jun and Jaafar, 2011). While this significant relationship has not been
495 found for other three e-commerce modes. This may be caused by their specific food
496 consumption patterns (half online and half offline) and the consumption preferences for food
497 categories (cooked meals and fresh food, see Figure 1). This differs from that for the B2C mode
498 (completing the whole purchase online with the consumption preferences for packed foods).
499 Consumers may have less opportunity to impulse buy non-packed food products in the half-

500 online and half-offline environment when food shopping in the O2O and New Retail platforms
501 compared to B2C mode (Childers et al., 2001; Chintagunta et al., 2012; Degeratu et al., 2000).

502 *Safety concerns* have a positive effect on consumer food e-commerce attitudes in the
503 B2C mode but no significant effect in the O2O and New Retail modes. This may be caused by
504 the different category preferences for food consumption between B2C and the other e-
505 commerce modes. Consumers prefer to purchase packaged foods through B2C platforms
506 because they can more easily obtain, compare and trace product information (e.g. expiry dates,
507 ingredients and origin) to evaluate safety issues than when purchasing in offline stores
508 (Chintagunta et al., 2012; Jin et al., 2016; Kang et al., 2016; Ramus and Nielsen, 2005).
509 Evaluating safety issues for fresh food and cooked meals by physically checking (e.g. degree
510 of freshness) is almost impossible using the information received from the O2O or New Retail
511 platforms (Chintagunta et al., 2012; Kang et al., 2016; Ramus and Nielsen, 2005).

512 *Quality concern* has a positive effect on consumer food e-commerce attitudes with B2C.
513 This is in line with previous findings that high quality is an important reason for consumers to
514 purchase packaged foods through B2C platforms due to the higher quality items available in
515 online shops than their local offline stores (Chintagunta et al., 2012; Jin et al., 2017; Kang et
516 al., 2016; Morganosky and Cude, 2012). The findings of this study indicate that consumer
517 quality concerns have a positive effect on their food e-commerce attitudes with O2O Delivery
518 and New Retail modes. In other words, they have positive impressions of the quality of cooked
519 meals and fresh food sold by O2O Delivery and New Retail platforms. This compensates for
520 the deficiency of B2C platforms in e-commerce food consumption, in which consumers have
521 low quality impressions on fresh and perishable foods (Chintagunta et al., 2012; Jin et al., 2017;
522 Kang et al., 2016; Morganosky and Cude, 2012). *Quality concern* has no significant effect on
523 consumer food e-commerce attitudes or consumption via O2O In-store mode. This may be
524 caused by the specific food consumption patterns of the O2O In-store mode, where consumers
525 mainly purchase non-simple meals physically at restaurants, ordered or paid for through O2O
526 In-store platforms, rather than the B2C, O2O Delivery or New Retail modes, thereby physically
527 eating or cooking in their own homes with packaged foods, simple meals or fresh foods. Wang
528 and Somogyi (2018) indicated that consumers do not focus on quality issues when eating fancy
529 meals in restaurants, as restaurant owners take the major responsibility for quality-assurance
530 of those meals.

531 According to convenience-related FCMs, *Processed-convenience* has a positive effect
532 on food consumption via O2O Delivery platforms. *Purchase-convenience* has a positive effect
533 on consumer food e-commerce attitudes with B2C and O2O Delivery platforms. This confirms
534 the findings by previous studies that perceived convenience (e.g. timing saving for purchasing
535 or cooking) is the most important factor driving consumer food consumption with B2C and
536 O2O Delivery platforms (Chintagunta et al., 2012; Cho et al., 2018; Chu et al., 2010; Kang et
537 al., 2016; Morganosky and Cude, 2012; Mortimer et al., 2016; Ramus and Nielsen, 2005; Wu
538 et al., 2015), while such significant effects do not exist for the O2O In-store and New Retail
539 modes. This may be because food consumption patterns in O2O In-store and New Retail modes
540 are similar to those of traditional offline restaurants and stores, where food is physically
541 collected or eaten offline, compared to B2C and O2O Delivery platforms, which involve
542 rapidly completing purchasing online without needing to go to offline restaurants and stores.
543 Consumers thus attach less importance to the convenience of food consumption with O2O In-
544 store and New Retail platforms.

