

Final Report

Research Grant 2022

The logo for ATTRANS features the word "ATTRANS" in a large, bold, sans-serif font. Each letter is filled with a collage of various transportation-related images, including cars, buses, and infrastructure. To the left of the letters are two vertical grey lines of varying lengths.

ASIAN TRANSPORTATION RESEARCH SOCIETY

INTENTION OF ACTIVITY-FROM-HOME AND TRAVEL AFTER THE COVID PANDEMIC

Varameth Vichiensan

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TRAVEL AFTER THE COVID PANDEMIC**



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List of Abbreviations and Acronyms

EFA	Exploratory factor analysis
CFA	Confirmatory factor analysis
SEM	Structural equation modeling
GFI	Goodness-of-fit index

CHAPTER I INTRODUCTION

1.1 COVID-19 Pandemic in Thailand

The COVID-19 pandemic in Thailand is part of the worldwide pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The initial wave of infection started when the first known case arrived in January 2020. In response to the first outbreak, several countermeasures were implemented in varying degrees throughout the country, including temporary shutdown of portions of the public and private sectors, closing of the potential risk places, no activity in crowded places, and imposing a night curfew from 10 p.m. to 4 a.m. These measures were known as soft lockdown while necessary activities and travels were still allowed but cooperation of people to work from home was requested. The strategies that were highly effective included social distancing, face mask wearing, working from home, and staying home at night. Restrictions were gradually released in various phases until August when the first wave of the outbreak was believed ending. After a while, the following waves of infection hit Thailand. The second wave was in December 2020, the third wave was in April 2021 when the daily peak was more than 20,000 cases largely due to the Beta and Delta variants. The current fourth wave hit during late 2021 due to the Omicron variant. As of January 2022, the cumulative number of cases reported in Thailand was nearly 2.5 million and the number of deaths was more than 22,000 (Ministry of Public Health, 2020, etc.).

During these past outbreaks, the situations were so severe that urban activities were much reduced, as did the travel demand in the urban area. Many people were able and prefer to do their daily activities from home such as working, studying, food-ordering, shopping for goods and other merchandise, etc. This study defines these as doing activity-from-home (AFH). Because of AFH, for example, Vichiensan et al. (2021) found that during the first wave of COVID-19, 92% of the rail transit passengers in Bangkok reduced travelling because they did not travel but mainly stayed home while many of them changed to travel by private car due to infection risk on public transport.

The research motivation is to investigate to what extent AFH will continue post-COVID and what will be the consequent travel behavior. However, intention to do various activities from home would be influenced by several factors.

In the long term post-COVID-19, a change in lifestyle will be obvious. For instance, online working at home, at satellite office, or at café will become more popular; car dependence will become more obvious as people will avoid traveling on crowded and COVID-19 risky public transport; and some people would leave from the city centers and live in a lower density neighborhood. Policy for a systematic behavioral change of people with proper travel demand management will be needed, otherwise traffic congestion would rapidly resume, and congestion would be even more severe.(Vichiensan et al., 2021). Such new-normal lifestyle as flexible worktime or flexible workplace would help reducing congestion on road and on public transport and simultaneously increase the quality of human well-being. In terms of urban transportation planning, the transit-oriented development must incorporate the changing lifestyle where residents would do various activities from home and may travel less frequently but be more dependent on car. Travelling in the neighborhood may be more, therefore improving walk and other non-motorized transport will become necessary to keep control of unnecessary traffic congestion in the community.

1.2 Hypothesis and Objectives

The research hypothesis is twofold: (1) people will continue to do activities from home (AFH) after the COVID-19 pandemic and (2) certain amount of travel demand will be suppressed by AFH.

The objectives of the current study are as follows:

- 1) To determine the post-impact of COVID on activity from home (AFH)
- 2) To determine the influential factors driving activity from home (AFH) after the COVID pandemic

CHAPTER 2 LITERATURE REVIEW

2.1 Theory of Planned Behavior

This study adopts the Theory of Planned Behavior (TPB) to explore factors influencing doing activities from home (AFH) in a post-COVID timeframe when there is no infection risk. TPB is a versatile framework which has been used widely, especially in the context of travel behavior. The Theory of Planned Behavior is an extension of the Theory of Reasoned Action. It states that an individual's intention to perform a behavior is related to three types of psycho-social determinants.

- Attitudes: “refers to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question.” (Ajzen, 1991)
- Subjective Norms: “it refers to the perceived social pressure to perform or not to perform the behavior.” (Ajzen, 1991)
- Perceived Behavioral Control: “refers to the perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience as well as anticipated impediments and obstacles.” (Ajzen, 1991)

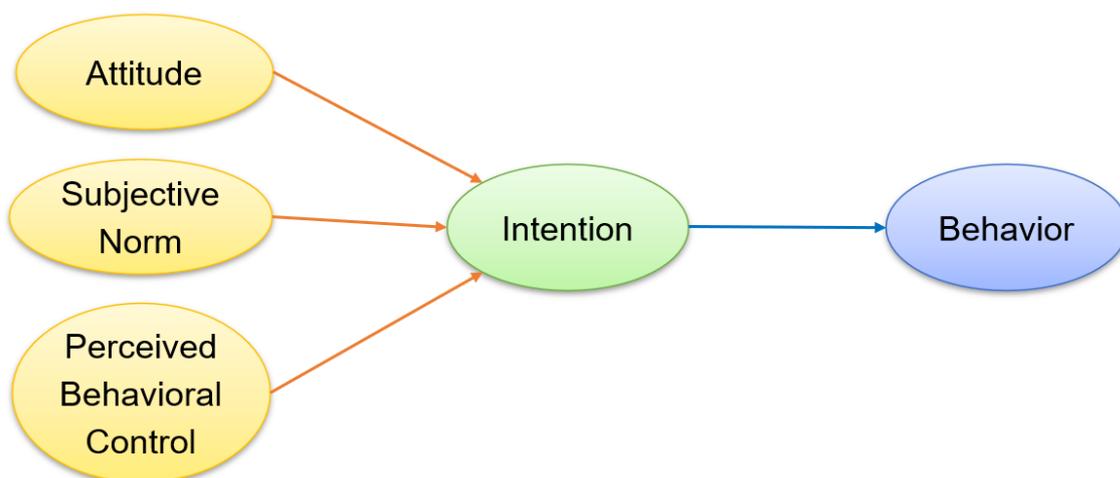


Figure 2.1 Theory of Planned Behavior

In addition to TPB, other related Psychological Theories/Models were proposed and applied in the past. They are summarized in Table 2.1.

Table 2.1 Related Psychological Theories/Models

Theories/Models	Concept
Theory of Reasoned Action (TRA), 1975	Intention to perform a certain behavior is affected by attitude and subjective norms (social influence)
Innovation Diffusion Theory (IDT), 1983	Adoption of an innovation is affected by 5 factors: relative advantage, compatibility, complexity, trialability and observability
Theory of Planned Behavior (TPB), 1985	Intention is predicted by 3 determinants: Attitude towards behavior , Subjective norm and perceived behavior control (that obstruct users from performing)
Value-based Adoption Model (VAM) 1988	Perceived values are the antecedence of attitude towards a certain adoption behavior and attitudes form the intention to adopt that behavior.
Technology Adoption Model (TAM), 1989	Perceived usefulness (expected improvements by using the service) and perceived ease of use (expected easiness of using the service) influence the attitude
Combined TAM & TPB (C-TAMTPB), 1995	Behavior intention is predicted by 3 determinants: attitude, subjective norms and perceived behavior control. Attitude is formed by perceived ease of use and perceived usefulness

Theories/Models	Concept
Unified Theory of Acceptance and Use of Technology (UTAUT), 2003	Behavioral intention is affected by 4 main factors: performance expectancy, effort expectancy, social influence and facilitating conditions and gender, age, experience and voluntariness of use act as moderating variables
Consumer Acceptance and Use of Information Technology (UTAUT2), 2012	UTAUT2 with 3 additional factors: Hedonic motivation, price value, habit

2.2 Existing Studies

Based on the existing literatures such as (Mokhtarian and Salomon, 1997), (Haddad et al., 2009), (Jain et al., 2021) and (Nguyen, 2021) etc., the psycho-social determinants of doing activities from home may be based on three general aspects:

- (1) Advantages and disadvantages of AFH: time/cost saving, wiser time usage, avoiding traffic congestion, producing less and/or exposing less to PM2.5, improving work-life balance, healthier lifestyle, etc.
- (2) Workplace, school, seller, and social factors: the support of the employer, school, food shops, department store to allow, encourage, and promote to work/study/shop from home, as well as the social influence of friends and colleagues working/studying/doing online shopping, etc.
- (3) Perceived difficulties of AFH: the nature of the job, study, commodities that allow doing the related activities from home. Also, the technology barriers (such as how to join the online platform of meeting and good/service ordering as well as the speed of the internet connection. Although one may see a behavior as advantageous and socially desirable, if the perceived control on the behavior is low, the intention to engage in that behavior would be low (Ajzen, 1991).

Strong favorable attitudes, subjective norms and greater perceived behavioral control concerning a particular behavior, are usually associated with a strong intention to behave in a particular fashion. Additional predictors can also be included in the framework. Some previous studies presented a range of predictors such as personal or moral norms, past behavior, habit, and descriptive norms to enhance TPB-based behavioral models.

CHAPTER 3 DATA COLLECTION

3.1 Interview Survey

Questionnaire surveys were conducted during August to December 2022. Face-to-face interview was conducted based on SurveyMonkey platform. The target respondents were residents in Bangkok mainly focused on the following specific groups for each survey:

- Work from home survey: office workers in the CBD area
- Food delivery service: general people working or studying in Bangkok
- Online shopping: general people working or studying in Bangkok



Figure 3.1 Interview surveys

3.2 Sample Profiles

The surveys asked for socioeconomic characteristics of the respondents. The profile of the samples for each survey are summarized as follows.

3.2.1 Gender

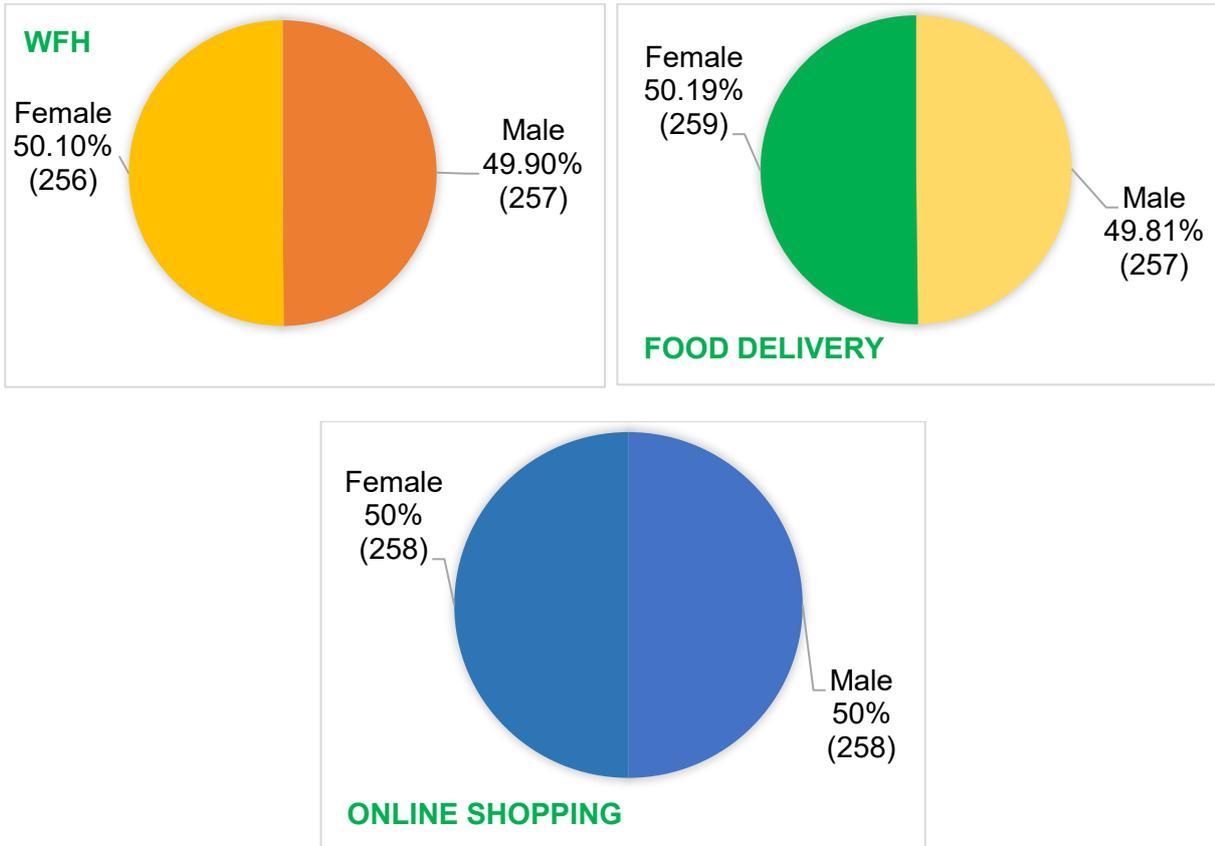
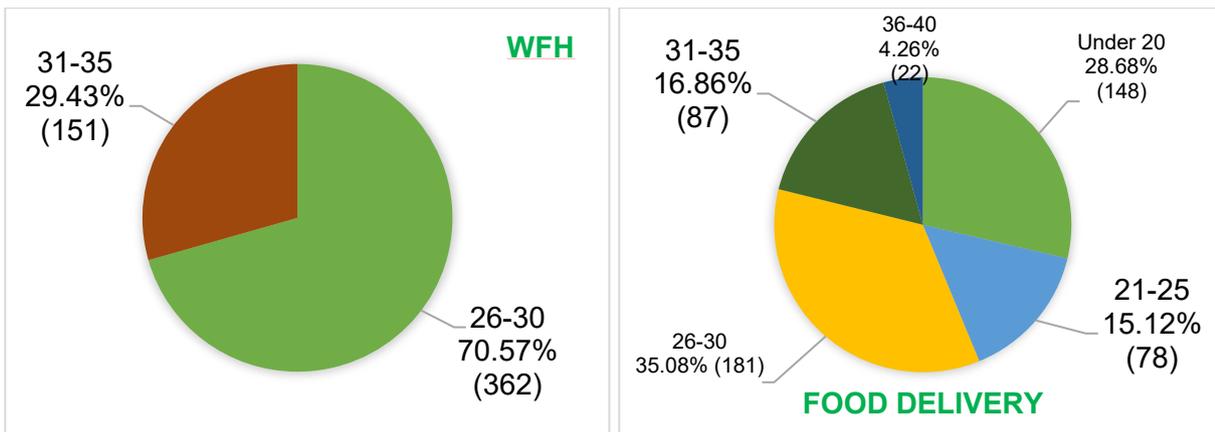


