Consumer adoption of online-to-offline food delivery services in China and New Zealand

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Consumer adoption of Online-to-Offline Food Delivery Services in China and New Zealand

Structured Abstract:

Purpose: This study explores impacts of innovation-adoption characteristics, food choice motives, segmentation and socio-demographics on consumer adoption of Online-to-Offline Food Delivery Services (O2O-FDS) in a western developed country - New Zealand and an Asian developing country - China.

Design/methodology/approach: An online survey of 1,185 consumers provides data that we analyze using factor analyses, structural equation modeling and cluster analysis.

Findings: The following innovation-adoption characteristics and food choice motives have statistically significant effects on consumers' attitudes and/or purchase intentions towards O2O-FDS in the pooled sample and/or the samples of two countries: perceived incentive, perceived complexity, processed convenience, cheapness, taste appeal, safety-assured and purchase convenience. Three consumer segments are recognized: Conservatives (26.6%), Food-value-seekers (40.8%) and Pioneers (32.6%). Significant differences are found in marital status, age, household income, education level, household size, occupation, country and residential areas across the three segments.

Originality/value: This is the first study to systematically understand significant influencing factors for the O2O-FDS adoption by using a sample set composed of both Eastern and Western consumers. This study is also the first to recognize consumer segments for the O2O-FDS adoption.

Abstract

Keywords

Consumer segmentation; food choice motives; innovation-adoption characteristics; O2O food delivery services.

1. Introduction

The food industry faces opportunities and challenges from the irreversible global trend of e-commercialized food marketing (Wang et al., 2020). The process of the e-commercialization of food marketing will speed up as a result of the COVID-19 pandemic (Withington, 2020). Different modes of e-commerce are suited to marketing different food categories (Wang et al., 2020). The business-to-consumer (B2C) mode (e.g. Amazon) has an obvious shortcoming that makes it more suitable for selling packaged foods like beverages and snacks (Quevedo-Silva et al., 2016; Piroth et al., 2020; Wang and Somogyi, 2018). The emergence of the Online-to-Offline mode supplements the role of B2C by enabling the success of the e-commercialization of meal services (Wang, 2020). Consumers now can purchase meals and food products, which are provided by their local restaurants/retailers and delivered to their places, by using Online-to-Offline Food Delivery Services (O2O-FDS) apps (established by the third-part service providers such as Uber Eats, or by physical restaurants and retailers themselves such as the meal ordering apps by Domino, and KFC) and the online ordering platforms by local supermarkets (Pigatto et al., 2017; Wang et al., 2020). The market shares of O2O-FDS are rising dramatically across the world (Eadicicco, 2019; Roh and Park, 2019; Wang, 2020). For this reason, understanding O2O-FDS consumption and, in particular, the relevant consumer behaviour, is vital if stakeholders of global foodservice industries are to create marketing strategies that ensure their food services meet actual consumer needs in this e-commerce age.

However, to date, consumer behaviour towards O2O-FDS is quite poorly explored. Few empirical consumer studies can be found on the topic, and most have been published in the past three years (Wang, 2020; Wang et al., 2020). Moreover, most of these studies have been conducted using consumer samples in Asian developing countries (e.g. China, India and Malaysia), because of the first explosion of O2O-FDS market growth in the region (Cho et al., 2019; Thibaud, 2019; Wang, 2020; Wang et al., 2020; Xiao et al., 2018). Specifically, there is a lack of empirical studies on O2O-FDS consumer behaviours in western developed countries, where dietary patterns are significantly different from Asian countries and there has been a recent rapid increase in O2O-FDS market shares (Eadicicco, 2019; Roh and Park, 2019; Wang, 2020). While, there are only a few recently published journal articles in the field that explore consumer intentions to use O2O-FDS in two western developed countries- The USA and Italy (Annaraud and Berezina, 2020; Brewer and Sebby, 2021; Cai and Leung, 2020; Gunden et al., 2020; Troise et al., 2020). To our knowledge, there is no prior study that compares O2O-FDS adoption between Eastern and Western consumers and provide a more generalized understanding of it surpassing the categories of Western and the Eastern dietary consumption patterns.

A review study by Wang (2020) builds an all-embracing conceptual model of significant factors influencing O2O-FDS adoption. The study summarizes significant factors that have been found in the limited published studies addressing consumer adoption of O2O-FDS, and has classified them into four categories: *Food choice motives (FCMs), Innovation–adoption characteristics (IACs), APP-service quality and Socio-demographics* (Wang, 2020). However, as far as we know, there is still a lack of studies that systematically explore the effects of IACs and FCMs on consumer adoption of O2O-FDS. Further, only two published studies focus on identifying the significant socio-demographic features for the consumer adoption of O2O-FDS (Roh and Park, 2019; Wang et al., 2020). In addition, no study has explored consumer segmentation for O2O-FDS, although there are empirical studies that identify consumer segments for the adoption of B2C food purchasing (Jin et al., 2017; Kang et al., 2016; Wang and Somogyi, 2018).

To fill these knowledge gaps we examine impacts of IACs, FCMs, socio-demographics and segmentation on consumer adoption of O2O-FDS in a western developed country - New Zealand – and an Asian developing country – China. This contrast in O2O-FDS behaviour is both between a developing and a developed country, between an Eastern and a Western country, and between a developed and a developing O2O-FDS country. China leads in the O2O-FDS industry, with sales of US$ 51.5 billion (more than half of global O2O-FDS market value) in 2020 (Curry, 2021; Wang, 2020). The O2O-FDS food market in New Zealand is rising but still lagging behind Asian developing countries, particularly China (Elluminati, 2020; Roh and Park, 2019).

2. Research framework

Figure 1 presents a framework for this study showing the context of the specific hypotheses and other research approaches. It was developed based on a literature review that revealed factors significantly influencing consumer adoption of O2O-FDS and a conceptual framework from the review study by Wang (2020) which has summarized significant influencing factors for consumer adoption of O2O-FDS. This section provides the theoretical and empirical background to it.

>>>>>>>>>>>> Insert Figure 1

2.1 Consumer adoption

Previous studies identify a two-stage procedure of consumer adoption of O2O-FDS based on general attitudes and consumption behaviours (e.g. purchase or purchase intentions) (Cho et al., 2019; Kang and Namkung, 2019; Wang et al., 2020; Yeo et al., 2017). Attitudinally, consumers' summary evaluations (positive or negative) towards O2O-FDS have a strongly positive effect on their O2O-FDS purchases or purchase intentions (Cho et al., 2019; Kang and Namkung, 2019; Wang et al., 2020; Yeo et al., 2017). From that perspective, factors with direct effects on the attitudes towards O2O-FDS have indirect effects on the consumption behaviours towards O2O-FDS (Wang et al., 2020). Therefore, a hypothesis (H) is developed as follows:

H1. Consumers' attitudes towards O2O-FDS have significant effects on their purchase intentions towards O2O-FDS.