545 *Others' Reviews* have a positive effect on consumer food e-commerce attitudes in B2C,
546 O2O In-store and New Retail modes. This corresponds with previous findings that perceived
547 social norms, such as others' opinions, ratings and reviews, as a significant factor driving the
548 adoption of food consumption on e-commerce platforms (Cho et al., 2018; Hansen, 2005;
549 Hansen, 2008; Heng et al., 2018; Xiao et al., 2017). Our study is the first to find that *Others'*

550 *Reviews* do not directly have significant effects on food consumption with B2C, O2O In-store
551 and New Retail modes, but have indirect effects through consumer e-commerce food shopping
552 attitudes. No significant effect was found with the O2O Delivery mode. This may be caused
553 by the specific food consumption pattern of the O2O Delivery platform. Consumers,
554 particularly in big cities, mainly order simple meals from O2O Delivery platforms in order to
555 deal with the time pressure in their daily lives and subsequently save time purchasing and
556 cooking (Cho et al., 2018; Heng et al., 2018; iResearch, 2018; Pieniak et al., 2009; Xiao et al.,
557 2017). As such, they attach less importance to the reviews of others regarding the O2O Delivery
558 mode compared to other e-commerce modes.

559 *Taste Appeal* refers to consumer's psychological motivation seeking for appetizing
560 reassurance or taste pleasure for food choices (Steptoe et al., 1995; Wang et al., 2015). It has a
561 significant effect on consumer food e-commerce attitudes and/or consumption within O2O
562 Delivery, O2O In-store and New Retail modes, but has no significant effects within the B2C
563 mode. This is partly in line with previous findings that consumer taste concerns have a more
564 important effect on their e-commerce purchase of fresh food, which is the preferred food
565 category for the New Retail mode, than that of bulky food, which is the preferred food category
566 for the B2C mode (Kang et al., 2016). Although it has a positive effect on consumer e-
567 commerce attitudes in the O2O In-store platform, *Taste Appeal* has a negative effect on e-
568 commerce consumption within O2O Delivery and In-store platforms. This suggests that
569 consumer generally have negative experiences with meals purchased from restaurants on O2O
570 platforms.

571 Age has a negative effect on e-commerce food consumption or attitudes, in all four e-
572 commerce modes. This is in line with previous findings that older people are less willing than
573 younger people to accept e-commerce food consumption due to their lower adaptive ability to
574 new technologies (Hansen, 2005; Morganosky and Cude, 2012). Some studies offer detailed
575 findings that people aged between 30 to 45 have more positive attitudes or purchase intentions
576 with B2C food consumption than other age groups (Kaur and Shukla, 2016; Wang and
577 Somogyi, 2018). This cannot be confirmed by our findings, based on regression analysis.

578 Marital status has a significant effect on consumer food e-commerce consumption or
579 attitudes, in the B2C and O2O modes (see Table 4 and 5). Married people have slightly higher
580 consumption frequencies and more positive attitudes towards food consumption via the B2C
581 platforms than single people and people with a partner. This may be because married people
582 are more likely to have regular and formalised dietary patterns than single people and non-
583 married couples, as they are frequently food shopping and cooking for family meals, (Kremmer
584 et al., 1998). These findings correspond with previous findings that married people are more
585 likely to become frequent B2C online food buyers than people with other marital statuses
586 (Wang and Somogyi, 2018). Married people and people with a partner also have more frequent
587 consumption patterns and/or more positive attitudes towards meal consumption with O2O
588 Delivery and In-store platforms than do single people. This may be because that married people
589 and people with a partner are inclined to eat together more often and therefore have a higher
590 probability of ordering a meal from restaurants using O2O platforms than single people
591 (Kremmer et al., 1998). While such significant relationships are not found for the New Retail
592 mode.