Figure 3.2 Gender of the sample

3.2.2 Age



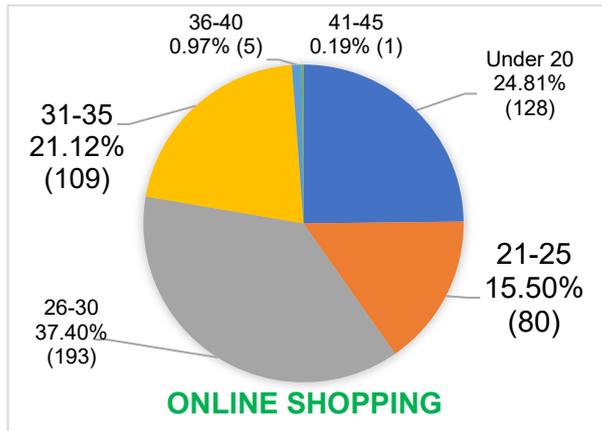


Figure 3.3 Age of the sample

3.2.3 Education

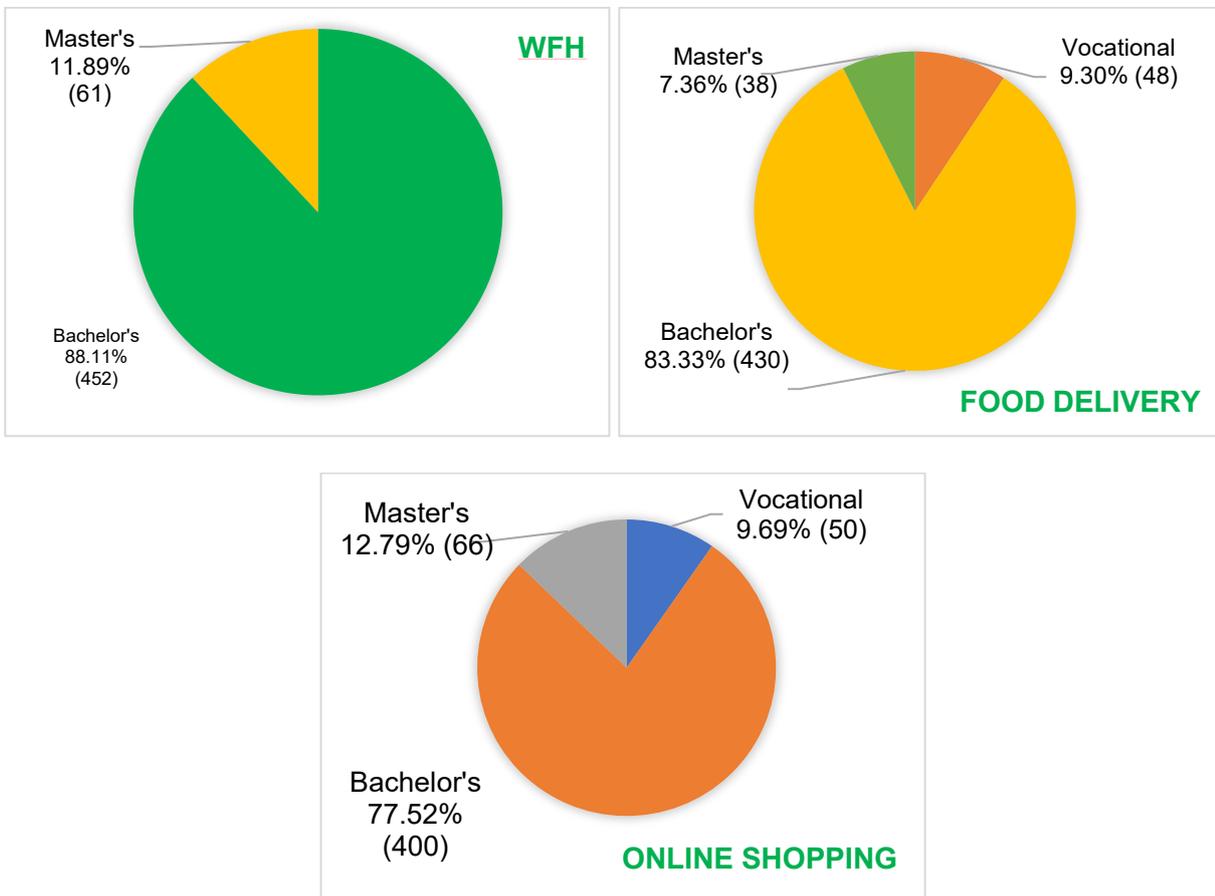
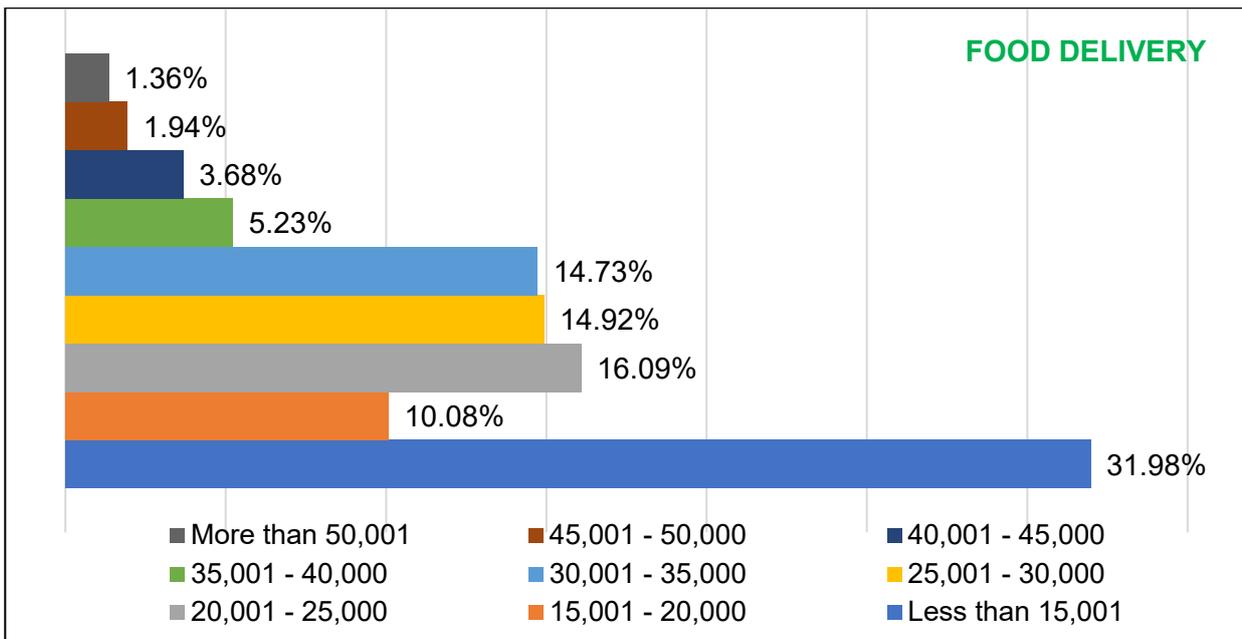
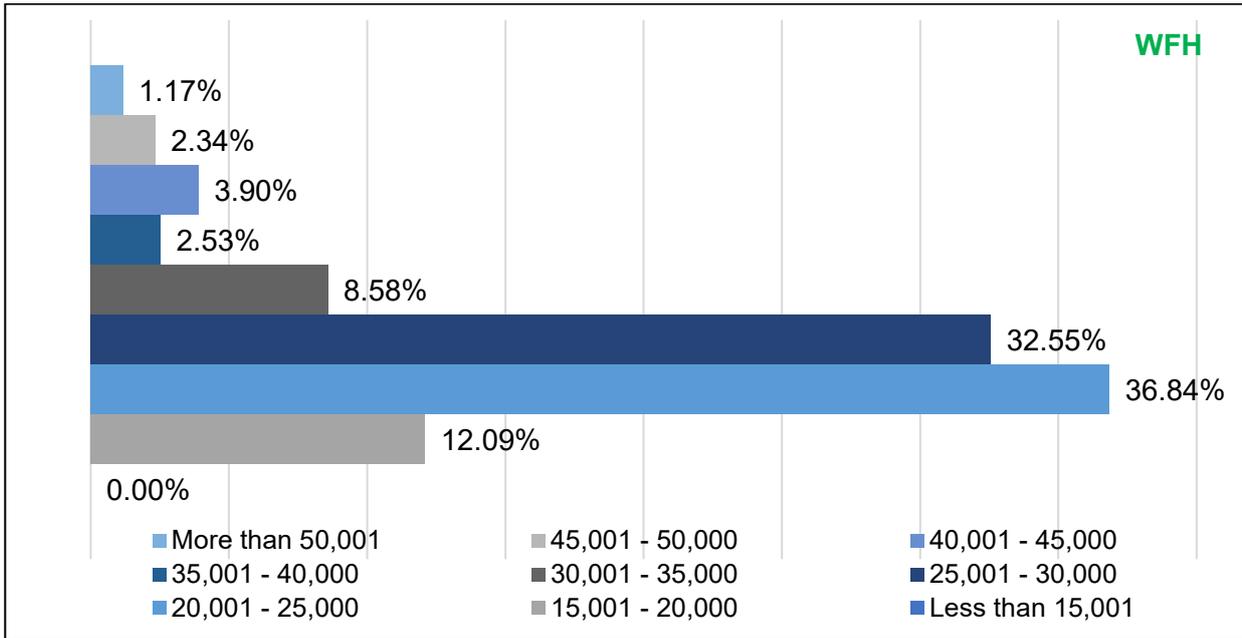


Figure 3.4 Education of the sample

3.2.4 Personal Income



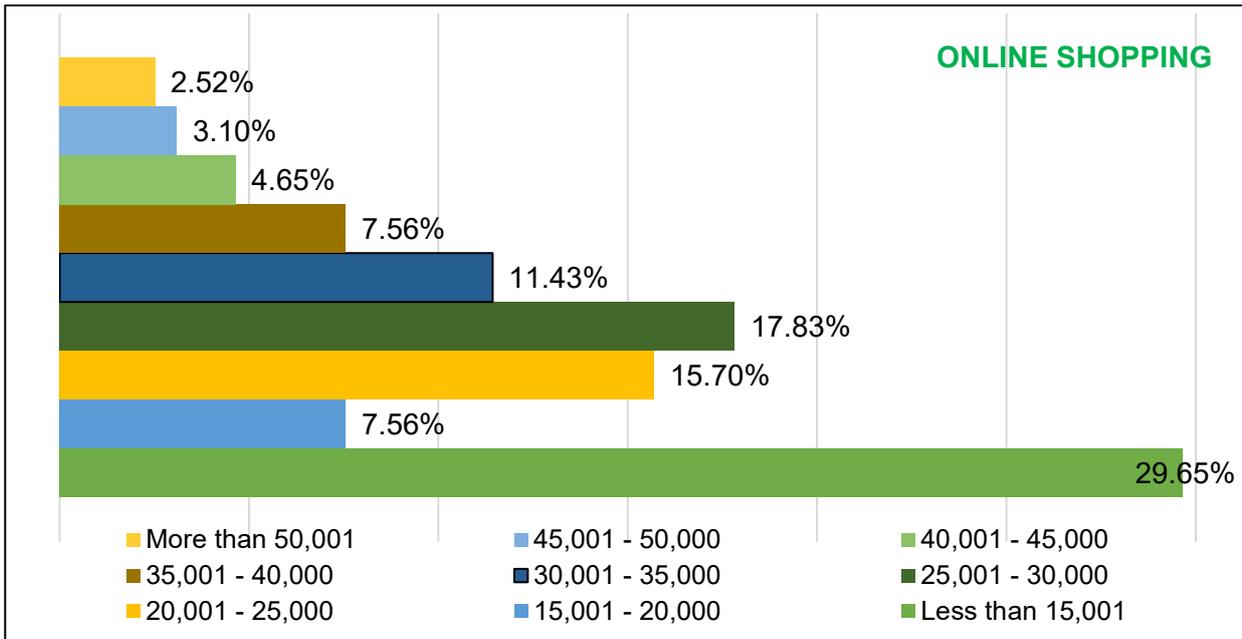
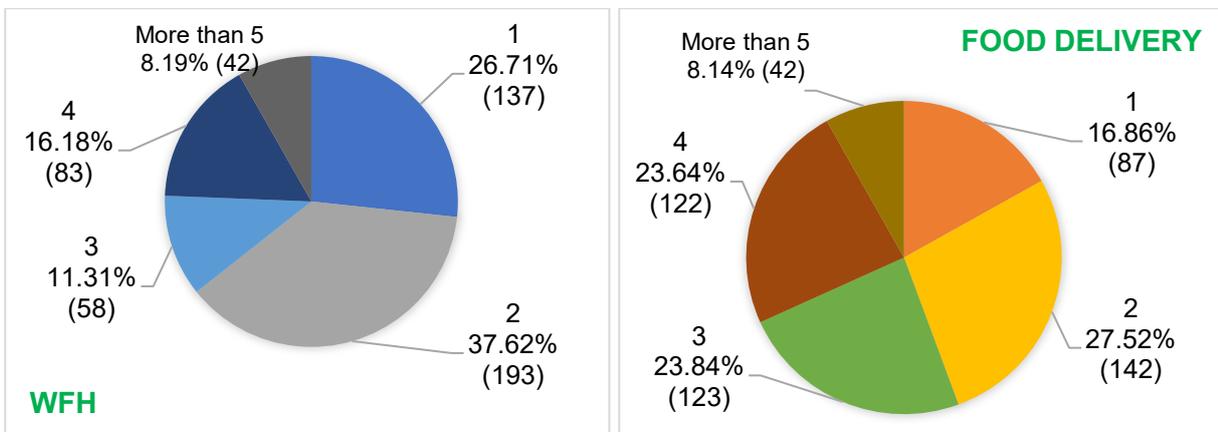


