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# Sustainability Considerations and Satisfaction with Online Food-Delivery Services During Covid-19 Pandemic

Myoung-Jin CHAE<sup>1</sup>

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## Abstract

**Purpose:** Motivated by an expedited growth and distribution of Online Food-Delivery (OFD) services, especially during the recent Covid-19 pandemic, this research aims to explore 1) how consumers' sustainability considerations are associated with satisfaction with the services via opt-out cutlery options and 2) the role of the pandemic in the relationships between sustainability considerations, attitudes toward opt-out cutlery options, and satisfaction with the OFD services. **Data and Methodology:** An analysis of survey data using 434 consumers in the United States recruited from Amazon M-Turk was conducted using structural equation modeling. **Results:** Findings suggest that consumers' environmental, health, and ethical considerations are positively related to their attitudes toward opt-out cutlery options. Furthermore, attitudes toward opt-out cutlery options are positively related to satisfaction with the OFD services only when they feel connected with the environment, driven by perceived threats of an infectious disease (i.e. Covid-19). **Conclusion:** The study findings provide new insights to managers in the OFD service industry on how to promote sustainable consumption during the pandemic.

**Keywords :** Covid-19, pandemic, sustainable consumption, online food delivery (OFD), e-commerce

**JEL Classification Code:** M10, M31, Q56, L81

## 1. Introduction<sup>a</sup>

While online food delivery (OFD) services on mobile apps are now widespread across the world, the Covid-19 pandemic has especially expedited their growth and distribution. With people restricted from dining out as usual, OFD services have been predominantly used for meals or even to order groceries. While the Covid-19 pandemic has raised several environmental concerns because of the adjustment to the new normal and the handling of numerous emergencies, OFD services present one of the biggest issues

regarding their impacts on the environment. As people turn to food deliveries or takeout meals, more disposable tableware and plastic bags are being consumed, generating waste (Liu et al., 2021). Furthermore, recycling collection has been disrupted due to the pandemic, and the volume of recycled plastic has been significantly reduced (Brock, 2020). Although OFD services benefit consumers, as they are easy to use and convenient, they also introduce environmental concerns due to plastic waste, especially during the epidemic. As one of the efforts to reduce waste,

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<sup>1</sup> First Author. Assistant Professor, Department of International Trade and Commerce, Soonchunhyang University, Korea. Email: mchae@sch.ac.kr

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the industry has introduced options to opt-out cutlery when ordering foods.

However, much less progress has been made in understanding the impacts of sustainability aspects on OFD services and ways to promote conservation in the long term in the academic literature. First, the current literature has mostly examined the determinants and outcomes of use of OFD services from the perspectives of their efficiency and quality. This research contributes to the academic literature by showing that sustainability aspects matter in online food-delivery (OFD) services. This research is among the first in the literature to show that opt-out cutlery options in OFD services could become more effective in enhancing satisfaction with the services during Covid-19 by understanding the psychological mechanism of the pandemic

Second, this research takes one step further from extant literature largely focused on online shopping and food-related services and explores more specifically how environmental health could be promoted via opt-out cutlery option while enhancing satisfaction with OFD services, especially when environmental concerns are growing during this epidemic.

Therefore, this research seeks to contribute to the literature by exploring the sustainability aspects of and their associations with consumers' satisfaction with OFD services and the influence of the Covid-19 pandemic on OFD services. This research aims to address the following questions: 1) How does consumers' considerations of sustainability aspects affect satisfaction with the OFD services, specifically via opt-out cutlery options? 2) How does the Covid-19 pandemic affect the relationship between considerations of sustainability aspects, attitude toward opt-out cutlery options, and satisfaction with the OFD services?

Using a survey data from 434 consumers in the United States recruited via Amazon M-Turk with a structural equation modeling approach, this research explores the relationship between consumers' sustainability considerations in OFD services and satisfaction with the services via opt-out cutlery options. In turn, this research examines how the Covid-19 pandemic plays a role in OFD services and shows that consumers' attitudes toward opt-out cutlery options have a positive impact on satisfaction with OFD services when consumers' sense of connectedness with nature and the community is greater due to the epidemic.

## 2. Literature Review and Theoretical Development

### 2.1. Online Food-Delivery (OFD) Services

OFD service is one of the most recently studied practice

in literature as its size and types have been expanding over the past several years. Zhao and Bacao (2020) named Food Delivery Apps (FDAs), defining them as “an emerging online-to-offline mobile technology, [which] provide a channel between catering enterprises and customers by integrating online order and offline delivery services,” which is the closest definition to the practice to be examined in this research context. While its definitions and forms vary by researchers and study purposes, Ray et al. (2019) have categorized OFD services into two types. First is that the restaurants themselves run their own delivery services (e.g. Pizza Hut or Domino's), and the second is intermediary platforms by third-parties, such as Uber Eats or Grubhub, which are one of the commonly and widely used platforms these days.