2.2 Innovation-adoption characteristics

Hansen (2005) finds a five-factorial construct of IACs influence consumer adoption of e-commerce food shopping. The five factors are *perceived social norm* (i.e. the peer pressures on an individual's adoption of e-commerce food shopping), *perceived compatibility* (i.e. if the e-commerce food shopping fits with an individual's lifestyle and values), *perceived relative advantage* (i.e. the superiority of e-commerce food shopping compared to offline - such as time saving), *perceived complexity* (i.e. the complexity of using e-commerce food shopping services), and *perceived risk* (i.e. the risk from using e-commerce food shopping services such as payment problems and untrustworthy e-commerce sellers) (Hansen, 2005; Wang and Somogyi, 2018a).

A numbers of studies systematically confirm the significant effects of consumers' IACs on their adoption of Business-to-Consumer (B2C) food shopping (Wang and Somogyi 2018; Wang et al., 2020). Wang and Somogyi (2018) show deficiencies of the five-factorial construct of IACs for Chinese consumers, and develop an adjusted three-factorial construct for the IACs towards

B2C food shopping including *perceived incentive* (i.e. incentives that drove consumers to adopt B2C food shopping), *perceived complexity* and *perceived risk*.

Some recent studies respectively confirm the significant effects of those IACs on consumers' attitudes and consumption behaviour towards O2O-FDS (Kang and Namkung, 2019; Lee et al., 2019; Ray et al., 2019; Roh and Park 2019; Suhartanto et al., 2019; Wu et al., 2015; Yeo et al., 2017). However, there is still a lack of studies that systematically explore the effects of IACs on the O2O-FDS adoption, in particular for consumers in Western developed countries. Therefore, two hypotheses (H) were developed to address the gaps:

H2. Consumers' innovation-adoption characteristics have significant effects on their attitudes towards O2O-FDS.

H3. Consumers' innovation-adoption characteristics have significant effects on their purchase intentions towards O2O-FDS.

2.3 Food choice motives

Steptoe et al (1995) find nine important motives for consumers' daily food choices: *health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity* and *ethical concern.* Recently, Wang et al. (2020) find ten FMCs related to e-commerce food shopping: *taste appeal, value for money, cheap, wide variety, safety concern, quality concern, processed convenience, purchase convenience, others' reviews* and *discount*. Some recent studies have identified significant FCMs attached to consumers' attitudes and consumption behaviours towards O2O-FDS such as *quality concern, processed convenience, purchase convenience, taste appeal, wide variety* and *discount* (Cho et al., 2019; Roh and Park, 2019; Ray et al., 2019; Suhartanto et al., 2019; Wang et al., 2020; Yeo et al., 2017). However, there is still a lack of studies that systematically recognize the important FCMs attached to O2O-FDS adoption. This is especially true for consumers in Western developed countries. Therefore, two hypotheses (H) are developed in order to address the gap as follows:

H4. Consumers' food choice motives have significant effects on their attitudes towards O2O-FDS.

H5. Consumers' food choice motives have significant effects on their purchase intentions towards O2O-FDS.

2.4 Consumer segmentation and socio-demographics

When analysing the socio-demographic influences on consumer behaviours, segmentation analysis is indispensable. Segmentation analysis is increasingly conducted in consumer and marketing studies, producing consumer segments followed by profiling with socio-demographic characteristics (e.g. Khan et al., 2019; Untaru et al., 2020; Zhang and Zhao, 2019). Regarding e-commerce food shopping, there have been empirical studies conducted to identify consumer segments for the adoption of B2C food purchasing. Different segments have been recognized, based on consumers' FCMs, product attribute perceptions, IACs or category preferences in relation to B2C food shopping (Jin et al., 2017; Kang et al., 2016; Wang and Somogyi, 2018). Significant socio-demographic characteristics for B2C online shopping, including income level, marital status, occupation and age, have been identified by profiling those segments in the studies (Jin et al., 2017; Kang et al., 2016; Wang and Somogyi, 2018). However, to date, no study has explored consumer segmentation for O2O-FDS.

In our study, two IACs and five FCMs are recognized with significant impacts on the O2O-FDS adoption. They are involved as segmentation variables to reveal consumer segments for O2O-FDS. The consumer segments are profiled with socio-demographic characteristics including marital status, age, gender, income, education, residential area, household size, occupation and country.

3. Methods and materials

3.1 Participants and procedures

A questionnaire was developed in English and Chinese. It was randomly sent to registered members of the consumer panels owned by two research agencies in China and New Zealand from November 2019 to March 2020. A quota sampling method was applied, using gender (male and female) and age (below and above 40 years of age) as the dimensions for quota stratification (Wang et al., 2015). The New Zealand survey was sampled based on regional population distribution across New Zealand: Auckland 34%, Waikato 10%, Wellington 18%, Canterbury 18%, Otago 8%, Bay of Plenty 6% and other New Zealand regions. The Chinese survey sampled equally from a first-tier city - Shanghai and a second-tier city – Qingdao, to reflect the differences in dietary habits, lifestyles, and economic and social development levels between first-tier and other-tiered cities in China (Wang et al., 2015).

A total of 1,185 valid responses were obtained; 604 from China and 581 from New Zealand. Respondents received a monetary incentive from the research agencies. Table 1 summarizes the socio-demographic distributions of the total sample, including marital status, age, gender, income, education, residential area, household size, O2O consumption frequency, and occupation and country. The household income was measured using a 10-step ladder developed from Stillman et al. (2015), where the lowest step (=1) represents the poorest people, and the highest step (=10) represents the richest people. China has a higher share of participants with frequent consumption experiences for O2O-FDS than New Zealand; 89.9% of Chinese participants use it often or sometimes; while the percentage for New Zealand participants is 54.7%.

>>>>>>>>>>> Insert Table 1

3.2 Measures

Table 2 indicates the measures and items of FCMs and IACs involved in the study. It includes the original five factors of IACs that influence consumers' adoption of e-commerce food shopping: *Subjective norm, Perceived complexity, Perceived compatibility, Perceived relative advantage* and *Perceived risk* (Hansen, 2005). Each of these five IACs was measured by using two or three items which were developed from a previous study on the consumer adoption of B2C food shopping by Wang and Somogyi (2018) and adjusted into the text expressions for O2O-FDS. A seven-point Likert agreement scale was used, with response categories from 1= totally disagree to 7= totally agree (Wang and Somogyi, 2018; Wang et al., 2020).

The table also includes the ten FCMs related to consumers' adoption of e-commerce food shopping (Wang et al., 2020): *Taste appeal, Value for money, Cheap, Discount, Wide variety, Safety-assured, Quality-assured, Processed convenience, Purchase convenience* and *Others' review*. Each FCM was measured by a single item which was developed from a recent study on the effects of FCMs in e-commerce food shopping (Wang et al. 2020) and adjusted into the text expressions for O2O-FDS. The seven-point Likert agreement scale was used again.