593 Female consumers have higher consumption frequencies for food using the B2C mode
594 and more positive attitudes towards food e-commerce in the New Retail mode than male
595 consumers, while male consumers have more positive food e-commerce attitudes towards O2O
596 Delivery platforms than female consumers. This may be due to different levels of involvement
597 in food cooking and preparation. Women often take more responsibility for a household's meal
598 cooking and grocery shopping (Hansen 2005, Kremmer et al., 1998). As such, it is reasonable
599 to state that female consumers are more likely to purchase cooking ingredients (e.g. fresh and

600 packaged foods) from B2C and New Retail platforms than male consumers, and male
601 consumers are more willing to purchase meals from O2O Delivery modes than their female
602 counterparts.

603 Household size is positively linked to consumer food e-commerce attitudes towards New
604 Retail mode and negatively associated with their food e-commerce consumption via O2O In-
605 store mode. This may be caused by the different dietary consumption patterns between small
606 and large families. Large families have a greater need to increase nutritional intake for children
607 and older family members and are therefore more willing to purchase fresh foods from New
608 Retail stores than small families (Wang and Somogyi, 2018). Larger families consume fewer
609 (non-simple) meals via O2O In-store platforms because they have greater desire to cut food
610 costs than small families (Cullen, 1994).

611 Income has a positive effect on consumer food e-commerce consumption with B2C. This
612 corresponds with previous findings that people with a higher income levels are more willing to
613 purchase food through B2C platforms than those with a lower level of income (Cho et al., 2018;
614 Wang and Somogyi, 2018). This study is also the first to find that personal income has no
615 significant effect on consumer food consumption in the O2O and New Retail modes.

616 Occupation has a significant effect on consumer food e-commerce attitudes within O2O
617 Delivery and In-store modes and their food consumption with the New Retail mode. Students
618 have slightly less positive food e-commerce attitudes regarding the O2O modes and a slightly
619 lower level of food consumption with the New Retail mode than those with other occupations
620 (see Table 5). This may be caused by the specific food consumption patterns by students in
621 China. University students mainly eat at school-run canteens and are not allowed to cook by
622 themselves in China (Zoninsein, 2013). As such, they may have a lower frequency to order
623 meals from restaurants (e.g. by O2O platforms or at New Retail stores) and purchase the fresh
624 cooking ingredients from local stores (e.g. at New Retail stores).

625 City has a significant effect on consumer food e-commerce attitudes with B2C mode.
626 Beijing and Shanghai consumers have more positive food e-commerce attitudes regarding B2C
627 platforms than Shenzhen consumers (see Table 5). This may be caused by different
628 development levels among these three cities. Beijing and Shanghai are China's political and
629 economic capitals, and international metropolis, and they are more developed in economics,
630 educational sections, new technological applications and social interaction, which may result
631 in a more developed food e-commerce market (e.g. with more food choices and faster delivery)
632 than that in other cities (Pieniak et al., 2009; Wang and Somogyi, 2018). As such, Beijing and
633 Shanghai consumers have more B2C food consumption experiences, which result in more
634 positive B2C food attitudes than consumers in other cities, such as Shenzhen. Such significant
635 effects do not exist for the O2O Delivery, O2O In-store and New Retail modes. This may be
636 due to the similar food service patterns of O2O and New Retail platforms among the three
637 cities, with limited choices for local food sellers and similar delivery distances (within around
638 three kilometres); which are different from the B2C mode which has many food choices from
639 around the world and almost unlimited delivery distances (iResearch, 2018; Mitchell, 2018;
640 Peterson, 2018). It is therefore reasonable to state that consumers in different cities have similar
641 perceptions or attitudes toward food consumption with the O2O and New Retail modes.