As OFD services have recently gained prominence as a way to order food, research has focused on the determinants and outcomes of their use. For example, studies have examined features related to performance and important factors that consumers consider when using the services including food and service quality, performance expectancy, convenience, and perceived ease of use (e.g. Lee et al., 2017; Yuan et al., 2016; Alshurideh et al., 2019). Additionally, technological aspects such as perceived technology-task fit, technology readiness, and facilitating conditions (e.g. Yuan et al., 2016; Tam et al., 2020) have been positively related to usage of and attitudes toward OFD services as they require some knowledge and experience. In turn, such factors result in consumers' attitudes toward OFD services and behavioral intentions (e.g. Yeo et al., 2017). Among the OFD service studies, Roh and Park (2019) have examined determinants of adoption of OFD services and have focused on moral aspects (e.g. convenience and guilt arising from use of OFD services). However, the moral aspect studied in this research is not close to sustainability aspects that are to be examined in this research.

Overall, the literature suggests that consumers use OFD services mainly due to their ease and convenience, as a variety of food choices are available on one platform and consumers can order food without going outside (e.g. Yeo et al., 2017). However, the current literature has mostly focused on the aspects of performance (i.e. efficiency) in consumers' use of such services (e.g. Lee et al., 2017; Yuan et al., 2016) and much less attention has been paid to the long-term impacts of OFD.

### 2.2. Considerations of Sustainability in Food-Related Consumptions

While studies across industries have shown that consumers consider sustainability in their purchases and consumption (e.g. Danish et al., 2019), research varies about its dimensions. Among others, environmental, health, and

ethical aspects are considered to be relevant dimensions of sustainability in food consumption (e.g. Reisch et al., 2013; Malak-Rawlikowska et al., 2019). For example, the environmental aspects of food consumption broadly include land use, water or soil pollution from agriculture, energy consumption from manufacturing processes in industry, and waste from consumption in households and restaurants. Health aspects indicate anything that undermines individuals' health and well-being, such as illness from a safety issue or poor hygiene, obesity, or malnutrition. The environmental and health aspects are highly related in the food consumption context as they affect individuals' well-being (Reisch et al., 2013). While ethical aspects include diverse issues such as fair trade, working conditions, and consumer awareness of animal welfare, they generally refer to justice and fairness, not endangering the health of consumers (Reisch et al., 2013).

### 2.3. Opt-Out Cutlery Options

Noting that environmental-health and ethical aspects are major sustainability domains in the use of OFD, many service platforms are now offering consumers options to help the environment. Among various options, the most prevalent adopted by many platforms is an opt-out cutlery option, meaning that consumers have the choice not to include plastic cutlery when ordering food on OFD platforms. Most platforms widely used in the United States, such as Uber Eats, Doordash, and Grubhub, now include opt-out cutlery options to reduce plastic waste, even leading to discussions of making it opt-in instead of opt-out (e.g. Greenpeace). Such growing concerns and interests among consumers are also evident on social media as they participate in a campaign with #CutOutCutlery on their postings (e.g. habitsofwaste.org). Thus, opt-out cutlery options are the most popular and immediate considerations regarding sustainability aspects in use of OFD services.

Based on the sustainability dimensions considered in literature, this study predicts that consumers' considerations of environmental and health sustainability are significantly related to their use of opt-out cutlery options in OFD services. In the environmentalism literature, researchers have adopted the Value-Belief-Norm (VBN) theory (Stern et al., 1999) to explain individuals' pro-environmental behaviors. The VBN theory postulates that values affect pro-environmental behaviors through pro-environmental beliefs and norms (Stern et al., 1999). Drawing upon the theory, scholars have found that personal norms and beliefs affect individuals' intention to engage in environmental behavior (Ozaki, 2011) and the effects have been found across multiple countries and industries (e.g. Hiratsuka et al., 2018). That is, as consumers become more conscious of an environmental issue and believe that it is important, they are

ready to take an innovative action, leading to a more conventional and normative behavior (Ozaki, 2011; Barr et al., 2005). Applying the theory in this research context, it is plausible to assume that consumers who are more conscious of sustainability aspects when using OFD services are more likely to believe that these sustainability aspects are important and thereby ready to take actions, one of which is using opt-out cutlery options.

It has also been argued in the literature that the domain of food consumption is one of the areas with the largest impact on the environment (Reisch et al., 2013), as the manufacturing process and consumption in households and restaurants create food and plastic waste and cause excessive use of energy and water. When consumers care about environmental sustainability, they will be more interested in reducing plastic waste, leading to positive attitudes toward opt-out cutlery options.

Experts also warn that use of plastic bowls or utensils has a harmful effect on health due to toxic byproducts, leading to potential repercussions linked to liver and thyroid disease, infertility, cancer, and high cholesterol (Daly, 2019). Consumers who care about their health and well-being will, thus, be more likely to acknowledge the possible harmful impact of plastic cutlery on health and try not to use it. In addition, the issue of individuals' health and well-being is also closely related to the environment in that practices with a harmful effect on the environment will also (eventually) be detrimental to health. Understanding such links will lead to more positive attitudes toward opt-out cutlery options.