Figure 3.5 Personal income of the sample

3.2.5 Number of Household Members



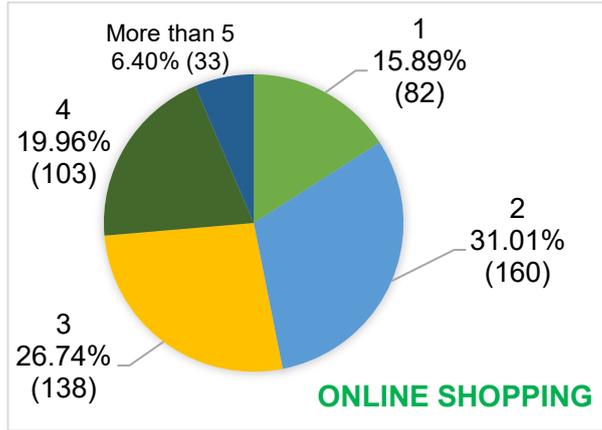


Figure 3.6 Number of household members of the sample

3.2.6 Number of private cars

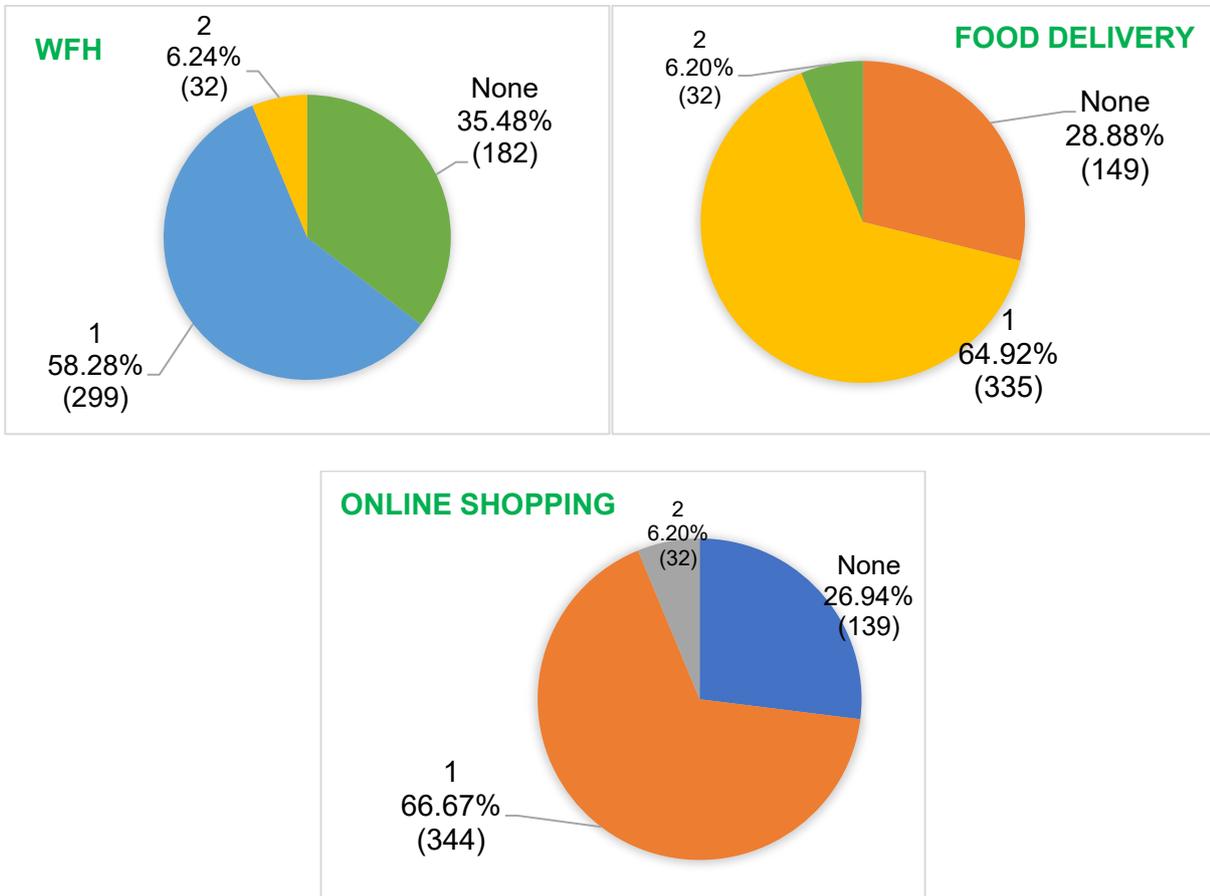


Figure 3.7 Number of private cars available in the household

3.2.7 Number of private motorcycles

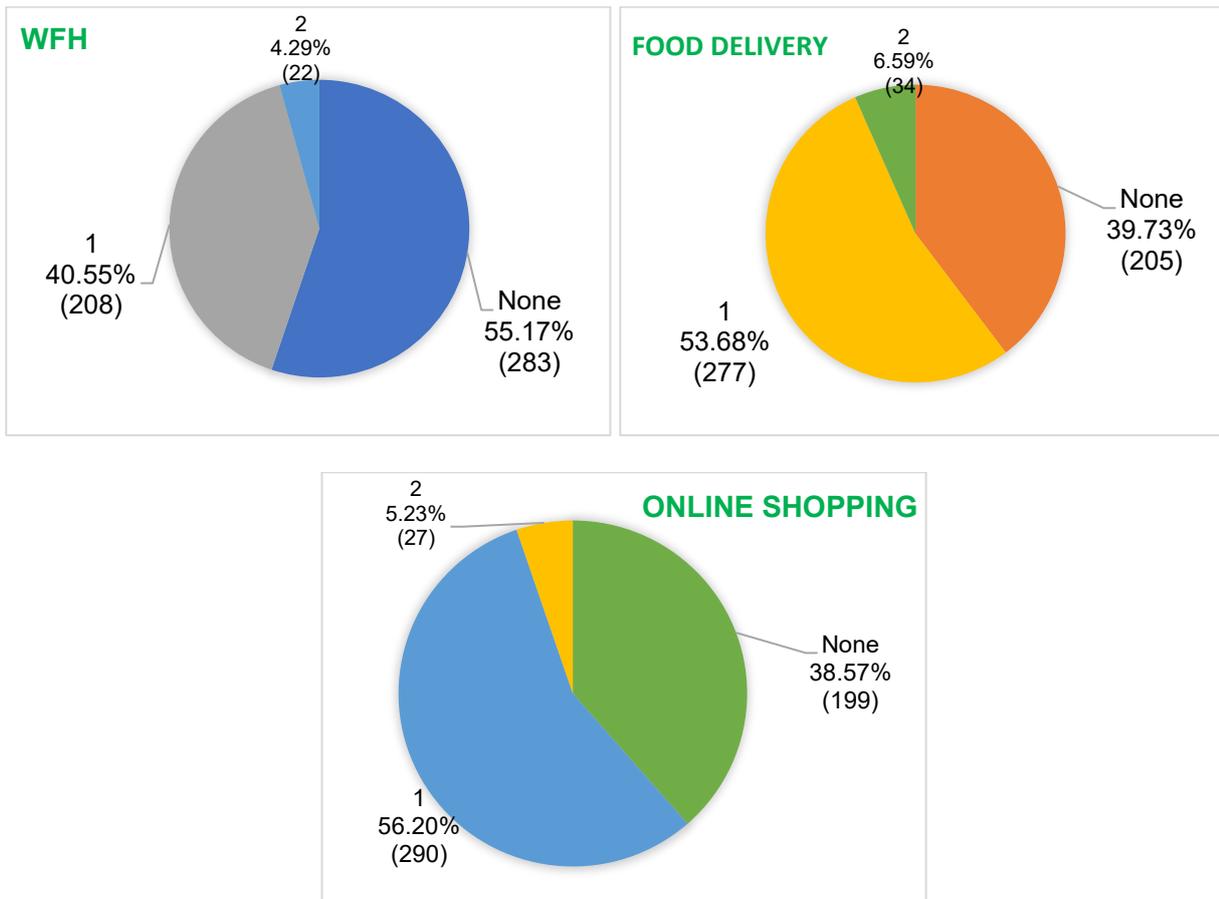
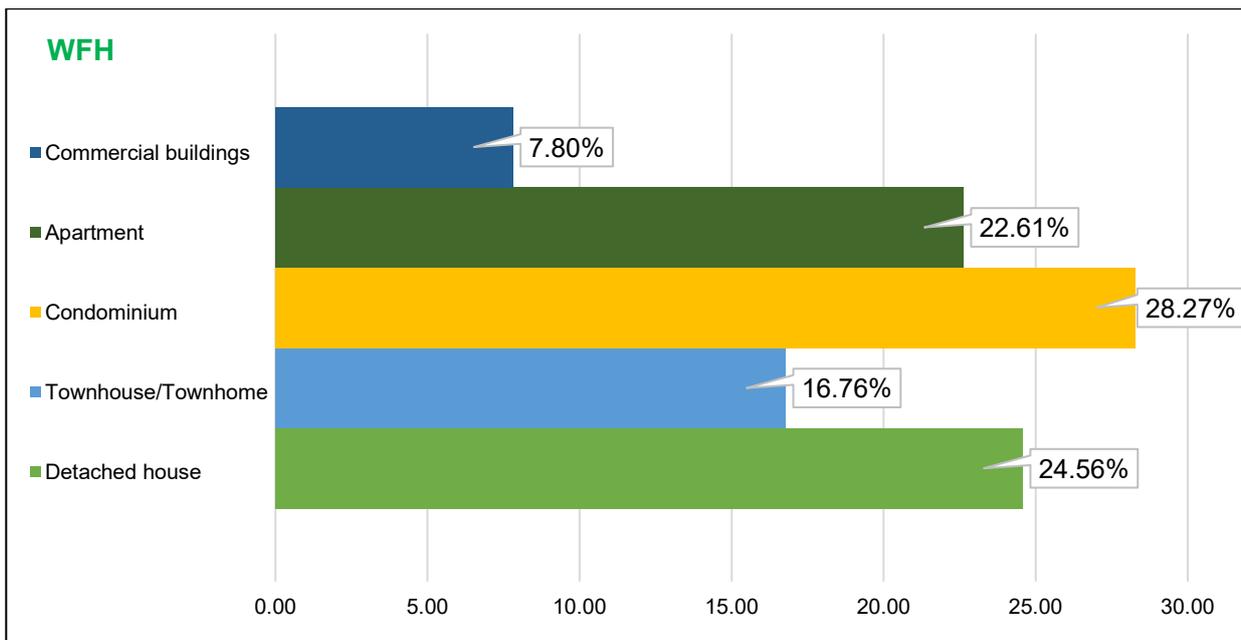
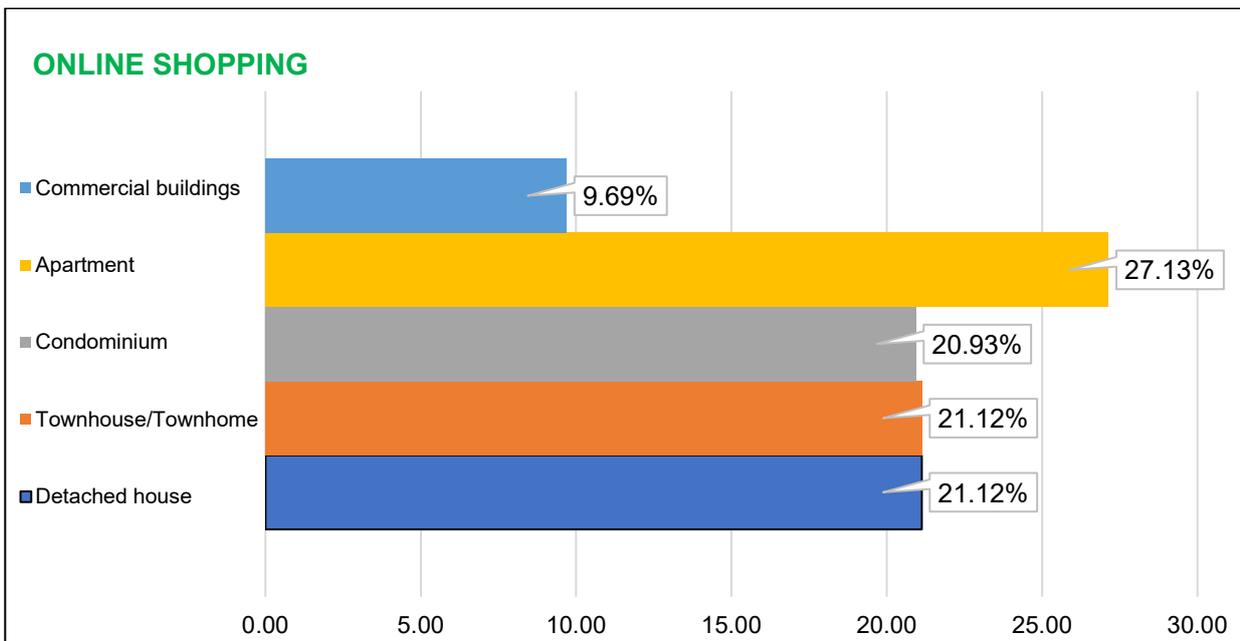
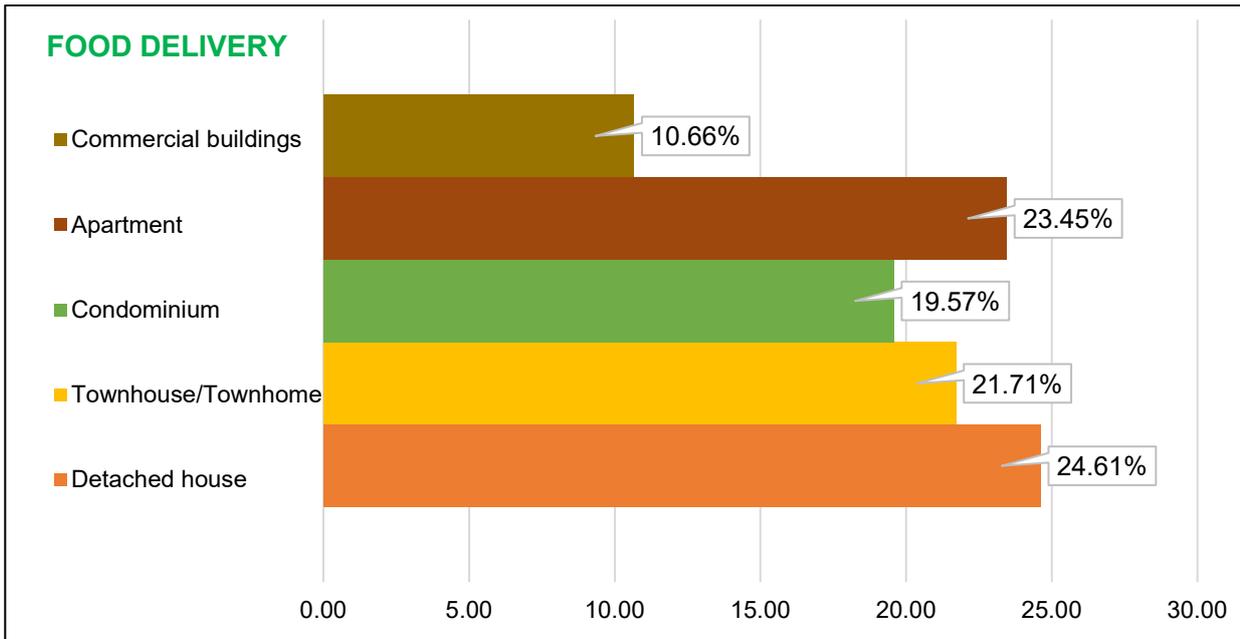