Participants' attitudes towards O2O-FDS (**the O2O-FDS attitudes**) were measured by two items using a seven-point semantic differential scales with bipolar adjectives from 1= unhappy/dull to 7= happy/excited. The measures were developed from previous studies that examined consumers' attitudes towards e-commerce food shopping (Wang and Somogyi, 2018; Wang et al., 2020).

Participants' purchase intentions towards O2O-FDS (**the O2O-FDS purchase intentions**) were measured by two items using the seven-point Likert agreement scale as the response categories. The measurement items were derived from previous studies that explored consumers' purchase intentions towards B2C food shopping (Mortimer et al., 2016; Wang and Somogyi, 2018).

>>>>>>>>>>>> Insert Table 2

3.3 Data analysis

Data analysis was performed using SPSS 25 and AMOS 25 statistical packages. First, confirmatory factor analysis (CFA) and exploratory factor analysis (EFA) were conducted to examine if the factorial construct of IACs. Second, a structural equation model (SEM) was built to associate consumers' IACs and FCMs with their attitudes and purchase intentions towards O2O-FDS, followed by path analysis and multi-group path analysis in the pooled sample and the separate samples from China and New Zealand. Third, a two-step hierarchical cluster analysis was conducted to reveal consumer segments by using the significant IACs and FCMs for the O2O-FDS adoption as segmentation variables. Cross-tabulation with a $\chi 2$ test and one-way ANOVA test were employed to profile the consumer segments.

4. Results and discussions

4.1 Factor analyses of innovation-adoption characteristics

Table 3 shows results of the CFA for the five-factorial construct of IACs for O2O-FDS with the pooled sample from China and New Zealand. The value of goodness of fit index CFI was within the acceptable limit - above 0.9; while that for RMSEA was outside the acceptable limit - below 0.08 (Pieniak et al., 2009). Furthermore, the individual items PR1 and PR2 did not load well on its latent variable (IAC factor)-*perceived risk*, with the values of standardized factor loading below than 0.5 (Wang et al., 2015). In addition, severe multi-collinearity was recognized among three IACs *social norm*, *perceived compatibility,* and *perceived relative advantage* due to their correlation coefficients higher than 0.85 (Pieniak et al., 2009). Moreover, the AVE scores of these three IACs were lower than several squared correlation coefficients with other IACs. As such, the discriminant validity was not established on the five-factorial construct of IACs for O2O-FDS for the pooled sample from China and New Zealand. The same CFA was conducted with the Chinese and New Zealand samples separately, showing the same problems for discriminant validity including low factor loadings, severe multi-collinearity, the unacceptable relationships between AVE scores and squared correlation coefficients, and the RMSEA value higher than 0.08. Therefore, the five-factorial construct of IACs for O2O-FDS (Pieniak et al., 2009) seems unsuitable for the data of this study.

>>>>>>>>>>>> Insert Table 3

>>>>>>>>>>>> Insert Table 4

Table 4 has results of the EFA that explored an adjusted factorial construct of the measurement items of IACs for O2O-FDS based on the pooled sample from China and New Zealand. A high Kaiser–Meyer–Olkin (KMO) value of 0.846 and a highly significant result of

Bartlett's test of sphericity ($\chi 2 = 5027.434$, $p = 0.000$) indicated the IAC measurement items in this study were appropriate for EFA. Similar with the EFA findings of IACs for B2C food shopping in a previous study by Wang and Somogyi (2018a), a three-factorial construct was identified in the current case for O2O-FDS: *perceived incentive, perceived complexity* and *perceived risk*. Three old IACs *social norm, perceived compatibility* and *perceived relative advantage* loaded on a new IAC- *perceived incentive* which reflected the incentives driving consumers' adoption of O2O-FDS.

Within the adjusted three-factorial construct, *perceived incentive* and *perceived complexity* had good internal reliabilities due to the Cronbach's α values higher than 0.60 (Wang et al., 2015; Žeželj et al., 2012). The measurement item PRA2 was removed from the further analyses in the study due to high cross-loadings for two IACs (the value of standardized factor loading higher than 0.35 on *perceived incentive* and *perceived complexity*) (Pieniak et al., 2009). Another item PR2 was also deleted due to a relatively high cross-loadings (0.345 on *perceived risk* and above 0.35 on *perceived complexity*) and the low values of standardized factor loadings (below 0.5) on all the three IACs in the adjusted factorial construct. In addition, good internal reliability was not established for *perceived risk* due to the Cronbach's α value lower than 0.60. Considering the semantical and practical differences of its two measurement items PR1 and PR3 ('receiving low-quality or incorrect meal item' versus 'many untrustworthy restaurants', see Table 2), the two items were treated as separate observed variables in the further analyses of this study.

4.2 Structural equation modeling

A SEM was developed to associate consumers' IACs and FCMs with their attitudes and purchase intentions towards O2O-FDS. It uses 4 latent variables and 24 observed variables. The observed variables regarding attitudes and purchase intentions had good internal reliabilities due to the high Cronbach's α values: 0.909 and 0.794 (Wang et al., 2015; Žeželj et al., 2012). The mean values of FCM variables ranged from 4.45 to 5.61, with the highest values for *processed convenience, purchase convenience* and *wide variety* (higher than 5.5), and the lowest values for *cheap* (lower than 4.5). Severe multi-collinearity was not found among SEM independent variables, with all values of their correlation coefficients lower than 0.75.

The SEM performed well for the path analysis using the pooled sample. The goodness-of-fit indices were within acceptance limits: below 0.08 for RMSEA and above 0.9 for CFI (Pieniak et al., 2009; Wang et al., 2015). Regarding the multi-group path analysis for the samples between China and New Zealand, the RMSEA values for all the six restricted models (from 0.045 to 0.058) and the CFI values for five of them (from 0.910 to 0.963) were within the acceptance limits. Only the CFI value of the restricted model of measurement residuals was slightly outside the acceptable limit (0. 883). These results underpin the decision to pool the datasets from China and New Zealand in order to detect significant paths from the IACs and FCMs to attitudes and purchase intentions towards O2O-FDS in a more generalized way, combining East and West, and developing and developed countries (Pieniak et al., 2009; Wang et al., 2015).

>>>>>>>>>>> Insert Table 5
>>>>>>>>>>> Insert Figure 2

Table 5 indicates the test results of hypotheses in the study. Figure 2 shows the significant paths from the path analysis on the pooled sample and the multi-group path analysis for the country-specific samples. The attitudes had a significantly positive path to the purchase intentions

towards O2O-FDS for either the pooled sample or the samples of the two countries. As such, **H1** is strongly supported. This highlights the impact of consumers' attitudes regarding their consumption behaviour in e-commerce food shopping with different modes including B2C, O2O and New Retail (Cho et al., 2019; Kang and Namkung, 2019; Wang and Somogyi, 2018; Wang et al., 2020; Yeo et al., 2017).