Finally, consumers who consider ethical aspects will exhibit behavior that contributes to society and their environment by being just and fair and "doing the right thing." Thus, by understanding the positive environmental impacts, consumers' ethical considerations regarding OFD services will be closely related to positive attitudes toward opt-out cutlery options. As such, this research predicts that consumers' environmental and health considerations in OFD services will be positively associated to attitudes toward opt-out cutlery options. Similarly, consumers' ethical considerations in OFD services will also be positively associated to attitudes toward opt-out cutlery options. Formally stating,

**H1:** Consumers' environmental and health considerations in OFD services are positively related to attitudes toward opt-out cutlery options.

**H2:** Consumers' ethical considerations in OFD services are positively related to attitudes toward opt-out cutlery options.

On the other hand, both positive effects and negative effects are predicted in terms of the impact of opt-out cutlery options on consumer satisfaction with OFD services. First, opt-out cutlery options can cause consumers to spend extra

effort to use their own cutlery, which counters the convenience of using these services. Therefore, it is plausible that attitudes toward opt-out cutlery options are not positively related to satisfaction with OFD services, possibly even leading to a negative relationship. In contrast, as many consumers perceive the importance of sustainable consumption and the long-term impacts of opt-out cutlery options on the environment, their positive attitudes toward this choice will lead to greater satisfaction with OFD. In addition, consumers can always choose using plastic cutlery, as they are currently in the format of “opt-out” in most platforms, suggesting that the negative impact of attitudes toward opt-out cutlery options on satisfaction with OFD may not be significant. Overall, this study predicts that the relationship between opt-out cutlery options and satisfaction with OFD services will be positive, while there is a room that it will depend on external factors. Formally, the hypothesis predicts a positive relationship between attitudes toward opt-out cutlery options and satisfaction with OFD services.

**H3:** Consumers’ attitudes toward opt-out cutlery options are positively related to satisfaction with OFD services.

#### 2.4. The Covid-19 Pandemic and Consumer Behavior

As Covid-19 has impacted the world in many ways, research has also been actively examining how the pandemic and new normal are influencing consumer behavior (e.g. Timotius & Octavius, 2021; Sudaryanto et al., 2021). According to the literature, consumers have been exhibiting unusual or new purchase behaviors due to unexpected emergent events and motives to protect their own safety and health (Sheth, 2020). Most relevant to the research topic under discussion, the use of digital technology has risen, such as online shopping or online meetings as communications, and daily activities are limited during the epidemic (Chang & Meyerhoefer, 2020; Nabity-Grover et al., 2020; Nguyen et al., 2021); the use of OFD services is considered a part of this new normal (Li et al., 2020; Zhao & Bacao, 2020).

Research findings have indicated that people tend to avoid crowds and public places due to lockdowns and perceived threat of the disease (Huang & Sengupta, 2020; Kim & Lee, 2020), resulting in social disconnectedness. Social distancing and disconnectedness that are prevalent around the world lead to consumers’ need for belonging (Song et al., 2020) and connectedness with others (Kirk & Rifkin, 2020). In addition, individuals are trying to feel connected with the world by spending more time in nature. Connectedness with nature, defined as “*the extent to which an individual includes nature within his/her cognitive*

*representation of self;*” (Schultz, 2002, p. 67) lies in a broader domain of individual environmental identity and investigates how individuals take identity-based motivations to manage their attitudes and behaviors toward the nature and environment (Clayton, 2003; Haasova et al., 2020). According to its psychological and behavioral correlates argued by scholars (e.g. Mayer & Frantz, 2004; Schultz, 2002), individuals’ direct experiences with the natural environment significantly affect shaping their connectedness with nature (e.g. Cheng & Monroe, 2012). Based on the literature, an association between the Covid-19 pandemic and individuals’ connectedness with nature has been suggested, although research in this area is still at an early stage (e.g. Haasova et al., 2020). Other sources beyond the academic literature suggest a similar idea. According to a *BBC Wildlife Magazine* survey in September 2020, 58% of people have spent more time in green and natural spaces since social distancing and government restrictions were introduced. Moreover, the article states that experiences with the epidemic have made people feel a loss of personal power and control in their lives and a belief that a greater power controls the world. Such factors lead to a greater sense of connection with society and the world rather than focusing on individual situations, leading consumers to perceive the importance of sustainability and efforts having long-term impacts on society (e.g. Cheng & Monroe, 2012). Therefore, this study predicts that the perceived threat of an infectious disease (i.e. Covid-19) is positively related to consumers’ sense of connectedness with their community and nature.

**H4:** Consumers’ perceived threat of the pandemic is positively related to a sense of connectedness with nature and the community.