Figure 3.8 Number of motorcycle available in the household

3.2.8 Type of housing





3.3 Attitude and Intention

3.3.1 Questions

Survey items included questions related to socio-demographic details, work and travel patterns (pre-pandemic, during pandemic and expected for post-pandemic period), attitudes, personality etc. A series of questions on a 7-point Likert scale was asked regarding self-reported perceptions of the latent constructs of intention, attitudes, subjective norms, and perceived behavioral control that are associated with the

elements of the Theory of Planned Behavior (TPB). The 7-point Likert scale was as follows: definitely agree = 7, agree = 6, somewhat agree = 5, neutral = 4, somewhat disagree = 3, disagree = 2, and definitely disagree =1. The questions for the three surveys were listed in Table 3.1 to Table 3.3, for work from home, food delivery service, and online shopping, respectively.

Table 3.1 Attitudinal questions: work from home

No.	Questions
1	WFH more often than before COVID-19 will make you concentrate more on your work.
2	WFH more often than before COVID-19 will make your work better, for example, your work has been praised.
3	WFH more often than before COVID-19 will save you time, such as having more free time due to the need to travel.
4	WFH more often than before COVID-19 will balance your work and personal life (Work-life Balance) better.
5	WFH more often than before COVID-19 will allow flexibility, such as being able to allocate time as needed.
6	WFH more often than before COVID-19 will improve your health such as having time to relax and exercise.
7	WFH more often than before COVID-19 will reduce your stress, such as not having to experience a stressful atmosphere at work.
8	WFH more often than before COVID-19 will reduce the risk of contracting COVID-19.
9	WFH more often than before COVID-19 will be safer from accidents
10	WFH more often than before COVID-19 will be cheaper for you, such as not having to pay for travel.
11	WFH more often than before COVID-19 is better for the environment, such as reducing air pollution, relieving traffic congestion, etc.
12	People around you (family, friends, close friends) think you should be working at home more often than before COVID-19.
13	People around you (family, friends, close friends) will encourage you to WFH more often than before COVID-19.

No.	Questions
14	Your boss will encourage you to WFH more often than before COVID-19.
15	Your colleague will WFH more often than before COVID-19.
16	Your work can be done or completed at home.
17	Working at home is easy, compared to commuting to work
18	You feel comfortable using technology for WFH.
19	You have devices for working at home: computer, internet, etc.
20	After the COVID-19 situation has relieved, you intend to WFH more often than in the pre-COVID-19 period.
21	Would you like to work at home in the future?
22	You will WFH whenever you have chance.

Table 3.2 Attitudinal questions: food delivery service

No.	Questions
1	Using food delivery service is more convenient than dining out.
2	Using food delivery service is more convenient than eating at a restaurant.
3	Food can be ordered from anywhere via food delivery service.
4	You can order food whenever you want to.
5	Food delivery service makes your life easier.
6	Food delivery service can help you save time.
7	It won't take you long to choose a delivery food.
8	It won't take you long to eat the food ordered from delivery service.
9	Food delivery service allows you to pay quickly and easily.
10	Family and friends order food delivery service regularly.
11	Family and friends agree if you order food delivery service.

No.	Questions
12	Family and friends will encourage you to use food delivery service more frequently than before COVID-19.
13	You can order food (delivery service) by yourself
14	You can easily and quickly make order with food delivery service
15	Food delivery service is easy compared with going to a restaurant.
16	It is not difficult to learn how to use food delivery service.
17	You have device to use food delivery service.
18	You intend to use food delivery service more frequently after the COVID-19.
19	You intend t to use food delivery service regularly after the COVID-19.
20	You'd prefer t to use food delivery service instead of going out in the future.
21	You will use food delivery service when you have chance.
22	You are satisfied with the price, e.g., the price is not expensive, the delivery fee is not expensive, etc.
23	You are satisfied with the food quality, e.g., good taste, food temperature, beverage with undissolved ice, etc.
24	You are satisfied with the service quality, e.g., variety of shops, got the ordered food correctly, short waiting time, etc.

Table 3.3 Attitudinal questions: online shopping

No.	Questions
1	Online shopping is more convenient than buying at stores.
2	Online shopping is possible from anywhere.
3	You can do online shopping whenever you want to.
4	Online shopping makes your life easier.
5	Online shopping can help you save time.
6	Ordering goods online is a peace of mind, comparing to buying at stores, for example, you are not followed by the shop staffs at the stores.

No.	Questions
7	It won't take you long to do online shopping.
8	Online shopping allows you to pay quickly and easily.
9	Family and friends do online shopping regularly.
10	Family and friends agree if you do online shopping.
11	Family and friends will encourage you to do online shopping more frequently than before COVID-19.
12	You can do shopping for yourself.
13	You can easily and quickly do online shopping
14	Online shopping is easier than buying at store.
15	It is not difficult to learn how to do online shopping.
16	You have device to do online shopping.
17	You intend to do online shopping more frequently post COVID-19.
18	You intend to do online shopping on a regularly post COVID-19.
19	You'd prefer to do online shopping instead of buying at store in the future
20	You will do online shopping when you have chance.
21	How much were you satisfied with the price of goods ordered online, e.g., good was not expensive, the delivery fee was not expensive, etc.
22	How much were you satisfied with the quality of goods ordered online, e.g., got the ordered goods correctly, etc.
23	How much were you satisfied with the service of goods ordered online, e.g., variety of sellers, delivery quality, etc.

The survey results of the attitudinal questions for each survey are summarized as follows.