642

643 **Conclusions, implications and limitations**

644 This study has numerous academic contributions. Based on the findings from both the
645 qualitative and quantitative data, it is the first to recognize the FCMs related to e-commerce
646 shopping such as: Taste Appeal, Value for Money, Cheap, Variety, Safety Concerns, Quality
647 Concerns, Processed Convenience, Purchase Convenience, Others' Reviews and Discount.
648 This is a contribution to the theory of FCMs proposed by Steptoe et al. (1995) and provides a
649 suitable measurement tool for researchers to develop their surveys for testing consumers'

650 choice motives for e-commerce food shopping. Further, previous consumer-based studies only
651 focus on food shopping with a single e-commerce mode (e.g. B2C or O2O). This study is the
652 first to compare consumers' choice motives, socio-demographics, attitudes, consumption and
653 categorial preferences for food shopping between different e-commerce modes. As such, these
654 findings will help researchers to better understand consumers' e-commerce food shopping
655 behaviour and assist them in designing studies in the future.

656 Our findings also have significant managerial and policy implications. Food producers,
657 marketers and policy-makers now have a better understanding of e-commerce food consumer
658 behaviours especially for the different e-commerce modes which should allow them to
659 streamline their product offering focussing on those preferred by consumers. This research can
660 also assist them to develop effective marketing strategies and promotion policies for their e-
661 commerce food products. Efforts could be made to improve the food product attributes related
662 to the important FCMs for consumer choices of food products in different e-commerce modes.
663 For example, they could improve consumers' taste impressions of food products for O2O
664 Delivery, O2O In-store and New Retail platforms, either through advertisements claiming
665 "better flavour" or working with the owners of these platforms to produce and promote tastier
666 food. They should improve consumer impressions of 'good value for money' for their food
667 products only for B2C platforms. Our findings can also help food producers and policy-makers
668 to target the right consumers for their products. For example, they should focus on female
669 consumers when selling and promoting food products through B2C platforms and direct their
670 efforts to male consumers for O2O Delivery platforms. Thirdly, our findings can help food
671 producers, marketers and policy-makers to sell and promote the right food products within the
672 different e-commerce modes. For instance, they should sell and promote packaged food
673 products through B2C platforms and fresh food products through New Retail platforms and
674 stores.

675 Some limitations of this study should also be noted. Firstly, only participants who had
676 consumed food in all the B2C, O2O Delivery and O2O In-store platforms in the past were
677 retained as valid participants in our study. This may result in a sampling bias, as consumers
678 who had food shopping experience with one, two or none of these three e-commerce modes
679 were excluded from our study. The questionnaire was sent to a total of 1117 members of the
680 consumer sample panel from the three most developed cities in China: Beijing, Shanghai and
681 Shenzhen, 954 of which were valid and involved in our study. As such, 85% of the 1117
682 participants had food shopping experience with all the three-commerce mode. This percentage
683 would be higher if considering those invalid participants who were excluded from the survey
684 due to careless answers. This is in line with the high penetration and development levels of
685 B2C and O2O e-commerce food shopping in China, particularly in large Chinese cities.

686 Secondly, we used a single-item approach to measure participant attitudes and consumption
687 regarding food shopping in each of the four e-commerce modes. These measurement
688 approaches had been confirmed by previous studies to explore consumer attitudes and
689 consumption towards different food products with high reliability (Pieniak et al., 2009; Wang
690 et al., 2015; Wang and Somogyi, 2018). It is a common practice to measure behaviour using a
691 single item (Pieniak et al., 2009). A multiple-item design with bipolar adjectives (e.g.
692 unhappy/happy, dull/exciting, and terrible/delightful) has often been employed to measure
693 consumer attitudes in previous studies (Pieniak et al., 2009; Wang et al., 2015; Wang and
694 Somogyi, 2018). We used a single-item design in our study due to the high reliability of its
695 multiple-item measurement of consumer attitudes towards food or e-commerce food shopping
696 shown in previous studies, with Cronbach's α scores often above 0.85 (Krystallis et al., 2012;
697 Wang et al., 2015; Wang and Somogyi, 2018). The single item approach also helped us to
698 shorten the questionnaire and thus reduce the survey cost. It is recommended that future studies
699 follow the multiple measurement approach to consumer attitudes.