It is predicted in H3 that there will be a positive impact of consumers’ attitudes toward opt-out cutlery options on satisfaction with OFD services. This study further predicts that the positive impacts will be strengthened with consumers’ enhanced sustainability mindset. In particular, consumers’ sense of connectedness with the community and nature during the Covid-19 pandemic will lead to sustainable consumption in OFD as people perceive the long-term outcomes of the use of these services. This is in line with prior findings in the literature that if a person includes the environment as part of his/her self-view, nature-protective attitudes and behaviors will be enhanced (e.g. Mackay & Schmitt, 2019). Therefore, connectedness serves as a moderator in the theoretical framework and will strengthen the positive impact of opt-out cutlery options on consumers’ satisfaction with OFD services:

**H5:** Consumers’ attitudes toward opt-out cutlery options are positively related to satisfaction with OFD services to a

greater extent when a sense of connectedness with nature and the community is higher.

The overall theoretical framework proposed in this research is presented in Figure 1.

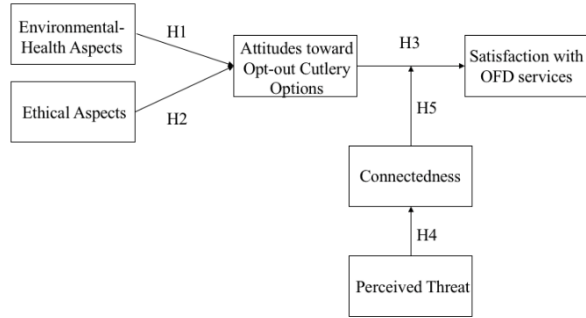


Figure 1: Proposed Theoretical Framework

### 3. Methodology

#### 3.1. Data

The official questionnaire for this study was distributed online using Amazon M-Turk in November–December 2020. Data was collected from 448 participants currently living in the United States, who received monetary compensation for participating in the survey. Participants who meet the study qualifications (i.e. their accounts are currently based in the US and overall approval rates in all completed works are greater than or equal to 95%) were recruited. After filtering out invalid responses, 434 samples (96.9% valid) were included in the analysis, satisfying the minimum quantity of samples suggested by the literature (Jackson, 2003). Among the respondents, 260 were men (60%) and 174 were women (40%), with the range of ages between 18 to 65. In terms of education levels, 240 had a bachelor’s degree (55.3%) and 146 had a master’s degree or above (33.6%). 312 of the respondents’ income level ranged between \$20,000 to \$80,000 (71.8%). The demographic information of the samples is described in Table 1.

Table 1: Sample Characteristics (n=434)

Variable	Items	N	%
Gender	Male	260	59.90
	Female	174	40.09
Age	Less than 20	2	0.46
	Between 20-29	115	26.50
	Between 30-39	122	28.11
	Between 40-49	85	19.59
	Between 50-59	67	15.43
	60+	43	9.91
Ethnicity	White	370	85.25

	African American	43	9.91
	American Indian or Alaska Native	6	1.38
	Asian	9	2.07
	Native Hawaiian or Pacific Islander	0	0.00
	Other	6	1.38
	Education Level	Less than high school degree	1
High school graduate (high school diploma or equivalent including GED)		3	0.69
Some college but no degree		31	7.14
Associate degree in college (2-year)		13	3.00
Bachelor's degree in college (4-year)		240	55.30
Master's degree		138	31.80
Doctoral degree		4	0.92
Professional degree (JD, MD)		4	0.92
Income Level	Less than \$19,999	31	6.93
	\$20,000 to \$49,999	158	36.49
	\$50,000 to \$79,999	153	35.33
	\$80,000 to \$149,999	83	19.17
	\$150,000 or more	9	6.22
Occupation	Management, professional, and related	210	48.39
	Service	38	8.76
	Sales and office	75	17.28
	Farming, fishing, and forestry	4	0.92
	Construction, extraction, and maintenance	38	8.76
	Production, transportation, and material moving	27	6.22
	Government	20	4.61
	Retired	6	1.38
	Unemployed	16	3.69

#### 3.2. Definitions and Measures of Variables

The constructs used in the survey and references are described in Table 2. Measures of environmental and health (ENV\_HEA) and ethical aspects (ETHIC) were adapted from the relevant literature on sustainability dimensions in food consumption (Reisch et al., 2013). Consumers’ attitudes toward opt-out cutlery options (A\_OCO) and satisfaction with OFD services (S\_OFD) were also adapted from relevant literature on services marketing (e.g. Wang et al., 2019; Lee & Chung, 2009). Finally, the Covid-19-related constructs, perceived threat (PT) and connectedness (CN), were adapted from environmental psychology literature (Mayer & Frantz, 2004; Bohm & Pfister, 2005). While some researchers have used five-point Likert scale items (e.g. Mayer & Frantz, 2004), seven-point Likert items have been found to more accurately measure participants’ true evaluations compared to five-point Likert items (e.g. Finstad, 2010) and many studies that are close to this research have used seven-point items (e.g. Wang et al., 2019; Childers et al., 2001). Therefore, all items were measured using a seven-point Likert scale, where 1 indicates “not at all” or “very

unlikely,” and 7 indicates “very much likely.”