3.3.2 Work from Home

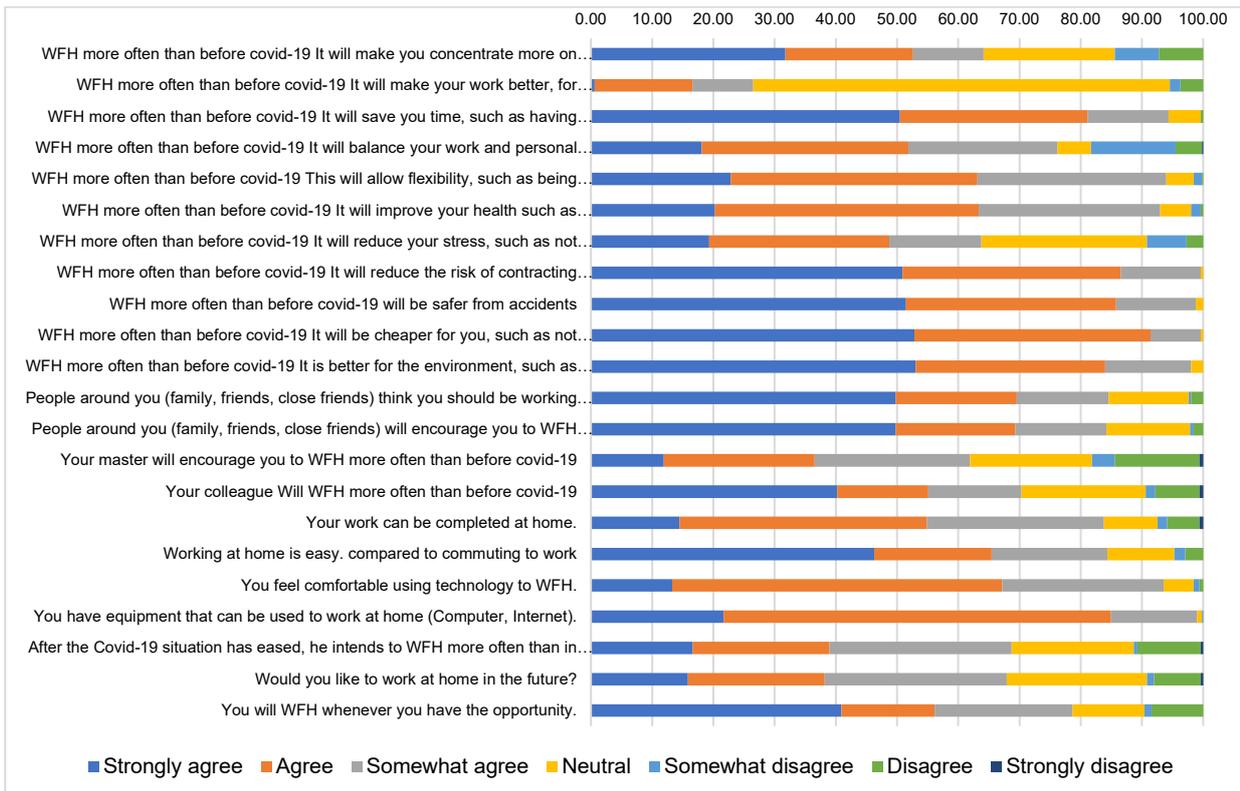


Figure 3.9 Attitudinal preferences of work from home

3.3.3 Food Delivery Service

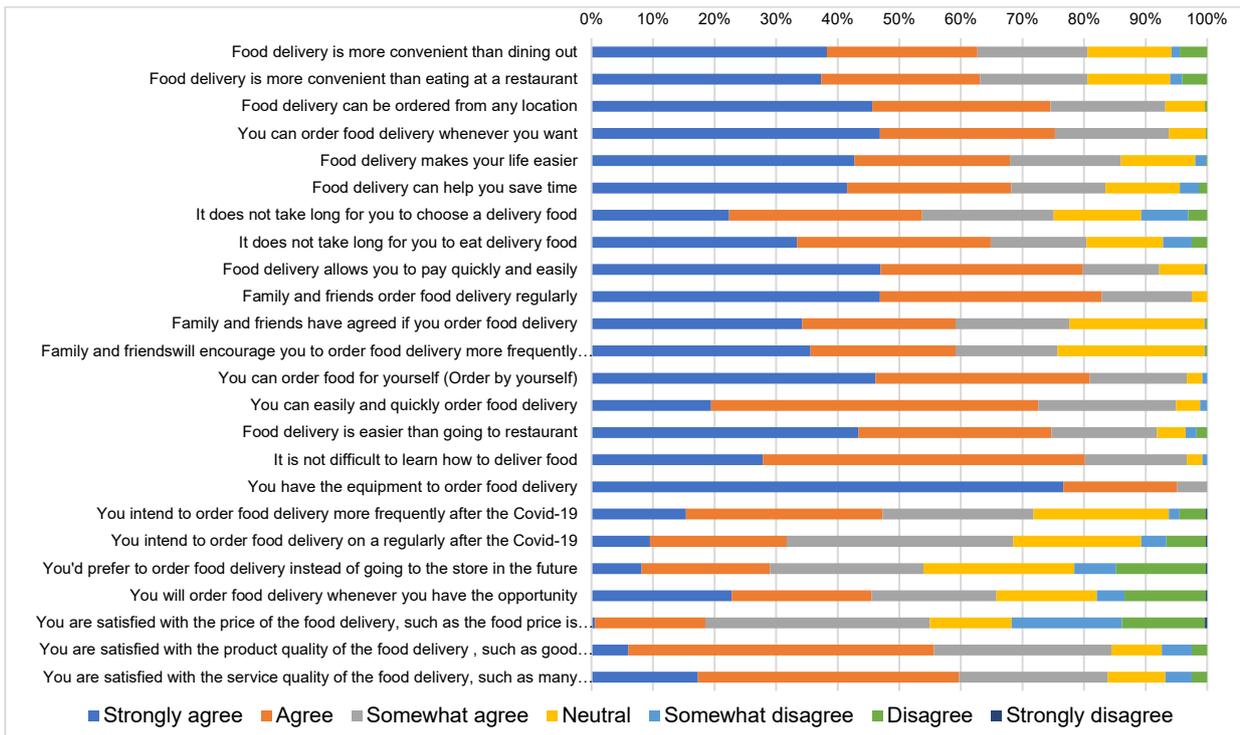


Figure 3.10 Attitudinal preferences of Food Delivery Service

3.3.4 Online Shopping

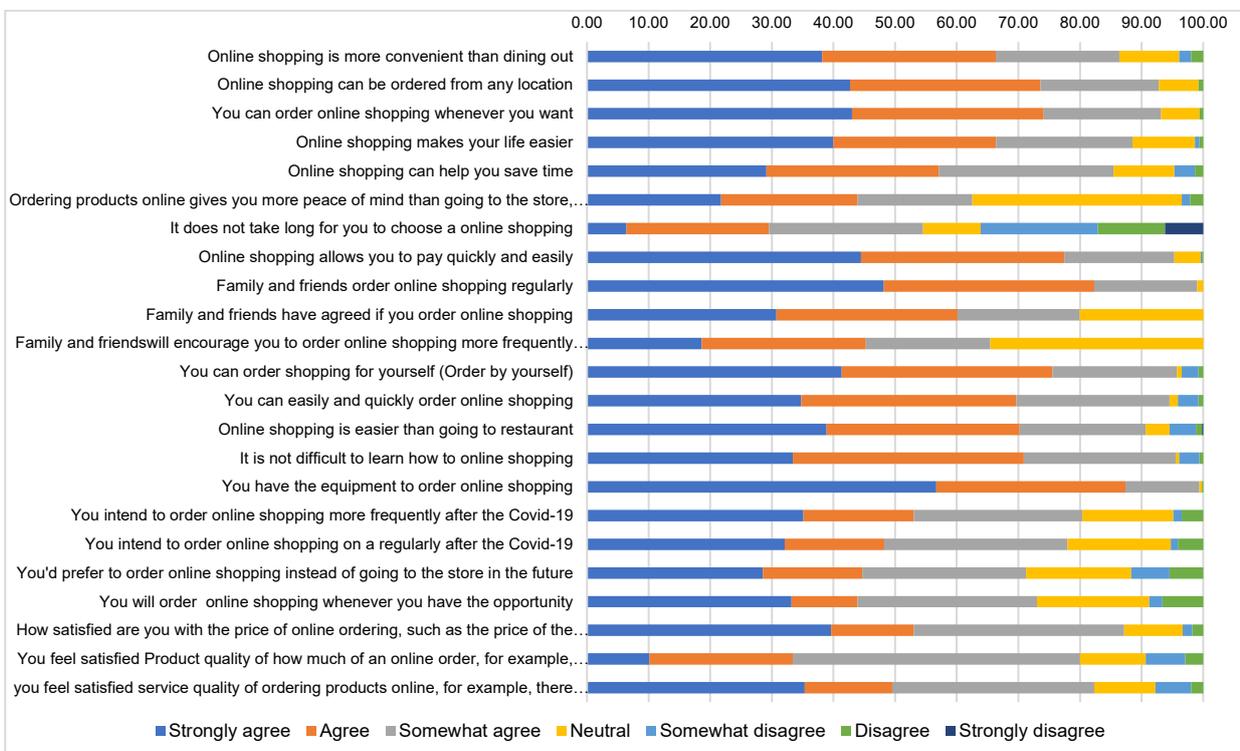
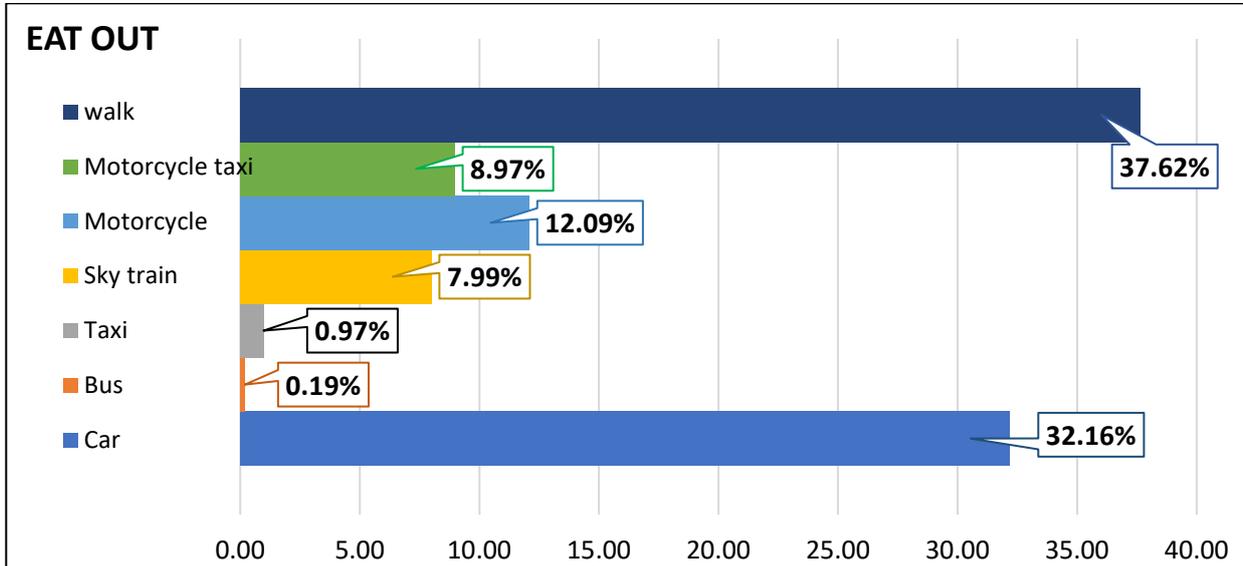
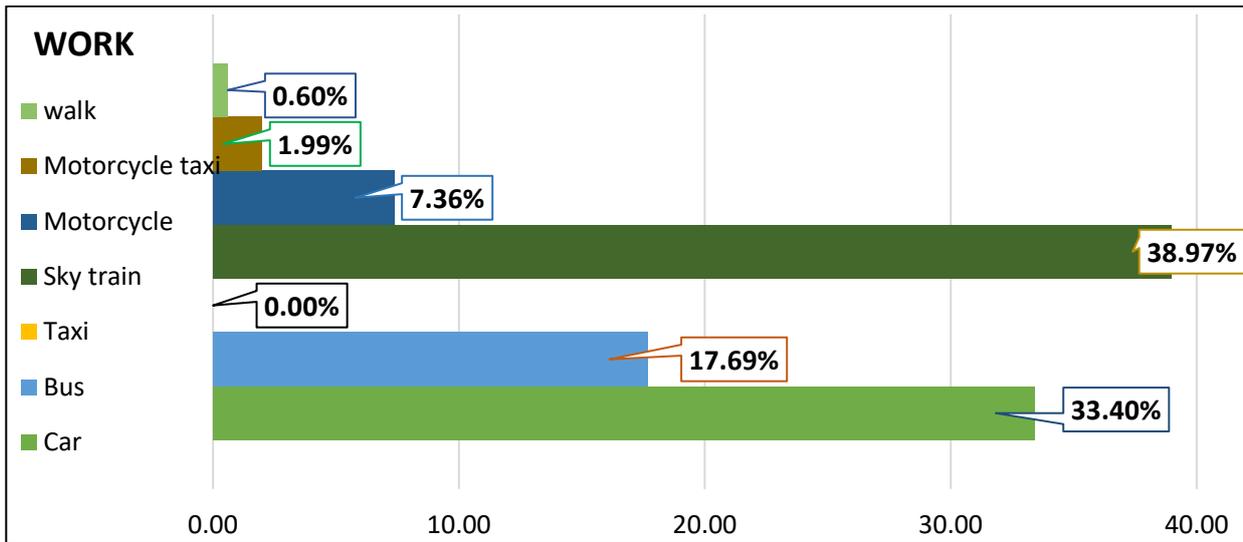


Figure 3.11 Attitudinal preferences of online shopping

3.4 Travel Behavior

In addition to the attitudinal questions, the respondents were asked about travel behavior in terms of travel mode, travel distance, and travel time for the trips to work, to buy food or eat out, or to buy goods at stores, respectively.

3.4.1 Mode of Travel



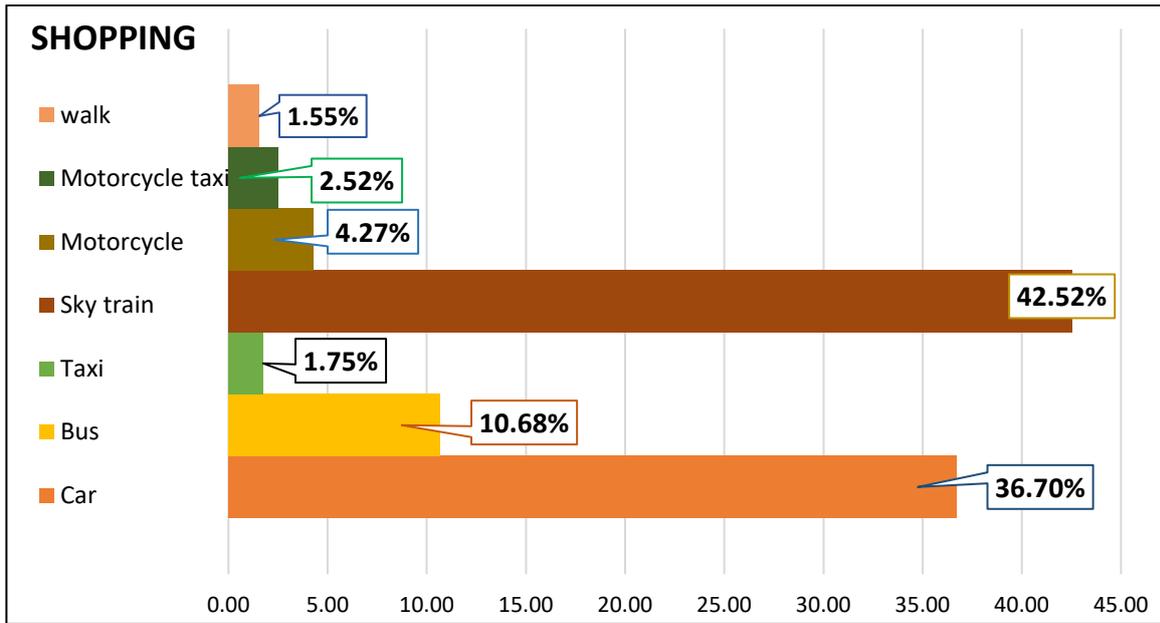
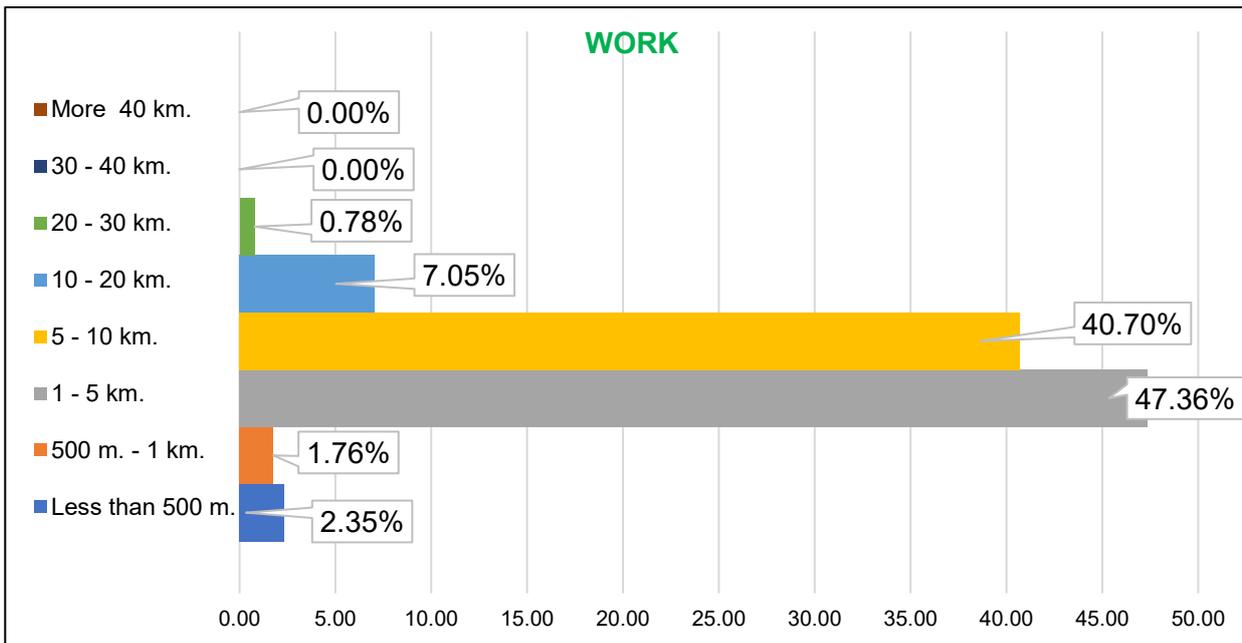