Regarding IACs, *perceived incentive* had a significantly positive path to both the attitudes and purchase intentions towards O2O-FDS for either the pooled sample or the separate country samples. Furthermore, *perceived complexity* had a significantly negative path to both the O2O-FDS attitudes and purchase intentions for the pooled sample and the Chinese sample. It had a significantly negative path to the O2O-FDS attitudes in the New Zealand sample. In addition, the two observed variables of *perceived risk*- PR1 and PR3 (see Table 2) were found to have no significant path to both the O2O-FDS attitudes and purchase intentions in the pooled sample and the country-specific samples. Therefore, **H2** and **H3** are partially supported. The three kinds of incentives partially relate to previous relevant studies and are all found with significantly positive effects on consumers' attitudes or consumption behaviours towards O2O-FDS (Kang and Namkung 2019; Lee et al, 2019; Ray et al., 2019; Roh and Park, 2019; Suhartanto et al., 2019; Wu et al., 2015; Yeo et al., 2017). The finding about *Perceived complexity* confirms previous findings that ease of use is still a barrier to consumers' adoption of e-commerce food shopping with both B2C and O2O-FDS platforms (Kang and Namkung 2019; Lee et al, 2019; Ray et al., 2019; Roh & Park, 2019; Suhartanto et al., 2019; Wang and Somogyi, 2018; Wu et al., 2015; Yeo et al., 2017).

According to FCMs, *taste appeal* has a significantly negative effect on the purchase intention towards O2O-FDS in the pooled sample. This is in line with the finding about the negative impact of *taste* appeal on Chinese consumers' consumption of O2O-FDS by Wang et al. (2020). Meanwhile *cheap* has a significantly negative effect on the adoption of O2O-FDS in the pooled sample and the Chinese sample. These negative impacts of *taste* appeal and *cheap* correspond with the reality in Chinese O2O-FDS market. The rapid but less-regulated development have caused some issues and problems in the Chinese O2O-FDS industry recently; which many unlicensed restaurants using low quality food ingredients surge into the O2O-FDS business and provide cheap and low quality (often with unsatisfactory tastes and textures) meals (Li et al., 2020; Sun and Buijs, 2018). This may result into consumption experiences of bad taste and cheap meals which have a significantly negative influence on the O2O-FDS repurchase. While *taste appeal* has a significantly positive effect on the attitudes towards O2O-FDS so an indirectly positive effect on the purchase intention in the Chinese sample. This is the opposite to the directly negative effect of taste appeal on the purchase intention. It may reflect the difficult challenge for consumers to make correct assumptions about sensory attributes of O2O-FDS meals. Good taste expectations originate from O2O-FDS platform displays but sometimes pictures are not consistent with the actual, unexpected and unsatisfactory taste experience from these O2O-FDS meals (Li et al., 2020).

Processed convenience has a significantly positive effect on the adoption of O2O-FDS in the pooled sample and the Chinese sample. This is in line with the important role of perceived convenience in driving the meal purchase with O2O-FDS confirmed by previous studies (Cho et al., 2019; Wang et al., 2020; Wu et al., 2015; Yeo et al., 2017). *Safety-assured* has a significantly positive impact on consumers' attitudes towards O2O-FDS in the New Zealand sample. This may be caused by the higher availability of safety-related information for ordered meals (e.g. ingredients and the restaurant reliabilities) by using e-commerce platforms than what is offered

using traditional offline restaurants (Chintagunta et al., 2012; Jin et al., 2017; Kang et al., 2016; Wang et al., 2020). In general, **H4** and **H5** are partially supported.

There are differences in the significant IACs and FCMs on the consumer adoption of O2O-FDS between China and New Zealand. As shown in Figure 1, many significant paths found in the pooled sample and the Chinese sample are not found in the New Zealand sample including the significant paths from the IAC *perceived complexity* to the O2O purchase intentions, and from the FCMs *processed convenience, cheap* and *taste appeal* to the attitudes or purchase intentions towards O2O-FDS. These differences may be caused by the much more frequent consumption experiences with O2O-FDS by Chinese consumers than that by New Zealand consumers (see Table 1). From that perspective, those IACs and FCMs linked to real consumption experiences e.g. taste, the ease of use, price and if saving meal processing time cannot be recognized as the significant influencing factors for the O2O-FDS adoption by consumers in New Zealand where the O2O-FDS food market is rising but still lagging behind Asian developing countries, particularly China (Eadicicco, 2019; Roh and Park, 2019; Wang et al., 2020). While these IACs and FCMs may become significant factors in the future in New Zealand when the O2O-FDS market is mature enough so that consumers are more experienced in it like their current counterparts in China.

4.3 Segmentation analysis

The significant IACs and FCMs for the O2O-FDS adoption were involved in the segmentation analysis as segmentation variables. The two-step hierarchical cluster analysis resulted in a three-segment solution. Table 6 indicates the size and mean value per segmentation variable for the pooled sample and the significant differences across the three segments for socio-demographic characteristics.

Segment 1 contained 26.6% of the pooled sample. It had the lowest mean scores on one IAC, *perceived incentives*, and on four FCMs, *taste appeal, cheap, processed convenience* and *purchase convenience*, and the highest mean score for the IAC of *perceived incentives* amongst the three segments. The mean score for *safety concern* in Segment 1 had no significant difference from the mean of Segment 3, but a very significantly lower score than the score for Segment 2 (at least two points lower). All the segmentation variables in Segment 1 scored on or close to the negative answer anchor (below or close to 4). They generally considered all the FCMs not to be important regarding O2O-FDS (i.e. the mean scores were below or close to 4 for the FCMs). In addition, Segment 1 had a percentage of participants who had stopped or never used O2O-FDS that was much higher than the other two segments (see Table 6). Therefore, this segment was labelled the *Conservatives* (Wang and Somogyi, 2018). This segment was characterized by the oldest mean age and the highest percentages of participants who had a low household income, a low educational level, a low level of occupation, and a household size of one to two or four or more, amongst the three segments. The segment had a higher percentage of participants who lived in New Zealand than in China. For marital status, the segment had percentages of participants for all the three categories between that for the other two segments.

>>>>>>>>>>> Insert Table 6

Segment 2 was the largest segment, accounting for 40.8% of the pooled sample. The participants in this segment had positive perceptions regarding the incentives to use O2O-FDS (i.e. a score above 4 for *perceived incentives*). This segment had a higher percentage of participants who used O2O-FDS sometimes than the other two segments. The segment was typified by high mean scores for the FCM segmentation variables (all higher than or close to 6). In particular, the

mean scores for three FCMs, *taste appeal, cheap* and *safety concern*, which were mainly derived from the consumers' psychological satisfaction with the food itself, were significantly higher than the scores for these factors in the other two segments. For this reason, this segment was named the *Food-value-seekers*. This segment was typified by the highest percentages amongst the three segments of participants who were unmarried (single or with a partner), had a high level of household income, and lived in New Zealand. The segment had a mean age between that for other two segments and a higher percentage of participants with a high educational level than those with a low educational level. It experienced an equal distribution of participants (around 33%) among the three household size categories (one to two, three, and four or more). Regarding occupation, this segment had the highest percentage of workers and self-employed participants amongst the three segments, and percentages for the other occupational categories between that for the other two segments.