In order to evaluate the quality of research, reliability (i.e. “the degree to which the results obtained by a measurement and procedure can be obtained,”) and validity (i.e. “the degree to which a measurement measures what it purports to measure”) needed to be ensured (e.g. Rothman et al., 2008). First, validity tests for theoretical constructs were conducted (e.g. Bolarinwa, 2015; Taherdoost, 2016). Variables in this study were adapted from prior studies in related fields (e.g. Reisch et al., 2013; Wang et al., 2019; Bohm & Pfister, 2005; Mayer & Frantz, 2004) and the survey questionnaire was reviewed by language editors to ensure that measures reflect the constructs (i.e. face validity) and items reflect the content (i.e. content validity; e.g.

Taherdoost, 2016; Straub et al., 2004). Validity tests for empirical constructs (i.e. convergent and discriminant validity) were conducted in the next section (Bolarinwa, 2015). Second, reliability tests were conducted through several steps. As the most commonly used internal consistency measure, especially when using Likert scales, Cronbach’s Alpha coefficients were calculated (Whitley & Kite, 2012). The Cronbach’s alpha values of all constructs were higher than 0.6, indicating that the variables were reliable. Next, using the split-half method, dataset was randomly divided into two groups and the items in the two groups showed strong correlations (> 0.7), indicating high internal consistency (Wong et al., 2012).

**Table 2 :** Construct Descriptions and Reference Scales

Constructs	Items	Statement	Reference Scale	Cronbach's $\alpha$
Environmental and Health Aspects (ENV_HEA)	ENV_HEA1	OFD services that I used during the pandemic was wise at considering environmental responsibilities (e.g. food waste, packaging, manufacturing, energy)	Reisch, Eberle, and Lorek, 2013	0.893
	ENV_HEA2	OFD services that I used during the pandemic was good at considering environmental responsibilities (e.g. food waste, packaging, manufacturing, energy)		
	ENV_HEA3	OFD services that I used during the pandemic was sensible at considering environmental responsibilities (e.g. food waste, packaging, manufacturing, energy)		
	ENV_HEA4	OFD services that I used during the pandemic was wise at considering health responsibilities (e.g. organic ingredients, reduced fat, reduced sugar)		
	ENV_HEA5	OFD services that I used during the pandemic was good at considering health responsibilities (e.g. organic ingredients, reduced fat, reduced sugar)		
	ENV_HEA6	OFD services that I used during the pandemic was sensible at considering health responsibilities (e.g. organic ingredients, reduced fat, reduced sugar)		
Ethical Aspects (EHIC)	ETHIC1	OFD services that I used during the pandemic was wise at considering ethical responsibilities (e.g. food safety, ethical production, fair trade)	Reisch, Eberle, and Lorek, 2013	0.777
	ETHIC2	OFD services that I used during the pandemic was good at considering ethical responsibilities (e.g. food safety, ethical production, fair trade)		
	ETHIC3	OFD services that I used during the pandemic was sensible at considering ethical responsibilities (e.g. food safety, ethical production, fair trade)		
Satisfaction with OFD Services (S_OFD)	S_OFD1	I am very satisfied with mobile food order apps.	Wang et al., 2019; Lee and Chung, 2009	0.779
	S_OFD2	I am happy with mobile food order apps.		
	S_OFD3	I am satisfied with the way that mobile food order apps have carried out transactions.		
	S_OFD4	Overall, I was satisfied with mobile food order apps.		
Attitudes toward Opt-Out Cutlery Options (A_OCO)	A_OCO1	Order without cutlery options on OFD services are wise.	Childers, Carr, Peck, and Carson, 2001	0.696
	A_OCO2	Order without cutlery options on OFD services are good.		
	A_OCO3	Order without cutlery options on OFD services are sensible.		
Perceived Threat (PT)	PT1	How high would you rate the overall risk of the pandemic? (very low risk - very high risk)	Bohm and Pfister, 2005	0.829
	PT2	How threatening do you find the pandemic situation? (not at all threatening - very threatening)		
	PT3	How dangerous do you find the pandemic situation? (not at all dangerous - very dangerous)		
	PT4	How probable is it that the situation will lead to harmful		

		consequences? (very unlikely - very likely)		
Connectedness (CN)	CN1	I often feel a sense of oneness with the natural world around me. When I think of my life, I imagine myself to be part of a larger cyclical process of living. I feel as though I belong to the Earth as equally as it belongs to me. I have a deep understanding of how my actions affect the natural world.	Mayer and Frantz, 2004	0.793
	CN2			
	CN3			
	CN4			

**3.3. Measurement Model**

Prior to analysis, the Kaiser-Meyer-Olkin (KMO) test and Bartlett’s test of sphericity were conducted to measure the adequacy of the sampling. It has been suggested that a value greater than 0.50 on the KMO test implies that the number of samples taken for factor analysis is appropriate. Additionally, Bartlett’s test of sphericity finds the overall significance of all correlations within the correlation matrix (Kline, 2005). Results from the KMO measure of sampling adequacy test (0.914) and Bartlett’s test of sphericity (p<0.000) indicated that the data were appropriate for factor analysis. Therefore, a factor analysis was followed.