700 Thirdly, our sampling focused on consumers aged over 18, who had e-commerce food
701 consumption experiences, and lived in the most developed Chinese cities. As such, the sample
702 did not fully represent the socio-demographic characteristics of China, or of the three cities.

703 Fourthly, given the scope of this study, it only explored FMCs and Socio-demographics
704 that influence consumers' attitudes and consumptions towards food shopping with the four e-
705 commerce modes. It is recommended that future studies explore the influences of other possible
706 important factors such as website quality and social media (Galati et al., 2016; 2017; 2019).

707 Fifthly, the study provided knowledge regarding socio-demographics, FCMs and food
708 categories of food e-commerce shopping with the four modes by using linear regression and
709 descriptive analysis. It is recommended that researchers use other statistical tools in their future
710 studies in order to present more information about consumers' e-commerce food shopping
711 behaviours.

712 Finally, this study compared our findings with that from previous studies. However, as
713 this study was exploratory in nature and focusing on a new academic and industry context, we
714 could not find literature to compare or explain part of our findings. It is therefore recommended
715 that researchers conduct further studies to better compare and contrast the findings of this study.

716

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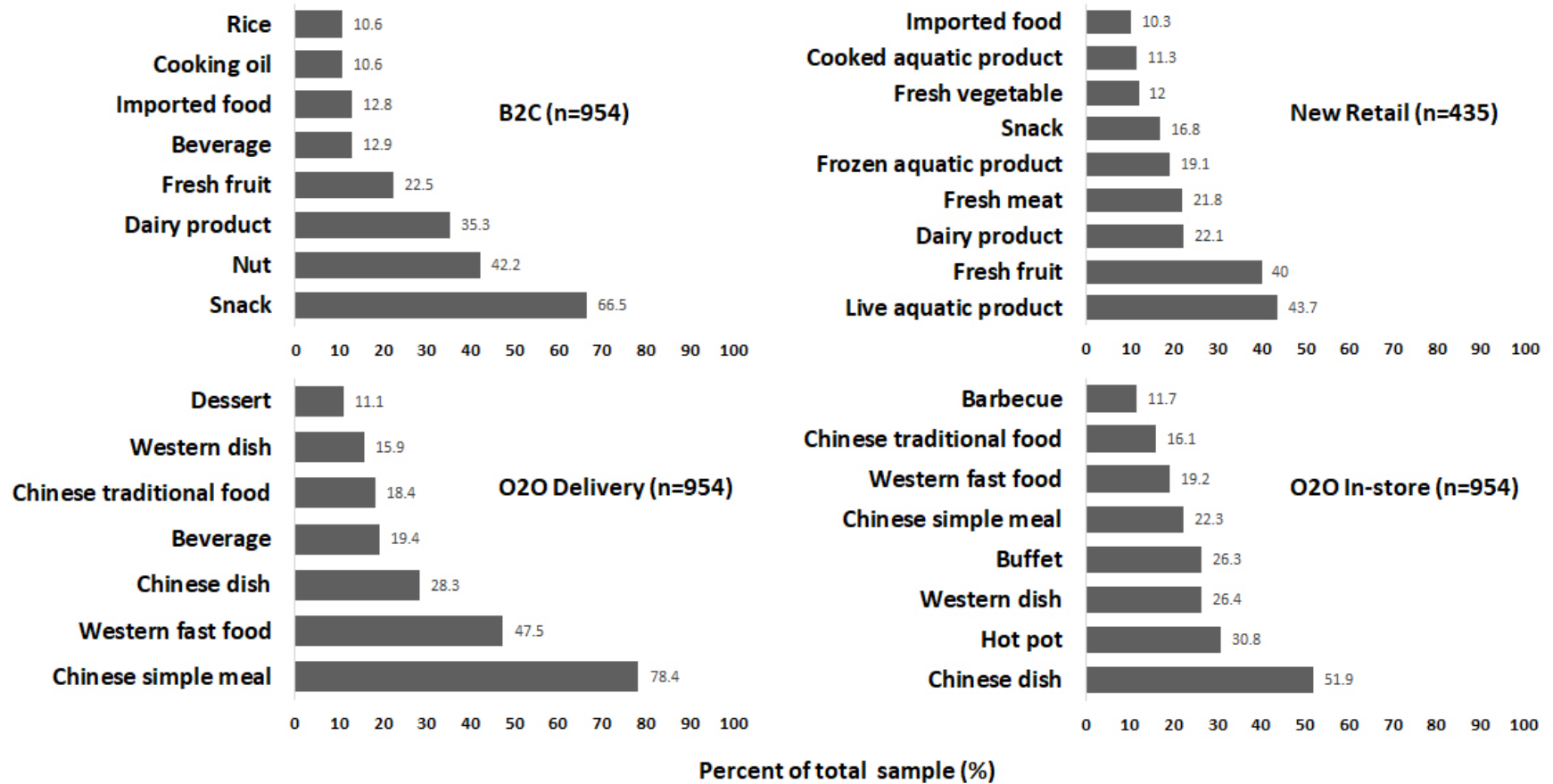