Segment 3 accounted for 32.6% of the pooled sample. Like the participants in Segment 2, the participants in this segment had positive perceptions regarding the incentives to use O2O-FDS. They considered the convenience-related FCMs, *processed convenience* and *purchase convenience*, to be very important for their use of O2O-FDS. They were less likely than their counterparts in the other two segments to consider the use of O2O-FDS to be complicated. The segment had the highest percentage of participants who used O2O-FDS often, and the lowest percentage of participants who had stopped or never used O2O-FDS, among the three segments. From that perspective, this segment was labelled the *Pioneers* (Wang and Somogyi, 2018). The segment was characterized by the youngest mean age and the highest percentages of participants amongst the three segments who had a middle level of household income, a high educational level, a household size of three, and a high or middle level of occupation, who were married, and who lived in China. This segment had the lowest percentage amongst the segments of participants with a low occupational level.

There are significant differences in the consumer segmentation for O2O-FDS between China and New Zealand. Chinese consumers are more likely to be Pioneers for O2O-FDS, with a high consumption frequency. In contrast, New Zealand consumers are more likely to be Food-value-seekers for O2O-FDS, with a low consumption frequency, or Conservatives who have stopped using it or have never used it. This corresponds with the fact that Asian developing countries, particularly China, have a higher level of marketing development for O2O-FDS than western developed countries (Cho et al., 2019; Thibaud, 2019; Wang, 2020; Wang et al., 2020; Xiao et al., 2018).

According to the O2O-FDS segmentation between residential areas in China, significant differences can be recognized between Shanghai and Qingdao. Shanghai consumers are more likely to become Food-value-seekers and Pioneers for O2O-FDS than their counterparts in Qingdao, while Qingdao consumers are more likely to become Conservatives for O2O-FDS than Shanghai consumers. This is in line with the reality that China's top-tier cities, like Shanghai and Beijing, have greater demand and market size for O2O-FDS than lower-tier cities like Qingdao (Daxue Consulting, 2020). There are different food consumption preferences between China's first-tier and other-tier cities because of the different economic and social levels of development, with consumers in first-tier cities being more willing to save time in food consumption in order to deal with their stressful and fast-paced lives than their counterparts in lower-tier cities who have a relatively slower pace of life (Wang et al., 2015). O2O-FDS meets the demand in China's first-tier cities for a tool to save people's food purchasing and processing time (Cho et al., 2019; Roh and

Park, 2019; Suhartanto et al., 2019; Wang et al., 2020; Yeo et al., 2017). No such significant difference is found between the residential areas in New Zealand.

Many socio-demographic characteristics are identified as having significant influences on the use of O2O-FDS, including marital status, age, income, education, household size and occupation. The findings indicate that the Pioneers segment consists of consumers who are more likely to use O2O-FDS frequently, are married, are young and have a high or middle level of occupation. This confirms the previous findings about the typical profile of frequent O2O-FDS users (Roh and Park, 2019; Wang et al., 2020).

This study is the first to indicate the significant influences of household size, educational level and income level on O2O-FDS consumption. Those consumers with a high educational level or a high or medium income level are more likely to become O2O-FDS users (i.e. consumers in the Pioneers and Food-value-seekers segments) than their counterparts with a low level of education or income (i.e. consumers in the Conservatives segment). The findings are similar to results for the B2C food shopping mode, which show that very frequent users have a high or medium income or a high educational level (Hansen, 2005; Morganosky and Cude, 2000; Wang and Somogyi, 2018). In addition, frequent O2O-FDS users (i.e. consumers in the Pioneers segment) are much more likely to have a household size of three than those who use O2O-FDS less often (i.e. consumers in the Food-value-seekers segment and the Conservatives segment).

4.4 Limitations and future studies

Nevertheless, this study does have limitations. Firstly, based on the Yamane formula (Israel, 2009), our sample sizes were enough to represent populations of China and New Zealand (above 400 for each country, at 95% confidence level). However, given the nature of the quota sampling method in our surveys, our samples did not fully represent the demographic distributions of the two countries. It is strongly recommended for future relevant studies to employ a more representative sample from the two countries, or even involve more countries (particularly western countries such as US, UK, Australia and EU countries). Secondly, due to the lack of literature and studies regarding choice motives for O2O-FDS, we might not fully explain the effects of *cheap* and *taste appeal* on the O2O-FDS adoption. This may raise relevant research questions for future scholarly work.

5. Conclusion and implications

5.1 Theoretical implications

This study modifies the existing theories for consumer adoption of O2O-FDS. Previous studies only provide scattered empirical findings for this emerging research topic. Based on the findings, Wang (2020) builds the all-embraced conceptual model of significant influencing factors for the O2O-FDS adoption. The current study is the first to develop a hypothetical framework based on the conceptual model, and examine its reliability by using a real consumer sample set. In particular, this study is the first to recognize consumer segments and to explore the impacts of so-demographics by using the segmentation profiling approach for the O2O-FDS adoption. In addition, this study revises the measurement design of FCMs and IACs used in previous studies (Wang and Somogyi, 2018; Wang et al., 2020), with the first time to make them specifically for the O2O-FDS consumer studies. All these efforts contribute to a more reliable and systematic understanding of the factors significant influencing O2O-FDS adoption.

This is the first study to systematically understand significant influencing factors for the O2O-FDS adoption by using a sample set composed of both Eastern and Western consumers. The results of the multi-group path analysis statistically underpin our decision to pool the datasets from China and New Zealand. This confirms the high reliability and validity for the more generalized understanding of impacts of FCMs, IACs, socio-demographics and segmentation on consumer adoption of O2O-FDS in this study, surpassing the West and East. Further, as far as we know, there is a lack of studies comparing consumer adoption of O2O-FDS between Eastern and Western, between developing and developed, and between O2O-FDS developed and developing countries. Our findings based on the sample set from China and New Zealand significantly addressed this knowledge gap and will inspire scholars to conduct additional and relevant studies.