Using AMOS v26.0 software, this research followed Anderson and Gerbing’s (1988) two-stage approach for the data analysis. First, the validity and reliability of the measurement model were assessed. The confirmatory factor analysis (CFA) results showed that the goodness-of-fit indices for the model were within the acceptable range (CMIN/DF = 2.842, CFI = 0.914, TLI = 0.899, RMSEA = 0.065), as suggested in the literature (MacCallum & Hong, 1997; Hu & Bentler, 1999). The composite reliability scores of the constructs were between 0.73 and 0.89, all of which are above 0.7, satisfying the criterion suggested by Hair et al. (2011) and indicating that the dimensions were internally consistent.

Next, convergent validity was confirmed following Fornell and Larcker’s (1981) approach. First, factor loadings of all items ranged from 0.626 to 0.837, which was within the acceptable limits (Hair et al., 2011; Fornell & Larcker, 1981), indicating that the items were reliable. Second, the average variance extracted (AVE) scores of the constructs were mostly higher than 0.50, with some constructs closer to 0.50. The results confirm that the constructs had a satisfactory level of convergent validity (Table 3).

**Table 3: Convergent Validity**

Constructs	Items	Factor Loadings	AVE	CR
Environmental and Health Aspects	ENV_HEA1	0.767	0.58	0.89
	ENV_HEA2	0.743		
	ENV_HEA3	0.799		
	ENV_HEA4	0.769		
	ENV_HEA5	0.726		

	ENV_HEA6	0.750		
Ethical Aspects	ETHIC1	0.777	0.57	0.80
	ETHIC2	0.726		
	ETHIC3	0.761		
Satisfaction with OFD Services	S_OFD1	0.772	0.47	0.78
	S_OFD2	0.640		
	S_OFD3	0.692		
	S_OFD4	0.626		
Attitudes toward Opt-Out Cutlery Options	A_OCO1	0.716	0.48	0.73
	A_OCO2	0.704		
	A_OCO3	0.654		
Perceived Threat	PT1	0.709	0.54	0.82
	PT2	0.837		
	PT3	0.679		
	PT4	0.706		
Connectedness	CN1	0.687	0.49	0.79
	CN2	0.688		
	CN3	0.743		
	CN4	0.678		

Next, this research followed Fornell and Larcker’s (1981) approach to test the discriminant validity of the study. The results in Table 4 showed that the square root of the AVE scores was higher than the correlations of all variables (Fornell & Larcker, 1981), and the correlations of the constructs were less than the cut-off value of 0.85 (Kline, 2015), indicating that the constructs had a high level of discriminant validity. The following step involved further checking a multicollinearity problem in the data. The variance inflation factor (VIF) scores ranged between 1.196 and 2.675, all of which were below the threshold of 3.0, indicating no multicollinearity issue in the data (Table 4).

**Table 4: Discriminant Validity**

	1	2	3	4	5	6
ENV_HEA	<b>0.759</b>					
ETHIC	0.752	<b>0.755</b>				

S_OFD	0.524	0.507	<b>0.685</b>			
A_OCO	0.347	0.342	0.455	<b>0.692</b>		
PT	0.259	0.250	0.335	0.314	<b>0.735</b>	
CN	0.620	0.649	0.486	0.454	0.325	<b>0.699</b>
Mean	5.41	5.53	5.69	5.63	5.53	5.48
SD	0.98	0.94	0.79	0.86	1.00	0.95
VIF	2.577	2.675	1.662	1.414	1.196	2.091

### 3.4. Common Method Variance

As the data used in this research was collected from a single source, common method variance (CMV) issues were checked using Harman’s single-factor method, a classical approach to diagnose the spurious covariance among constructs (Podsakoff et al., 2003). The results from exploratory factor analysis showed that the first three factors explain 53.61% of the variance: the first factor accounted for 36.39%, the second for 10.33%, and the third for 6.89% of the total variance. The total variance for a single factor was 36.39%, which is below 50%, suggesting that CMV does not affect the data.

### 3.5. Path Analysis

This research also used AMOS v26.0 software to conduct a path analysis (See Table 5 for the path analysis results). First, the environmental-health aspects (ENV\_HEA) had a positive and significant impact on attitudes toward opt-out cutlery options (A\_OCO) ( $\beta = 0.293, p < 0.001$ ), confirming H1. Similarly, the ethical aspects (ETHIC) also had a positive and significant impact on A\_OCO ( $\beta = 0.232, p < 0.001$ ), confirming H2. It was also found that the main effect of A\_OCO on satisfaction with OFD services (S\_OFD) was not significant ( $\beta = 0.990, p = 0.170$ ) and, therefore, H3 was not supported. Lastly, the results indicated that perceived threat (PT) had a positive and significant impact on connectedness (CN) ( $\beta = 0.299, p < 0.001$ ), confirming H4. Therefore, the main effects proposed in the theoretical model were confirmed in the path analysis.