Figure 1 Food categories indicated by 10 percent or more of total participants in their consumption through different e-commerce platforms

Note: Please see Table 1 for definitions of food categories.

Table 1 Measurement items of food category consumption through different e-commerce platforms

E-commerce platform	Measurement item (food category and its definition)
B2C	1. Snack, 2. Nut, 3. Dairy product, 4. Cooked meat, 5. Dried meat, 6. Frozen meat, 7. Fresh meat, 8. Fresh fruit, 9. Dried fruit, 10. Cooked aquatic product, 11. Frozen aquatic product, 12. Dried aquatic product, 13. Live aquatic product, 14. Beverage, 15. Cooking oil, 16. Instant food, 17. Rice, 18. Flour, 19. Imported food, 20. Bread, 21. Cereal, 22. Other
O2O Delivery	1. Chinese simple meal (e.g. noodle, lunch box, pilaf...), 2. Western fast food (e.g. burgers, fries...), 3. Chinese traditional food (e.g. dumpling, bun...), 4. Chinese dish (except simple meal, hot pot, hot-hot-hot, traditional food, and barbecue), 5. Western dish (e.g. steak, salad..., except fast-food), 6. Beverage, 7. Dessert, 8. Fruit, 9. Hot pot, 10. Barbecue, 11. Hot-hot-hot, 12. Other
O2O In-store	1. Hot pot, 2. Hot-hot-hot, 3. Chinese dish (except simple meal, hot pot, hot-hot-hot, traditional food, barbecue, combo and buffet), 4. Chinese traditional food (dumpling, bun...), 5. Western-dish (e.g. steak, salad..., except fast-food), 6. Dessert, 7. Barbecue, 8. Buffet, 9. Western fast food (e.g. burgers, fries...), 10. Chinese simple meal (e.g. noodle, lunch box, pilaf...), 11. Beverage, 12. Japanese meal, 13. Combo, 14. Other
New Retail	1. Snack, 2. Nut, 3. Dairy product, 4. Cooked meat, 5. Dried meat, 6. Frozen meat, 7. Fresh meat, 8. Fresh fruit, 9. Dried fruit, 10. Cooked aquatic product, 11. Frozen aquatic product, 12. Dried aquatic product, 13. Live aquatic product, 14. Beverage, 15. Cooking oil, 16. Instant food, 17. Rice, 18. Flour, 19. Imported food, 20. Bread, 21. Cereal, 22. Fresh vegetable, 23. Other