5.2 Managerial and policy implications

Apart from the important theoretical implications mentioned above, the study findings have important managerial and policy implications as well. The findings can assist stakeholders of the global food industry to better understand consumer behaviour towards O2O-FDS. This will enable them to develop effective promotions for their food products to be marketed effectively utilising the O2O-FDS e-commerce mode. For example, food marketers could develop marketing promotions to highlight those product characteristics related to the significant IACs and FCMs on the O2O-FDS adoption (e.g. the high in processed convenience, food safety or the simple ordering platform to use). Further, the findings can also help global food producers and food service providers to recognize the right target groups for their products and services in order to develop effective marketing strategies in this e-commerce era. For consumers in the Pioneers segment, efforts could be made to enhance their experiences and expressions in the convenience aspect of the usage of the O2O-FDS platforms, while for consumers in the Food-value-seekers segment, more efforts should be made to improve their experiences in relation to the food-based values (e.g. the taste, price and safety) of the dishes they order from O2O-FDS platforms. Regarding consumers in the Conservatives segment, efforts should focus on enhancing their positive image and perceptions of the benefits of using O2O-FDS.

The explosion of O2O-FDS first appears in Asian developing countries (particularly China) due to low labour costs, cheap mobile devices and services, and huge population bases relative to developed countries (e.g. New Zealand) (Wang, 2020). While the O2O-FDS market shares are increasing quickly in developed countries (e.g. U.S., U.K. and New Zealand), particularly during the Covid-19 epidemic (Brewer and Sebby, 2021; Eadicicco, 2019; Elluminati, 2020; Roh and Park, 2019; Wang et al., 2020). Our findings reveal how much more significant choice motives appeared for the adoption of O2O-FDS in China than in New Zealand. As mentioned above, this difference may be caused by the greater development of O2O-FDS in China relative to New Zealand. However, some of our findings correspond with the current problems in the fast moving but less-regulated development in the Chinese O2O-FDS market (Li et al., 2020; Sun and Buijs, 2018). Our Chinese participants have been dissatisfied with poor tasting and cheap meals from their O2O-FDS orders. This negatively influences their repurchase intentions via O2O-FDS. This informs stakeholders in the O2O-FDS developing countries (e.g. New Zealand) to make relevant marketing strategies and policies in order to avoid the same development problems in their own O2O-FDS markets (e.g. reasonable regulations to avoid unqualified restaurants and food ingredient businesses entering the industry).

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Table 1 Socio-demographics of the sample in this study

	Total sample (n=1185)				
Country		**Residential area**			
China	51%	Auckland	17%		
New Zealand	49%	Wellington & Canterbury & Waikato	22.9%		
Marital status		Other NZ regions	9.2%		
Married	55.3%	Shanghai	25.5%		
No, but has a partner	15.6%	Qingdao	25.5%		
Single	29.1%	**Household size**			
Age		1-2	26.7%		
Mean value	37.84	3	38.1%		
Range	18-79	≥4	35.2%		
Gender					
Male	50.1%	**Occupation**			
Female	49.9%	Managing employee	22.3%		
Income (income ladder)		Salaried employee	32.4%		
Low income (1-4)	27.4%	Student	11.6%		
Middle income (5-6)	48.5%	Worker	8.8%		
High income (7-10)	24.1%	Self-employed	8.4%		
Education		Other (Unemployed, Retired, Farmer, Housewife/houseman or On leave)	16.5%		
Low educational level	45%	**O2O-FDS consumption frequency**	Total sample	China	New Zealand
High educational level	55%	Stopped or never using it	27.3%	10.1%	45.3%
		Sometimes (less than once a month)	37.5%	33.3%	41.8%
		Often (once a month or more)	35.2%	56.6%	12.9%

Note: Low educational level= Trade training (New Zealand)/College degree (China), high school or below; High educational level= Bachelor degree or above.

Table 2 Measurement items in the study

Code	Factor and measurement items
SN	**Subjective norm**
SN1	Members of my family think that it is a good idea to order meals by using mobile meal delivery apps.
SN2	Most of my friends and acquaintances think that order meals by using mobile meal delivery apps is a good idea.
PCL	**Perceived complexity**
PCL1	Ordering meals by using mobile meal delivery apps is in general very complex.
PCL2	With using mobile meal delivery apps, it is difficult to order meals.
PCT	**Perceived compatibility**
PCT1	Ordering meals by using mobile meal delivery apps is attractive to me in my daily life.
PCT2	Ordering meals by using mobile meal delivery apps is well suited to the way of my daily eating.
PRA	**Perceived relative advantage**
PRA1	Online meal ordering services is favorable as it makes me less dependent on restaurant opening hours.
PRA2	Online meal ordering services saves much time.
PRA3	There is a lot of money to be saved through online meal ordering services.
PR	**Perceived risk**
PR1	A risk when ordering meals by using mobile meal delivery apps is receiving low-quality or incorrect meal items.
PR2	Security around payment on the mobile meal delivery apps is not good enough.
PR3	There are too many untrustworthy restaurants on the mobile meal delivery apps.
	Food Choice Motives
	(It is important to me that the meal I ordered by using mobile meal delivery apps…)
TA	Is delicious (**Taste appeal**).
VM	Has a good value for money (**Value for money**).
C	Is cheap (**Cheap**).
D	Has a discount or e-coupon (**Discount**).
WV	Has a wide variety to choose (**Wide variety**).
S	Is reliable in safety (**Safety-assured**).
Q	Has a high quality (**Quality-assured**).
PRC	Saves my time for cooking (**Processed convenience**).
PUC	Saves my time for purchasing food or food ingredients (**Purchase convenience**).
OR	Has good evaluations from other buyers (**Others' reviews**).
A	**Attitudes toward O2O-FDS**
A1	Unhappy/Happy
A2	Dull/Excited
PI	**Purchase intentions toward O2O-FDS**
PI1	I expect to purchase my daily meals by using mobile meal delivery apps.
PI2	I am willing to use online meal delivery services.

Table 3 Results of the CFA and the correlation matrix based on the factorial construct of innovation-adoption characteristics toward O2O-FDS for the pooled sample from China and New Zealand (n=1185)

Latent and observed variable	Standardized factor loading	Composite reliability	Average variance extracted (AVE)
Subjective norm		0.660	0.493
SN1	0.685		
SN2	0.719		
Perceived complexity		0.832	0.713
PCL1	0.807		
PCL2	0.880		
Perceived compatibility		0.804	0.672
PCT1	0.835		
PCT2	0.804		
Perceived relative advantage		0.661	0.398
PRA1	0.727		
PRA2	0.621		
PRA3	0.529		
Perceived risk		0.540	0.293
PR1	0.479		
PR2	0.699		
PR3	0.401		

Correlation matrix	1	2	3	4	5
1. Subjective norm	1				
2. Perceived complexity	-0.106	1			
3. Perceived compatibility	0.901	-0.141	1		
4. Perceived relative advantage	0.918	-0.322	0.961	1	
5. Perceived risk	-0.182	0.688	-0.197	-0.258	1

Note: For the codes of variables, please see Table 2; Goodness-of-fit indices: RMSEA=0.083, CFI=0.928, Chi-square=404.976, DF=44, p=0.000.