Figure 3.12 Mode of travel

3.4.2 Trip Distance



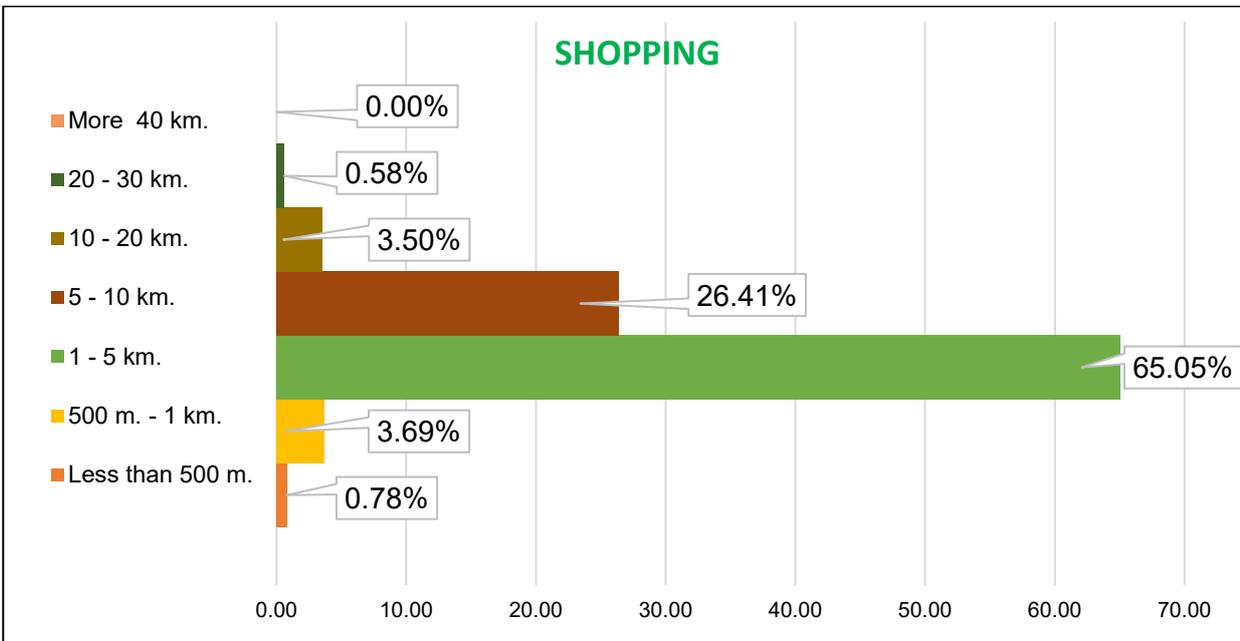
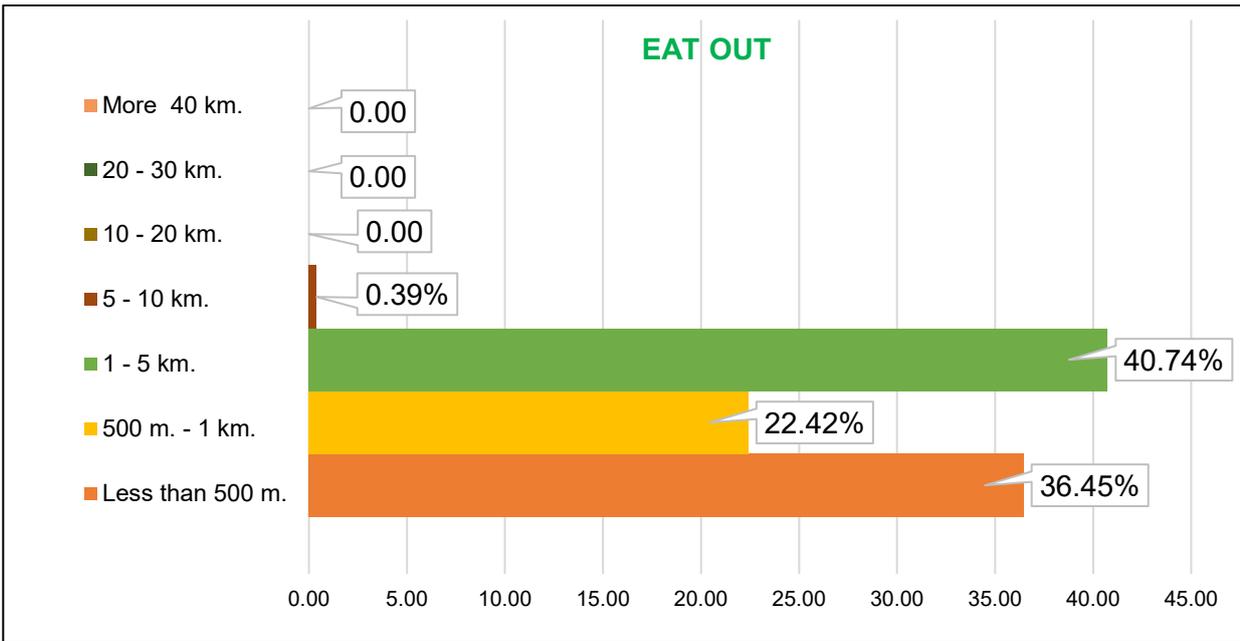
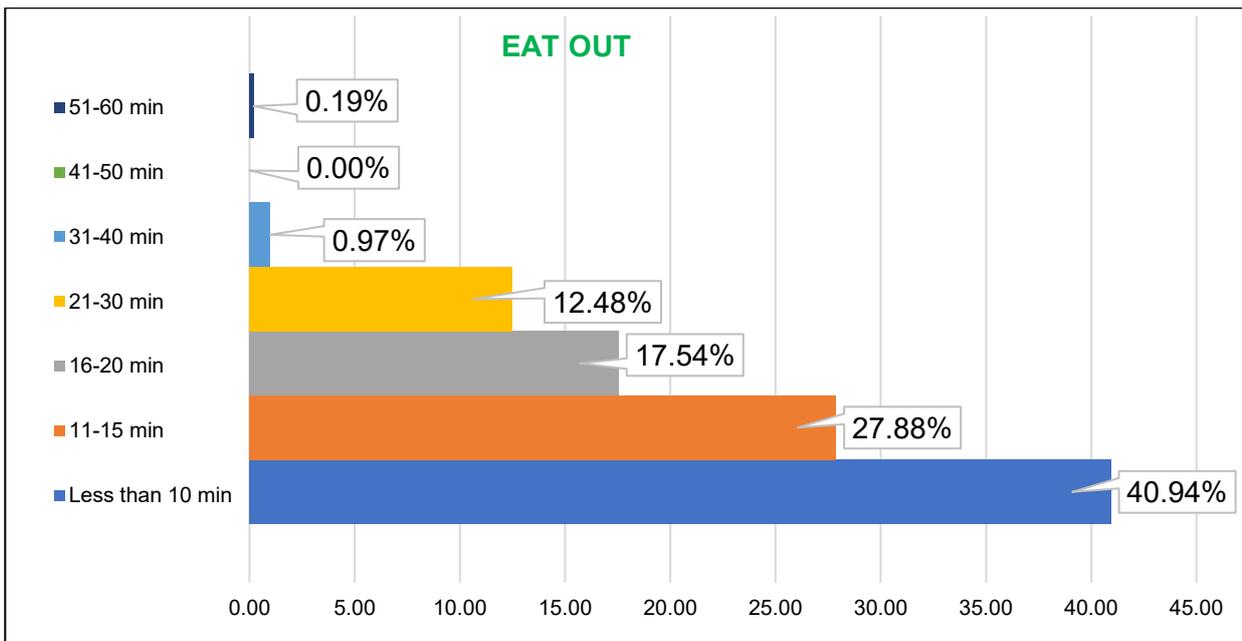
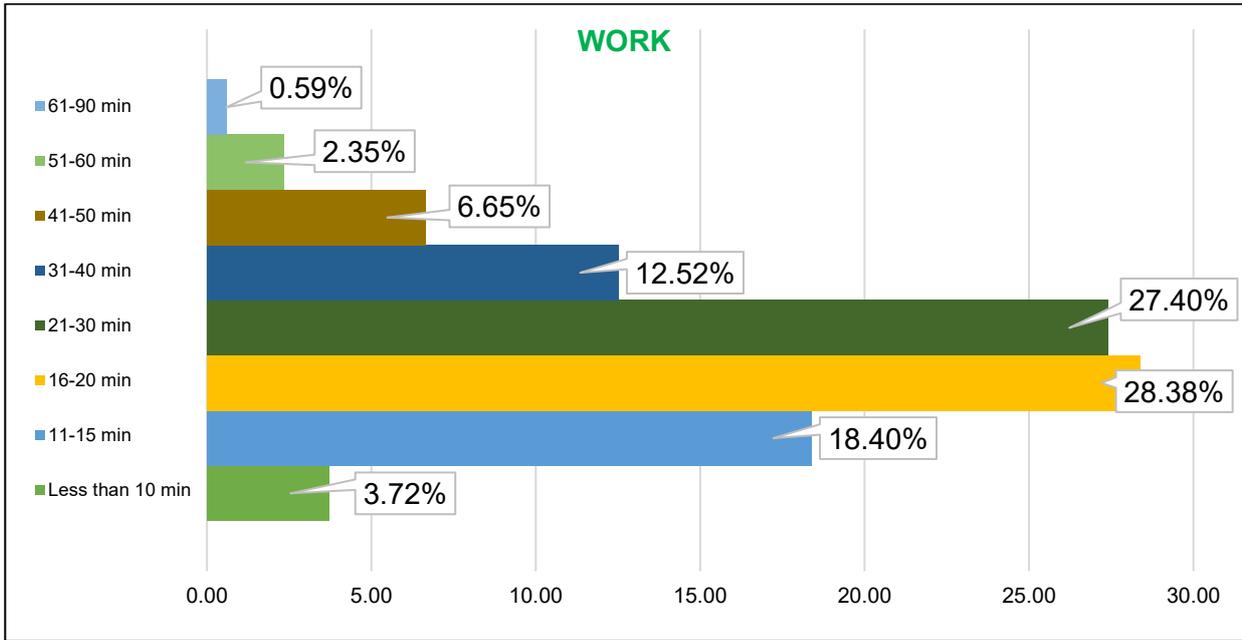


Figure 3.13 Average trip distance

3.4.3 Travel Time



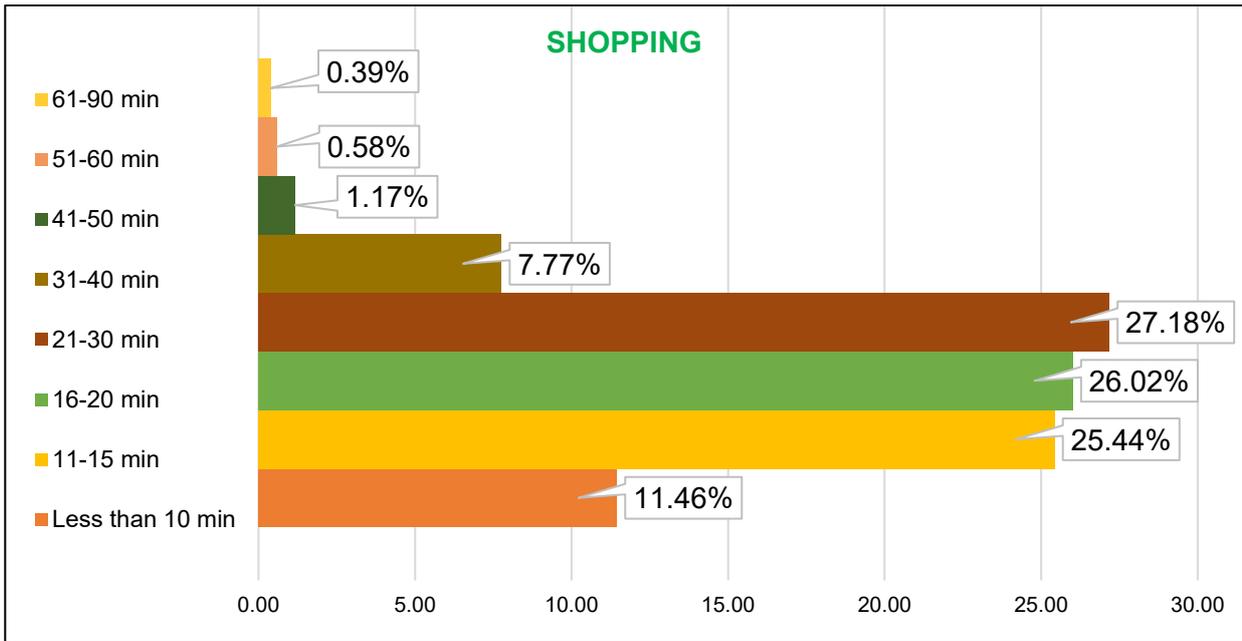


Figure 3.14 Average travel time

3.5 Behavior Change

The respondents were asked the frequency of doing work from home, ordering food delivery service, and doing online shopping, pre-COVID, during the lockdown, and post-COVID.