Table 2 Socio-demographic distribution of the sample

	Total sample	Beijing	Shanghai	Shenzhen
Sample size (n=)	954	319	326	309
Gender				
Male	49.4%	50.2%	47.5%	50.5%
Female	50.6%	49.8%	52.5%	49.5%
Marital status				
Married	69.7%	71.5%	78.8%	58.3%
No, but has a partner	12.6%	11.3%	8.0%	18.8%
Single	17.7%	17.2%	13.2%	23.0%
Age				
Range	18-69	19-69	18-65	18-60
Mean (Std. Deviation)	33.8 (9.113)	35.1(9.935)	35.1 (8.091)	31.0 (8.621)
18-25	19.9%	16.9%	11.7%	31.7%
26-40	51.3%	48.6%	58.2%	46.6%
≥41	28.8%	34.5%	30.1%	21.7%
Personal income (RMB, monthly)				
0-5000	18.4%	20.4%	11.7%	23.6%
5001-10000	52.9%	51.4%	55.8%	51.5%
≥10001	28.6%	28.2%	32.5%	24.9%
Education				
High school, polytechnic school or below	7.0%	5.3%	6.4%	9.4%
College degree	16.5%	14.1%	11.3%	24.3%
Bachelor degree	63.9%	63.9%	69.0%	58.6%
Master degree or above	12.6%	16.6%	13.2%	7.8%
Occupation				
Managing employee	41.1%	39.2%	42.6%	41.4%
Salaried employee	42.6%	42.0%	43.3%	42.4%
Student	7.5%	8.2%	5.2%	9.4%
Other (worker, retired, self-employed, on-leave, housewife/houseman, unemployed, others)	8.8%	10.7%	8.9%	6.8%
Household size				
1-2	9.1%	12.9%	9.2%	5.2%
3	52.7%	57.7%	67.8%	31.7%
4	19.6%	18.2%	11.0%	30.1%
≥5	18.6%	11.3%	12.0%	33.0%
With food consumption experience by e-commerce platforms				
B2C	100%	100%	100%	100%
O2O Delivery	100%	100%	100%	100%
O2O In-store	100%	100%	100%	100%
New Retail	45.6%	42.6%	62.3%	31.0%

Table 3 Measurement items and correlation matrix of FCM variables

Food choice motive	Measurement item
Taste appeal	Is delicious.
Value for money	Has a good value for money.
Cheap	Is cheap.
Variety	Has a wide variety to choose.
Safety concern	Is reliable in safety.
Quality concern	Has a high quality.
Processed convenience	Takes no time to prepare or cook.
Purchase convenience	Is easy to purchase.
Others' reviews	Is sold by sellers who get good evaluations from other buyers.
Discount	Has a discount.

Correlation matrix of FCM variables										
Factor	1	2	3	4	5	6	7	8	9	10
1. Taste appeal	1									
2. Value for money	0.495	1								
3. Cheap	0.246	0.443	1							
4. Variety	0.437	0.383	0.279	1						
5. Safety concern	0.582	0.504	0.241	0.398	1					
6. Quality concern	0.545	0.432	0.176	0.432	0.615	1				
7. Processed convenience	0.183	0.224	0.333	0.296	0.150	0.147	1			
8. Purchase convenience	0.277	0.295	0.285	0.393	0.228	0.272	0.285	1		
9. Others' reviews	0.365	0.285	0.226	0.379	0.317	0.333	0.299	0.374	1	
10. Discount	0.265	0.366	0.456	0.378	0.257	0.272	0.309	0.399	0.309	1

Note: All correlations are significant at 0.01 level.

Table 4 Determinants of food consumption and attitude toward food consumption with e-commerce modes (outcomes of linear regression)