Table 4. Results of the EFA resulted in the adjusted factorial structure of innovation-adoption characteristics toward O2O-FDS for the pooled sample from China and New Zealand (n=1185)

Factor and item	Standardized factor loading	Cronbach's α	Percent explained variance
Perceived incentive	**Code: PIN**	0.861	27.575
SN1	0.647		
SN2	0.670		
PCT1	0.809		
PCT2	0.796		
PRA1	0.709		
PRA2	0.553		
PRA3	0.569		
Perceived complexity		0.775	15.605
PCL1	0.817		
PCL2	0.840		
PR2	0.481		
Perceived risk		0.500	7.305
PR1	0.497		
PR3	0.651		

Note: For the codes of measurement items, please see Table 2; Kaiser–Meyer–Olkin (KMO)value=0.846; Results of Bartlett's test of sphericity (Approx. $\chi 2$=5027.434, p=0.000).

Table 5 Test results of hypotheses in the study

Code	Description			Pooled	China	New Zealand
H1	Attitudes	→	Purchase intentions	s	s	s
H2	IACs	→	Attitude	ps	ps	ps
	Perceived incentive	→	Attitude	s	s	s
	Perceived complexity	→	Attitude	s	s	s
	Perceived risk	→	Attitude	ns	ns	ns
H3	IACs	→	Purchase intentions	ps	ps	ps
	Perceived incentive	→	Purchase intentions	s	s	s
	Perceived complexity	→	Purchase intentions	s	s	ns
	Perceived risk	→	Purchase intentions	ns	ns	ns
H4	FCMs	→	Attitude	ps	ps	ps
	Taste appeal	→	Attitude	ns	s	ns
	Value for money	→	Attitude	ns	ns	ns
	Cheap	→	Attitude	s	s	ns
	Discount	→	Attitude	ns	ns	ns
	Wide variety	→	Attitude	ns	ns	ns
	Safety-assured	→	Attitude	ns	ns	s
	Quality-assured	→	Attitude	ns	ns	ns
	Processed convenience	→	Attitude	s	s	ns
	Purchase convenience	→	Attitude	ns	ns	ns
	Others' reviews	→	Attitude	ns	ns	ns
H5	FCMs	→	Purchase intentions	ps	ps	ns
	Taste appeal	→	Purchase intentions	s	s	ns
	Value for money	→	Purchase intentions	ns	ns	ns
	Cheap	→	Purchase intentions	ns	s	ns
	Discount	→	Purchase intentions	ns	ns	ns
	Wide variety	→	Purchase intentions	ns	ns	ns
	Safety-assured	→	Purchase intentions	ns	ns	ns
	Quality-assured	→	Purchase intentions	ns	ns	ns
	Processed convenience	→	Purchase intentions	ns	ns	ns
	Purchase convenience	→	Purchase intentions	ns	s	ns
	Others' reviews	→	Purchase intention	ns	ns	ns

Note: s= supported; ns= not supported; ps= partially supported.

Table 6 Results of the segmentation analysis

	Segment 1 Conservatives (n=315)	Segment 2 Food-value-seekers (n=484)	Segment 3 Pioneers (n=386)
Perceived incentives	3.03[a]	4.43[b]	4.39[b]
Perceived complexity	3.43[a]	3.17[b]	1.68[c]
Taste appeal	4.21[a]	6.36[b]	4.87[c]
Cheap	3.52[a]	5.52[b]	3.88[c]
Safety concern	3.98[a]	6.16[b]	3.83[a]
Processed convenience	4.05[a]	6.18[b]	6.17[b]
Gender			
Male	52.1%	49.4%	49.5%
Female	47.9%	50.6%	50.5%
Marital status* **			
Married	54.9%	46.5%	66.6%
No, but has a partner	16.2%	19.6%	10.1%
Single	28.9%	33.9%	23.3%
Age* **			
Mean value	40.8[a]	37.8[b]	35.47[c]
Income* **			
Low income	36.2%	25.2%	23.1%
Middle income	43.2%	46.3%	55.7%
High income	20.6%	28.5%	21.2%
Education* **			
Low educational level	57.5%	48.6%	30.5%
High educational level	42.5%	51.4%	69.5%
Household size* **			
1-2	35.2%	33.7%	10.9%
3	26.7%	33.5%	53.1%
≥4	38.1%	32.8%	36%
Occupation* **			
Managing employee	16.2%	17.8%	32.9%
Salaried employee	26.0%	30.2%	40.4%
Student	9.5%	11.6%	13.5%
Worker	10.8%	11.4%	3.9%
Self-employed	9.8%	11.4%	3.6%
Other (Unemployed, Retired, Farmer, Housewife/houseman or On leave)	27.6%	17.8%	5.7%
Country* **			
China	37.1%	27.5%	91.7%
New Zealand	62.9%	72.5%	8.3%
Residential area in New Zealand	(n=198)	(n=351)	(n=32)
Auckland	36.4%	33.3%	37.5%
Wellington & Canterbury & Waikato	33.3%	36.5%	40.6%
Other NZ regions	30.3%	30.2%	21.9%
Residential area in China**	(n=117)	(n=133)	(n=354)
Shanghai	37.6 %	55.6%	52.0%
Qingdao	62.4%	44.4%	48.0%
Consumption frequency of O2O-FDS* **			
Stopped or never using it	53.7%	27.1%	6.2%
Sometimes (less than once a month)	34.3%	40.1%	36.8%
Often (once a month or more)	12.1%	32.9%	57.0%

*Note: *** $p<0.001$; a - c indicate significantly different means; NZ= New Zealand.*