**Table 5:** Path Analysis Results

HYPOS	IV	DV	Std. Coefficients	S.E.	C.R.	p-value
H1	ENV_HEA	A_OCO	0.293	0.050	4.851	***
H2	ETHIC	A_OCO	0.232	0.050	3.768	***
H3	A_OCO	S_OFD	0.990	0.743	1.373	0.170
H4	PT	CN	0.299	0.046	4.900	***

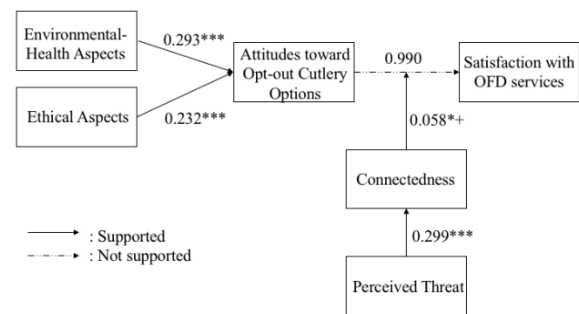
Note: \*\*\*( $p < 0.001$ )

### 3.6. Moderation Analysis

To test the moderation effect of connectedness with nature (CN) on the relationship between A\_OCO and S\_OFD proposed in H5, the PROCESS macro 3.4 (Hayes, 2017) was conducted with SPSS. The results from the bootstrapping technique with a sample size of 5,000 and a 95% confidence interval showed that the main effect of A\_OCO on S\_OFD was not significant ( $\beta = -0.024, p = 0.869$ ). However, the interaction effect between A\_OCO and CN on S\_OFD was positive and significant ( $\beta = 0.058, SE = 0.027, p = 0.034, 95\% CI = [0.005, 0.111]$ ), indicating that the impact of A\_OCO on S\_OFD became more positive when CN was greater. Therefore, H5 was supported.

This study further investigated conditional effects of A\_OCO on S\_OFD at different levels of CN values (-1SD, mean, and +1SD). The effect of A\_OCO on S\_OFD when CN was below 1SD from the mean was positive and significant ( $\beta = 0.239, p < 0.001, 95\% CI = [0.152, 0.326]$ ). The value of estimated coefficients increased when the level of CN increased ( $\beta = 0.294, p < 0.001, 95\% CI = [0.208, 0.379]$ ) when CN was the mean,  $\beta = 0.349, p < 0.001, 95\% CI = [0.238, 0.460]$ ), indicating that the positive impact of A\_OCO on S\_OFD was strengthened when CN increased.

Through a moderation analysis, this research examined how Covid-19 pandemic has impacted consumers and, thereby, affected the relationship proposed in H3. Without the moderating effect arising from Covid-19-related constructs, the findings only suggested a non-significant relationship between attitudes toward opt-out cutlery options and satisfaction with OFD services, implying that opt-out cutlery options do not help in enhancing consumer satisfaction with OFD services. The moderation analysis suggested that Covid-19 pandemic and its related constructs (i.e. how it influenced consumers) provided additional insights on the relationship between opt-out cutlery options and satisfaction with OFD services. Overall hypotheses test results are graphically presented in Figure 2.



**Figure 2:** Hypotheses Test Results

Note: \*\*\*( $p < 0.001$ ), \*\*( $p < 0.05$ ), \*( $p < 0.1$ )

+ : Result from moderation analysis



## 4. Results and Discussions

This research has utilized the structural equation model to examine factors that determine consumers' attitudes toward opt-out cutlery options in OFD services and, in turn, their satisfaction with the services during the Covid-19 pandemic. The results indicate that consumers' consideration of environmental-health aspects and ethical aspects positively affect their attitudes toward opt-out cutlery options. The path analysis shows a positive and significant relationship between environmental-health considerations and attitude toward the opt-out cutlery options, confirming H1. In addition, consumers' ethical considerations positively affect attitudes toward the opt-out cutlery options, which confirms H2. The results indicate that when consumers consider environmental, health, and ethical aspects to a greater extent, they are more likely to form positive attitudes toward the opt-out cutlery options while using OFD services. In contrast, no main effect is found for the attitudes toward opt-out cutlery options on satisfaction with OFD services, which implies that H3 is not supported.

The results suggest that attitudes toward opt-out cutlery options do not significantly affect consumers' satisfaction with OFD services. While this research initially predicted a positive main effect of consumers' attitudes toward opt-out cutlery options on satisfaction with OFD services in H3, it is also plausible to predict that the effect will depend on several factors and, therefore, may not be positive. In line with such possibility, the idea that consumers have to spend extra effort to use their own cutlery outperforms reasons that a positive effect has been predicted (e.g. consumer understanding the importance of sustainable consumption), and, therefore, the effect predicted in H3 is not supported.