3.5.1 Work from Home

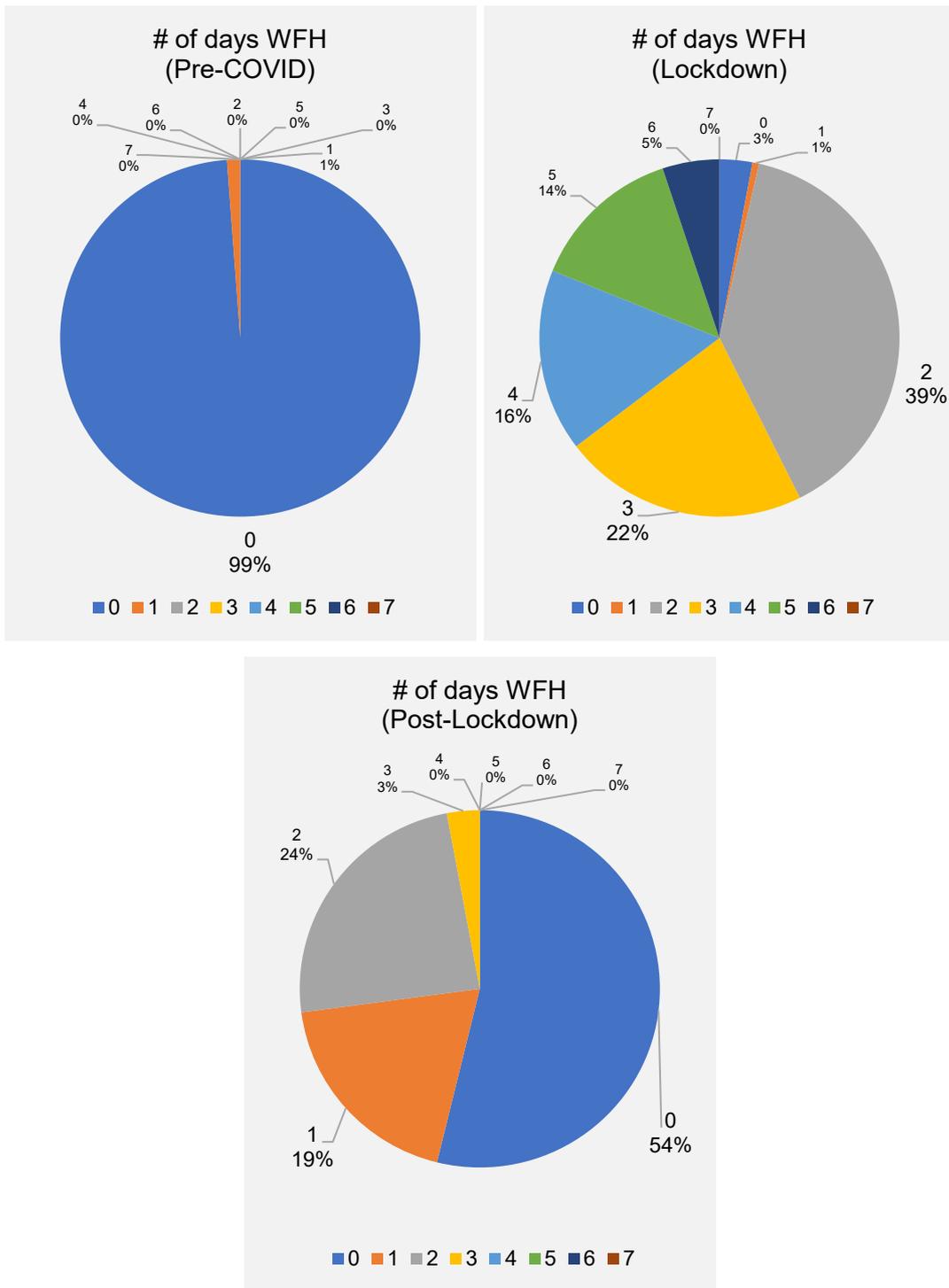


Figure 3.15 Number of days working from home per week

3.5.2 Food Delivery Service

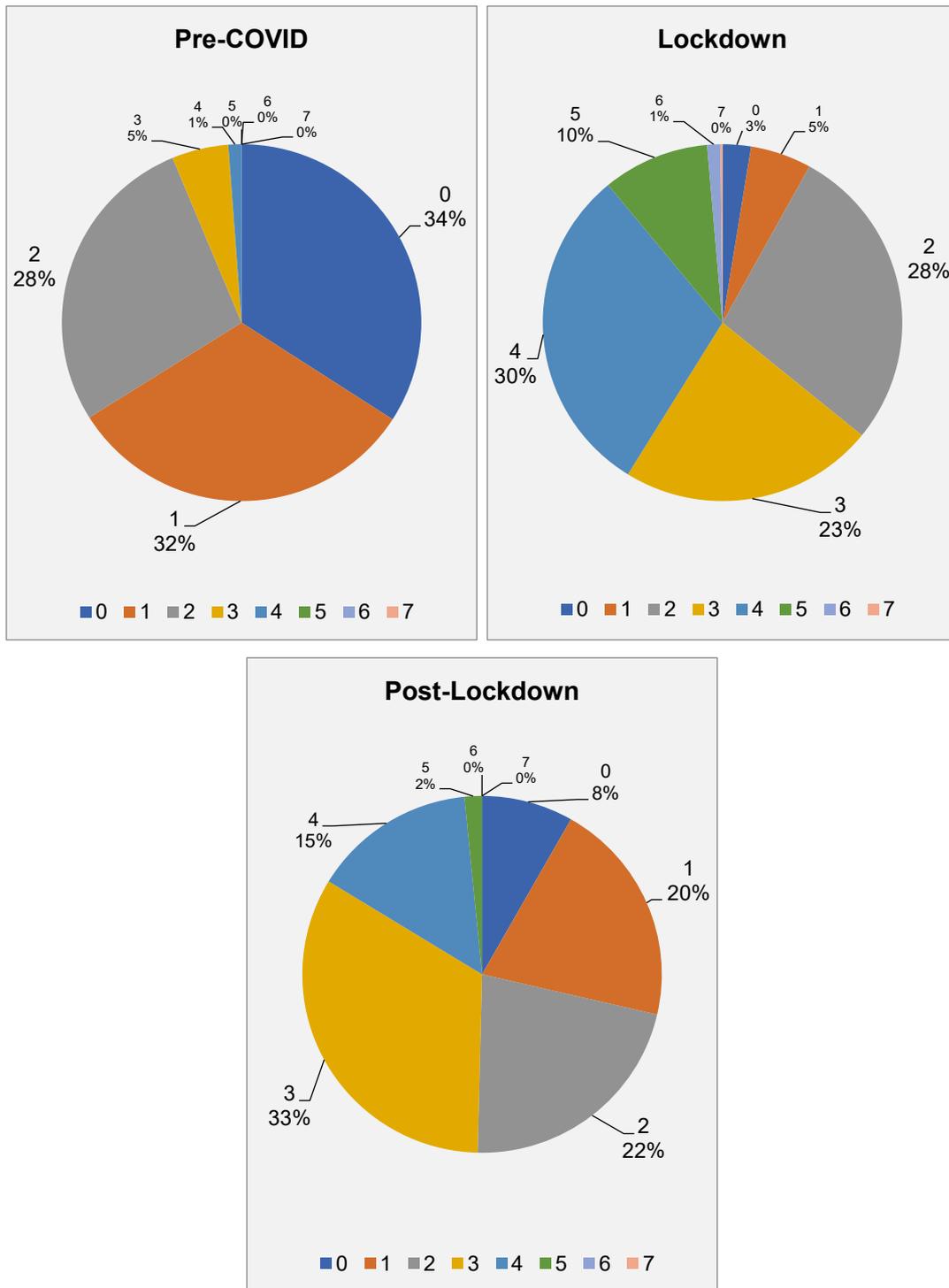


Figure 3.16 Number food delivery ordering per week

3.5.3 Online Shopping

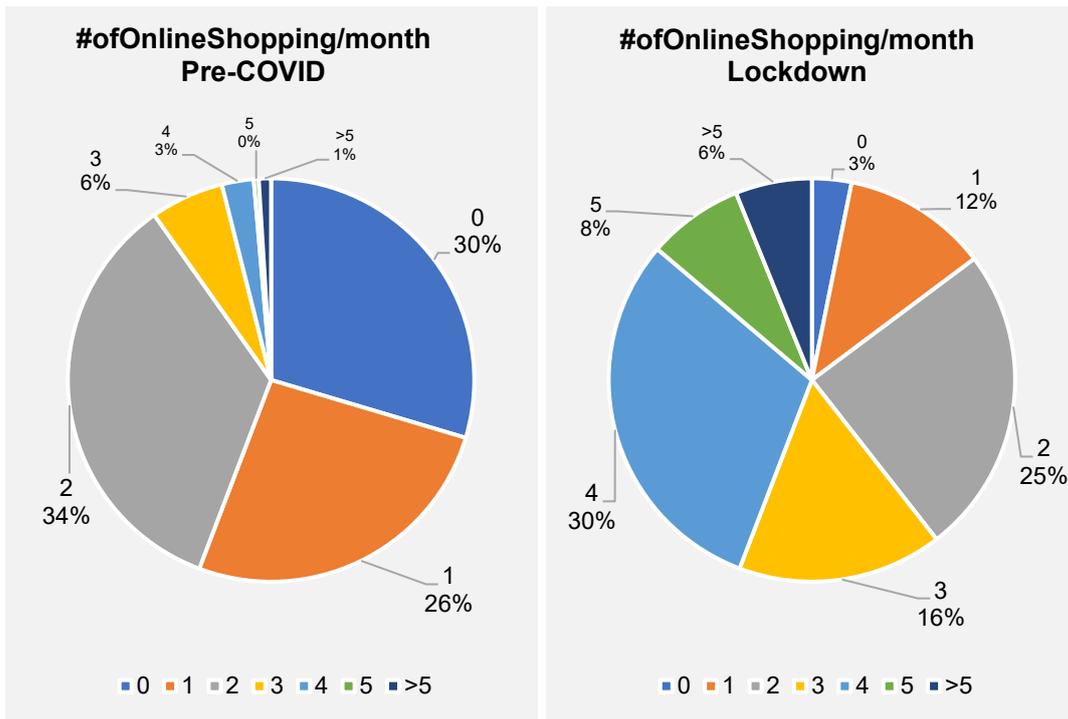


Figure 3.17 Number of online shopping per month

CHAPTER 4 STATISTICAL ANALYSIS

4.1 Method

By using the data obtained from the interview survey, the following analyses were conducted. Firstly, exploratory factor analysis (EFA) with principal component extraction and factor rotation was conducted by using IBM SPSS Statistics 28 software to examine the underlying structure of the factors. The Kaiser–Meyer–Olkin (KMO) was determined (>0.8) and Bartlett's test of sphericity was conducted (the p-value of the chi-square statistics in the hypothesis test must be less than 0.05), for testing suitability of the data analysis (Hair et al., 2019). Factor loading values of 0.30 to 0.40 were considered to meet the minimal level for interpretation of structure; the values of 0.50 or greater were practically significant, while the values exceeding 0.70 were indicative of well-defined structure (Hair et al., 2019). Cross-loading items were eliminated (Hair et al., 2019). Communality, which is the proportion of variable's variance explained by its loadings on the factors, was calculated as the sum of the squared loadings across the factors. It identifies the strength of the factors in explaining each variable; a high variable communality (>0.50) indicated a set of factors that could explain much of the variance of the variable and justify keeping the variable (Hair et al., 2019). Reliability of the model was evaluated by Cronbach's alpha (>0.7).

Secondly, confirmatory factor analysis (CFA) was conducted by using IBM SPSS AMOS 28 software to validate the measurement models of the latent constructs identified through the EFA. The goodness-of-fit of the estimated model was evaluated and the validity of the construct was examined. Construct reliability (>0.7) and average variance extracted (>0.5) were determined. Thirdly, a structural equation model (SEM) was developed by using IBM SPSS AMOS 28 software to examine the relationship between the latent constructs. The overall model fit was evaluated through several recommended goodness-of-fit statistics and indices (Hair et al., 2019). As absolute fit indices, the Chi-square (χ^2) statistic was determined to evaluate the fit between the observed and estimated covariance matrices. As the Chi-squared test is sensitive and biased to sample size, the value is larger with a larger sample size. The normed Chi-square was then determined as a ratio of χ^2 to the degrees of freedom for a model

(CMIN/df) (<5.0). The goodness-of-fit index (GFI), which evaluates the proportion of variance in the sample variance–covariance matrix (>0.9). As an incremental fit indicator, the comparative fit index (CFI) was determined (>0.9). As a badness-of-fit index, the root mean square error of approximation (RMSEA) was determined; a value < 0.08 indicates a good fit (Hair et al., 2019).

4.2 Work from Home

4.2.1 EFA

An exploratory factor analysis (EFA) was conducted with the data of the respondents who worked from home two days or more per week during the COVID-19 lockdown in Bangkok (n=292). The final EFA model on 11 measurement items with Varimax rotation extracted the first three factors based on eigenvalue greater than 1 that accounted for 76.354% of the total variance. The KMO value was 0.840 (>0.8) and the Chi-square value in Bartlett's test of sphericity χ^2 (df = 55) was 2260.800 with significance at $p = 0.000$, indicating that the data was valid for the factor analysis. The standardized factor loadings of each measurement item of each latent construct are shown in Table 4.1. All variables making up each of these three factors are significant, having values above the 0.50 cut-off. The values of Cronbach's alpha are well above 0.5, indicating reliable scales.

Table 4.1 EFA – Work from Home

Latent construct	Measurement Items	Components			Cronbach's alpha
		1	2	3	
Risk	COVID safety	0.911			0.961
	Traffic safety	0.891			
	Cost saving	0.861			
	Environment	0.834			
Condition	Technology		0.832		0.822
	Device		0.801		
	Teleworking	0.458	0.706		
	WFH is easy	0.570	0.663		
Personal	A6-healthy			0.876	0.748
	A5-flexible			0.819	
	A7-stress			0.777	

Remark: Factor loadings less than 0.3 are not shown.

The first factor, named Risk, consisted of four items. The second factor, named Condition, consisted of four items. The third factor, named Personal, consisted of three items.

4.2.2 CFA

Confirmatory factor analysis (CFA) was conducted on the three latent constructs, namely, Risk, Condition, and Personal, as shown in Figure 4.1. The model fit was within an acceptable range. This confirms the measurement models that were derived from the EFA results.

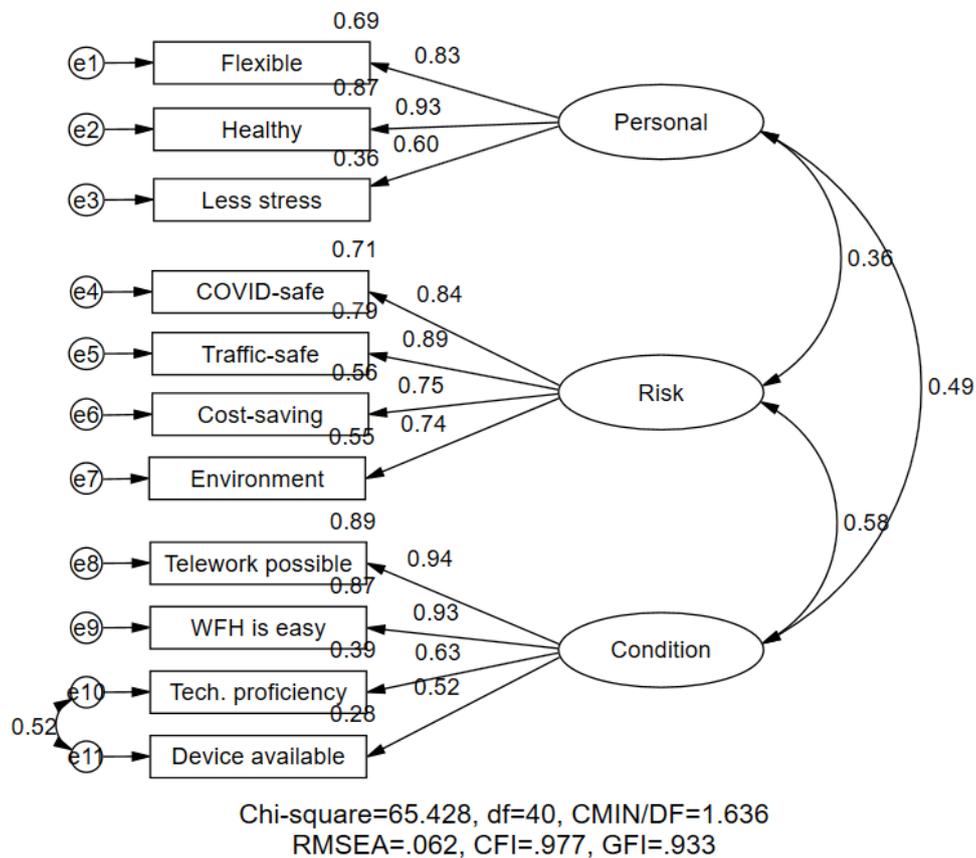
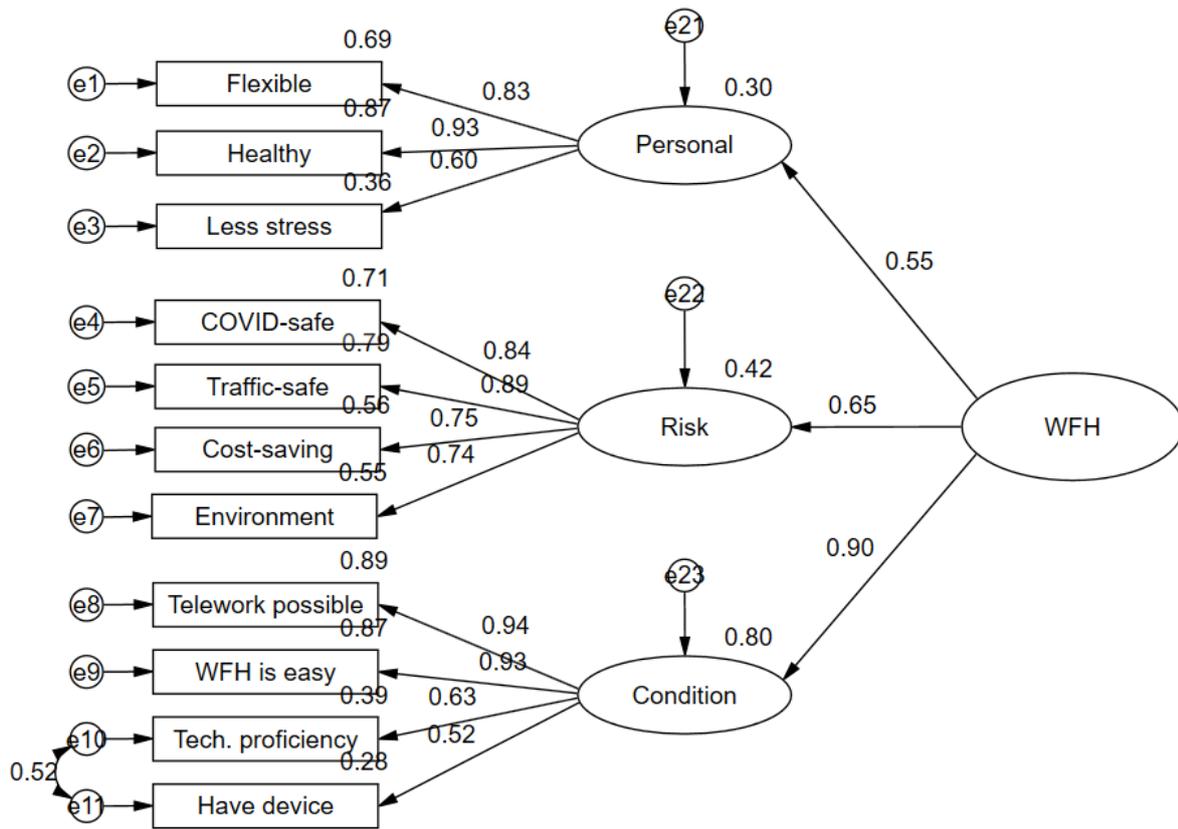