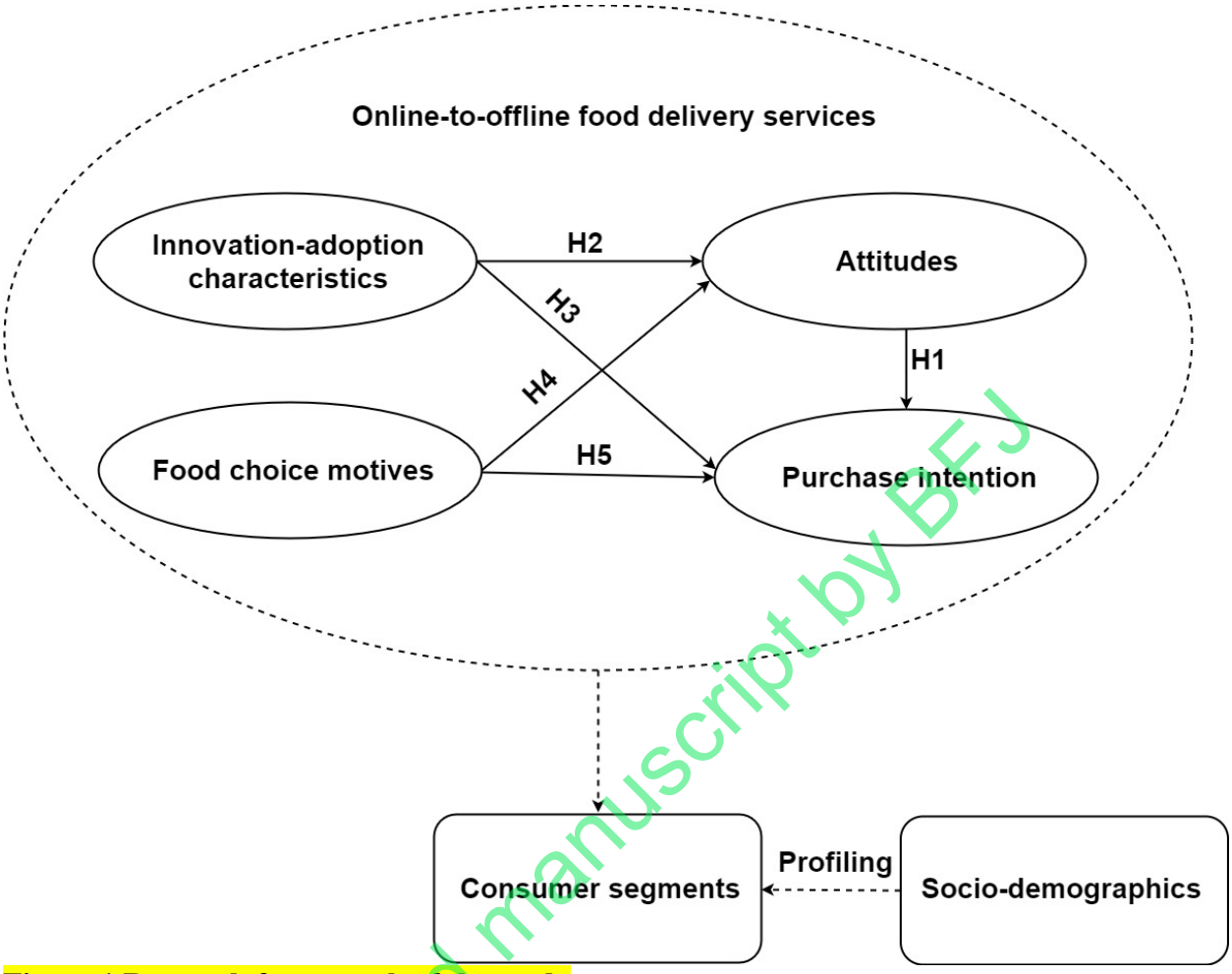

Figure 1 Research framework of the study

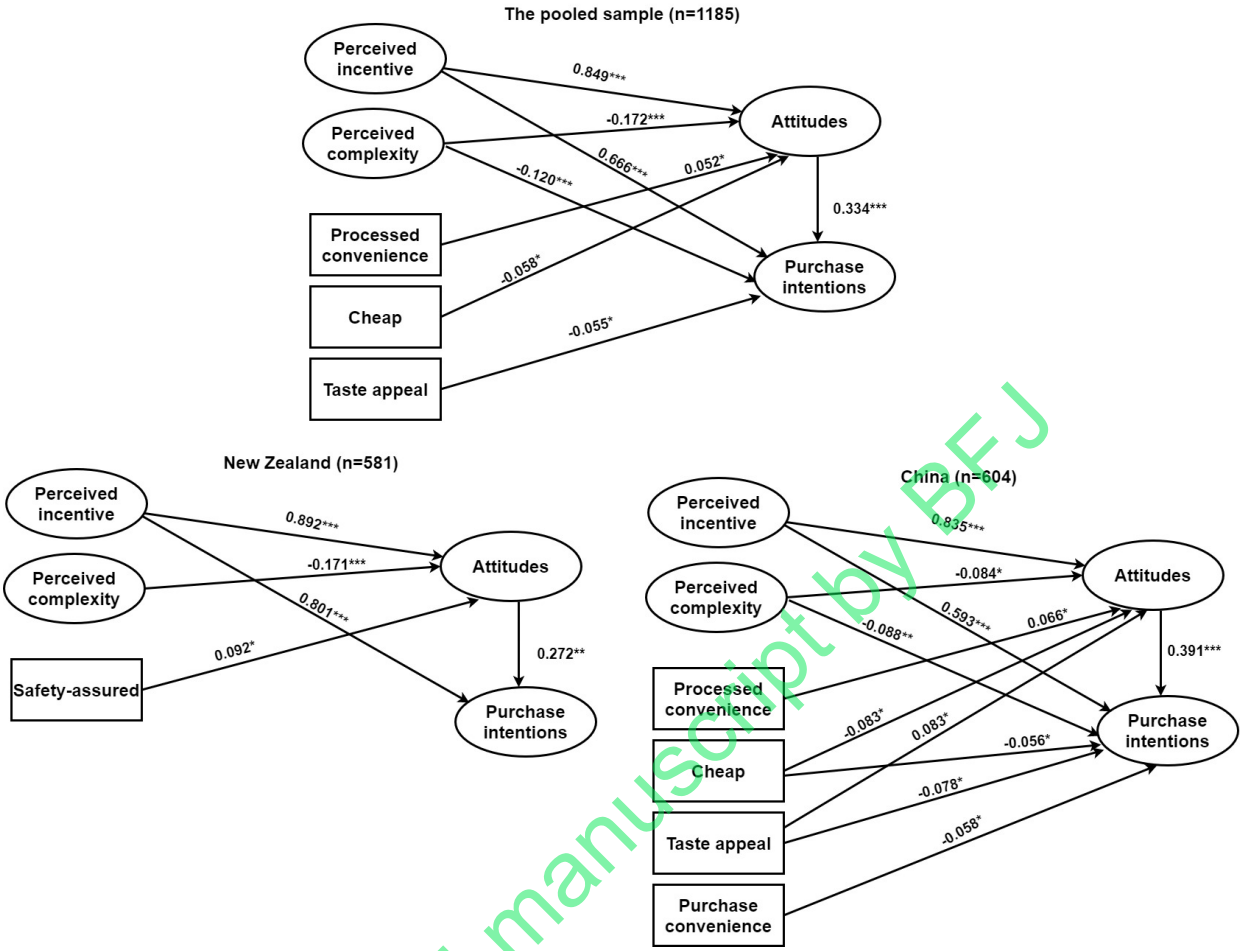

Figure 2 Significant paths identified from the analysis of the pooled sample from China and New Zealand and the multi-group path analysis between the Chinese and New Zealand samples utilising standardized regression weights

*Note: ***= p<0.001; **= p<0.01; *= p<0.05; Goodness-of-fit indices for the path analysis of the pooled sample from China and New Zealand: RMSEA=0.057, CFI=0.963, Chi-square=703.953, DF=144, p=0.000; Goodness-of-fit indices for the multi-group path analysis between China and New Zealand (unconstrained model): RMSEA=0.045, CFI=0.954, Chi-square=983.891, DF=288, p=0.000.*