To examine how the Covid-19 pandemic has affected sustainability considerations in OFD services, further analysis is conducted to examine the relationship among perceived threat, consumers' sense of connectedness, and satisfaction with OFD. The results indicate that when consumers perceive the threat of Covid-19 to a greater extent, they sense higher levels of connectedness with nature, confirming H4. However, connectedness does show a significant impact on satisfaction with OFD services.

To further investigate a boundary condition under which consumers' attitudes toward the opt-out cutlery options have a positive impact on satisfaction with OFD services, this research tests connectedness as a moderator in the abovementioned relationship. The analysis results using the PROCESS model indicate that an interaction effect between attitude toward the opt-out cutlery options and connectedness on satisfaction with OFD services is positive and significant, providing support for H5. Therefore, consumers who have positive attitudes toward opt-out cutlery options are more likely to be satisfied with OFD

services, when they feel connected with nature.

## 5. Theoretical and Practical Implications

This research contributes to the academic literature in the following aspects. First, while several papers have examined the drivers and outcomes of the use of OFD services, this research study is among the first to examine the impacts of consumers' sustainability considerations on satisfaction with OFD services through attitudes toward opt-out cutlery options. Moreover, opt-out cutlery options have been widely used in practice, but the concepts and impacts of the opt-out cutlery options have not yet been systematically examined in literature. This research utilizes the options in OFD services, which are widely used and easy to control in practice and, therefore, provides novel and actionable insights to managers and literature. The findings suggest that consumers who consider sustainability aspects in OFD services are more likely to form positive attitudes toward opt-out cutlery options. Lastly, this research contributes to the literature by exploring the impact of the pandemic on OFD services. This research shows that there is an opportunity for managers in OFD services to promote opt-out cutlery options. This study finds that while there is no significant relationship between attitudes toward opt-out cutlery options and consumer satisfaction with OFD services, the relationship becomes positive when consumers feel connected with nature arising from the perceived threat of the pandemic.

The research findings provide several insights to practitioners. First, the findings suggest that those who care about sustainability aspects in OFD services have more positive attitudes toward opt-out cutlery options. Managers can consider types of consumers or foods they order (e.g. the extent to which they are sustainable) and expect how they would respond to opt-out cutlery options. More importantly, positive attitudes toward opt-out cutlery options have led to greater satisfaction with OFD services when consumers feel connected with nature. Managers can use this link as an opportunity to promote opt-out cutlery options, ultimately leading to higher satisfaction with the services. For example, restaurants could promote and highlight messages about the Covid-19 pandemic, describing and showing empathy to this difficult situation, showing gratitude for their interests, and kindly remind environmental issues. Such practice will remind consumers of the pandemic and increase their sense of connectedness with nature, thereby leading to higher satisfaction with OFD services as suggested in our findings. To summarize, more communications are necessary to remind consumers of their connection with nature and the community during and after the pandemic, which will cause them to realize the importance of protecting the environment

and increasing their willingness to put effort toward this goal.

## 6. Conclusions

With the growing size of OFD services along with environmental concerns, especially during the Covid-19 pandemic, sustainability considerations in daily consumptions are more important than ever before. This research aims to examine how consumers' considerations of sustainability aspects affect their satisfaction with OFD services and how Covid-19-related factors played a role in this relationship. More specifically, this research examines opt-out cutlery options which are widely used in OFD services in order to understand the relationship between consumers' sustainability considerations, attitudes toward opt-out cutlery options, and overall satisfaction with OFD services. This research shows that consumers' considerations of sustainability aspects – i.e. environmental, health, and ethical – in OFD services were positively related to attitudes toward opt-out cutlery options, indicating that those who care more about long-term impacts of their consumptions are more likely to form positive attitudes toward opt-out cutlery options. However, the findings show that positive attitudes toward opt-out cutlery options are not necessarily positively related to satisfaction with OFD services. Further analysis of boundary conditions shows that when consumers feel threat during Covid-19, they feel connectedness with nature to a greater extent, and this enhanced sense of connectedness makes the effect of consumers' attitudes toward opt-out cutlery options on satisfaction with OFD services positive and significant. Therefore, findings in this research suggest how managers could promote opt-out cutlery options to protect the environment while enhancing satisfaction with the OFD services at the same time by enhancing connectedness with nature during the pandemic. While managers make efforts to reduce plastic cutlery usage to protect the environment, they also need to make sure that such efforts do not hurt but enhance consumers' satisfaction with OFD services. This research shows that consumers who care about sustainability aspects in OFD services have positive attitudes toward opt-out cutlery options, but it does not necessarily increase satisfaction with OFD services. However, sense of connectedness arising from threat of Covid-19 serves as a moderator and helps in increasing satisfaction with OFD services. During and after the Covid-19 pandemic, managers can remind consumers of connectedness with nature in order to promote opt-out cutlery options while enhancing overall satisfaction with the OFD services.

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