Independent variable	Dependent variable							
	Attitude				Consumption			
	B2C	O2O Delivery	O2O In-store	New Retail	B2C	O2O Delivery	O2O In-store	New Retail
	H1	H2	H3	H4	H5	H6	H7	H8
	Coefficient estimates							
City1	0.175*	0.101	0.135	0.031	-0.012	0.024	-0.006	0.259
City2	0.135	0.046	0.107	0.054	0.079	-0.096	0.022	0.001
Gender (female)	0.046	-0.133*	-0.015	0.191*	0.140*	0.071	-0.0002	0.095
Household size	0.020	0.007	-0.031	0.140*	-0.043	-0.057	-0.087*	0.045
Age	-0.009*	-0.018***	-0.007	0.002	-0.014**	-0.031***	-0.028***	-0.022**
Income	-0.045	-0.054	-0.039	-0.032	0.191**	0.128	0.087	0.197
Occupation1	0.196	0.122	0.222	0.359	0.175	0.095	0.007	-0.298
Occupation2	0.148	0.031	0.242*	0.215	0.111	-0.052	-0.161	-0.262
Occupation3	-0.189	-0.446*	-0.187	0.419	0.225	-0.237	-0.339	-1.022*
Education	0.061	0.014	0.066	0.090	0.045	0.022	-0.012	-0.010
Marital status1	0.086	0.325**	-0.024	0.326	0.351**	0.330**	0.473***	0.364
Martial status2	0.024	0.186	0.047	0.073	0.138	0.230	0.314*	0.209
Taste appeal	0.043	0.053	0.095*	0.132*	-0.009	-0.126**	-0.119**	-0.122
Value for money	-0.061*	-0.015	0.005	-0.053	0.012	0.020	0.058	0.079
Cheap	0.0002	-0.008	-0.004	0.018	0.003	0.007	0.034	0.043
Variety	-0.018	0.041	0.037	0.060	0.074	-0.002	-0.054	-0.103
Safety concern	0.071*	0.031	0.060	-0.012	-0.040	0.059	0.003	0.083
Quality concern	0.113***	0.105**	0.062	0.165**	0.035	0.019	0.062	-0.002
Processed convenience	-0.001	0.031	0.006	-0.022	0.035	0.054*	-0.002	0.030
Purchase convenience	0.095**	0.094**	0.039	0.012	0.0004	-0.001	0.018	0.092
Others' reviews	0.084**	0.026	0.076*	0.108*	-0.044	0.005	-0.001	0.017
Discount	0.056	0.020	0.031	0.048	0.005	0.003	0.050	-0.060
Attitude					0.506***	0.531***	0.432***	0.582***
R ² adjusted	0.1399	0.1251	0.1258	0.1707	0.2374	0.2623	0.1959	0.2325
N=	954	954	954	435	954	954	954	435

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

Table 5 Differences of the food e-commerce consumptions and attitudes among the categorical socio-demographic groups with significant relationships to the dependent variables in the linear regression analyses (Table 4): Mean (SD)

Attitude/consumption	Socio-demographic groups (mean)				F	p
	City					
	Beijing	Shanghai	Shenzhen			
Attitude towards B2C (n=954)	5.69 ^a (0.945)	5.67 ^a (0.951)	5.44 ^b (1.079)	5.927	0.003	
	Marital status					
	Married	With a partner	Single			
Attitude towards O2O Delivery (n=954)	5.48 ^a (1.035)	5.38 ^{ab} (1.070)	5.16 ^b (1.026)	6.258	0.002	
Consumption by B2C (n=954)	4.86 ^a (1.212)	4.63 ^{ab} (1.174)	4.45 ^b (1.149)	8.709	0.000	
Consumption by O2O Delivery (n=954)	4.52 ^a (1.287)	4.62 ^a (1.204)	4.20 ^b (1.312)	5.090	0.006	
Consumption by O2O In-store (n=954)	4.58 ^a (1.222)	4.62 ^a (1.168)	4.24 ^b (1.260)	5.723	0.003	
	Occupation					
	Managing employee	Salaried employee	Student	Other		
Attitude towards O2O Delivery (n=954)	5.51 ^a (1.046)	5.42 ^a (0.995)	4.94 ^b (1.086) ^b	5.24 ^{ab} (1.115)	6.949	0.000
Attitude towards O2O In-store (n=954)	5.58 ^{ab} (1.098)	5.63 ^b (0.962)	5.26 ^a (1.075)	5.26 ^a (1.131)	4.796	0.003
Consumption by New Retail (n=435)	4.86 ^a (1.321)	4.69 ^a (1.278)	3.67 ^b (1.500)	4.65 ^a (1.142)	2.828	0.038

Note: With statistics from one-way ANOVA tests (confidence interval= 95%); a - c indicate significantly different means.