Figure 4.1 CFA result (work from home)

A second-order confirmatory factor analysis was conducted, as shown in Figure 4.2. It is found that for the respondents worked from home during the lockdown, the WFH condition has the greatest influence while risk perception and personal attitude were also found significant.

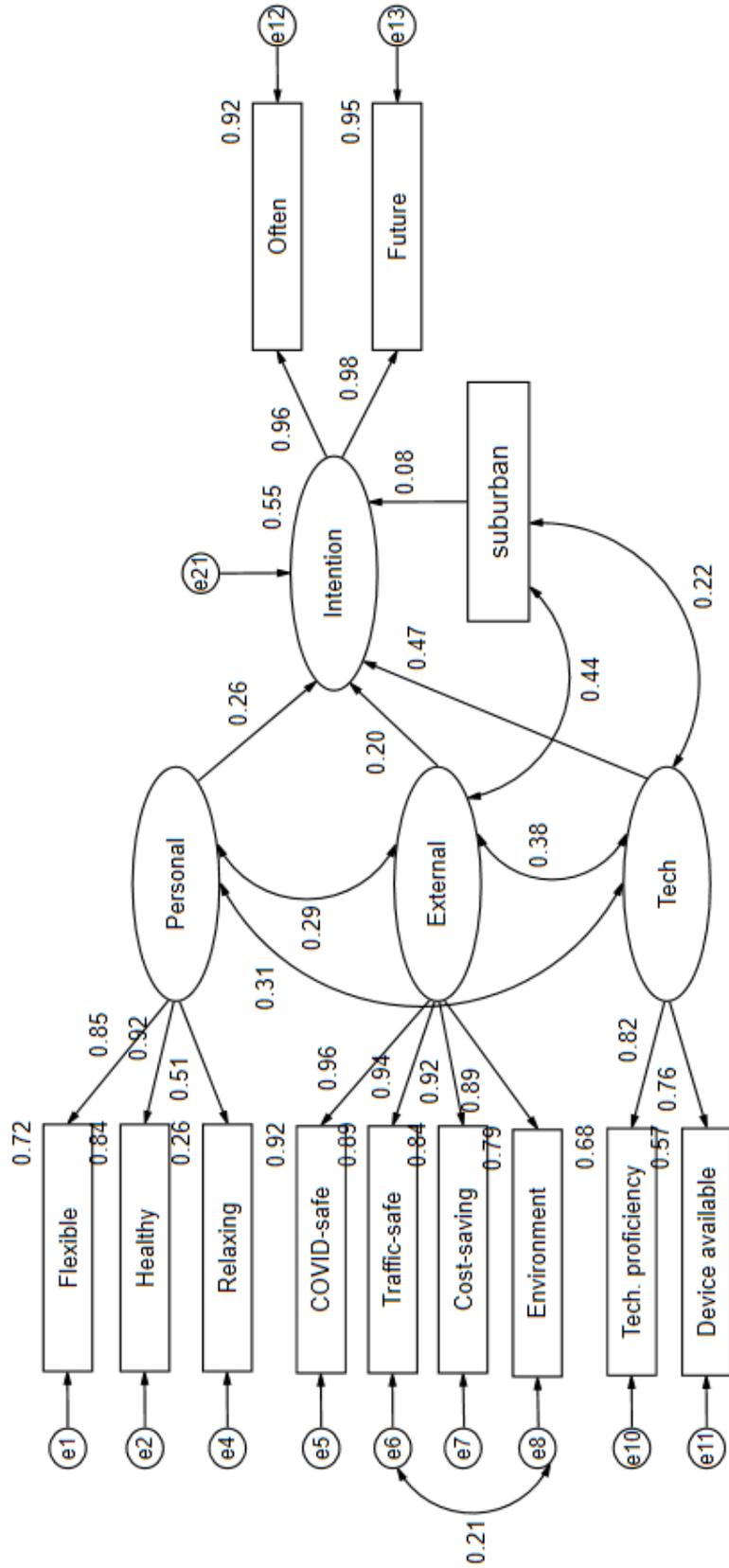


Chi-square=65.428, df=40, CMIN/DF=1.636
 RMSEA=.062, CFI=.977, GFI=.933

Figure 4.2 Second order CFA result (work from home)

4.2.3 SEM

The suggested EFA and CFA results were used to construct the Structural Equation Model (SEM) (n=491), as shown in Figure 4.3. All of the parameters are statistically significant at 0.001 level.



Chi-square=80.111, df=45, CMIN/DF=1.780, RMSEA=.040, RMR=.045
 NFI=.984, CFI=.993, GFI=.974

Figure 4.3 SEM result (work from home)

4.2.4 Multiple-group analysis

A multiple-group analysis SEM was conducted to examine the influential difference between the respondents living in a detached house or townhouse and the respondents living in a condominium or apartment. The results are shown in Figure 4.4 and Figure 4.5. It was found that suburban living preference was found to have significant influence.

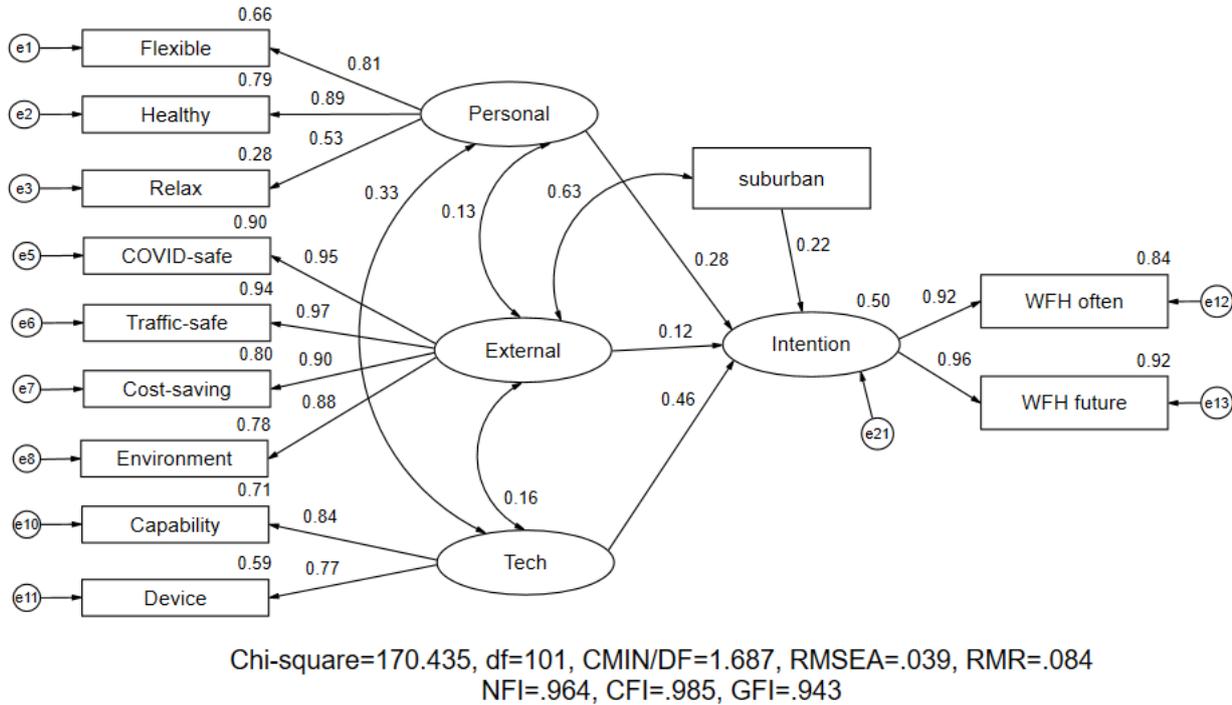
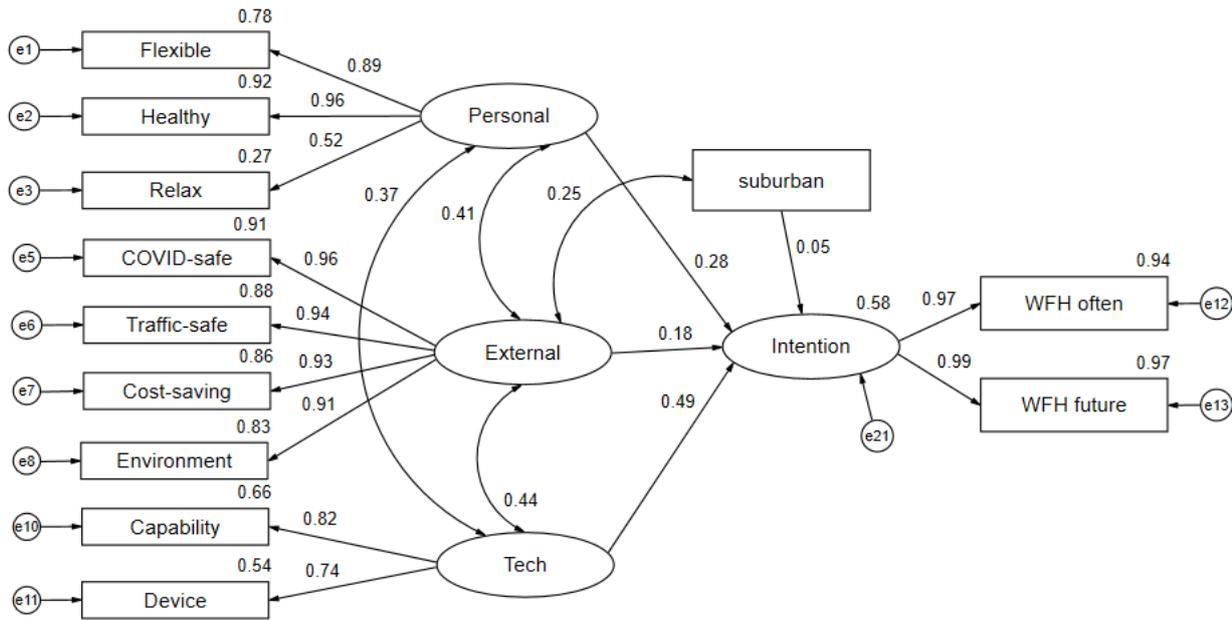


Figure 4.4 Group 1 – detached house or townhouse



Chi-square=170.435, df=101, CMIN/DF=1.687, RMSEA=.039, RMR=.084
 NFI=.964, CFI=.985, GFI=.943

Figure 4.5 Group 2 – condominium or apartment

4.3 Food Delivery Service

4.3.1 EFA

EFA was conducted with the data of the respondents who used food delivery service at least once during the lockdown (n=370). After removing the items with cross-loadings, the final EFA on 14 measurement items with Varimax rotation extracted four factors that accounted for 85.64% of the total variance. The KMO value was 0.937 (>0.8) and the Chi-square value in Bartlett’s test of sphericity χ^2 (df=91) was 5617.877 with significance at $p = 0.000$, indicating that the data was valid for the factor analysis. The standardized factor loadings of each measurement item of each latent construct are shown in Table 4.2.

Table 4.2 EFA – Food delivery service

Latent construct	Measurement Items	Components				Cronbach's alpha
		1	2	3	4	
PBC	Easy to learn	0.851				0.934
	Can order quickly	0.827				
	Can order by oneself	0.751		0.424		
	Easy to order	0.722		0.449	0.325	
Intention	Usually		0.846			0.926
	Often		0.818			
	Future		0.729	0.382	0.307	
Satisfaction	Food	0.326	0.309	0.791		0.858
	Service		0.370	0.704	0.313	
	Price		0.557	0.584		
Attitude	Quick to choose				0.889	0.925
	Quick to eat	0.335	0.317	0.340	0.761	
	Convenience	0.472	0.304	0.461	0.547	
	Save time	0.488		0.512	0.535	

Remark: Factor loadings less than 0.3 are not shown.

4.3.2 CFA

Confirmatory factor analysis (CFA) was conducted on the four constructs, as suggested by EFA, namely, Attitude, PBC, Intention, and Satisfaction. The result is shown in Figure 4.6 where the model fit indicators are within an acceptable range. This confirms the measurement models that were derived from the EFA results.

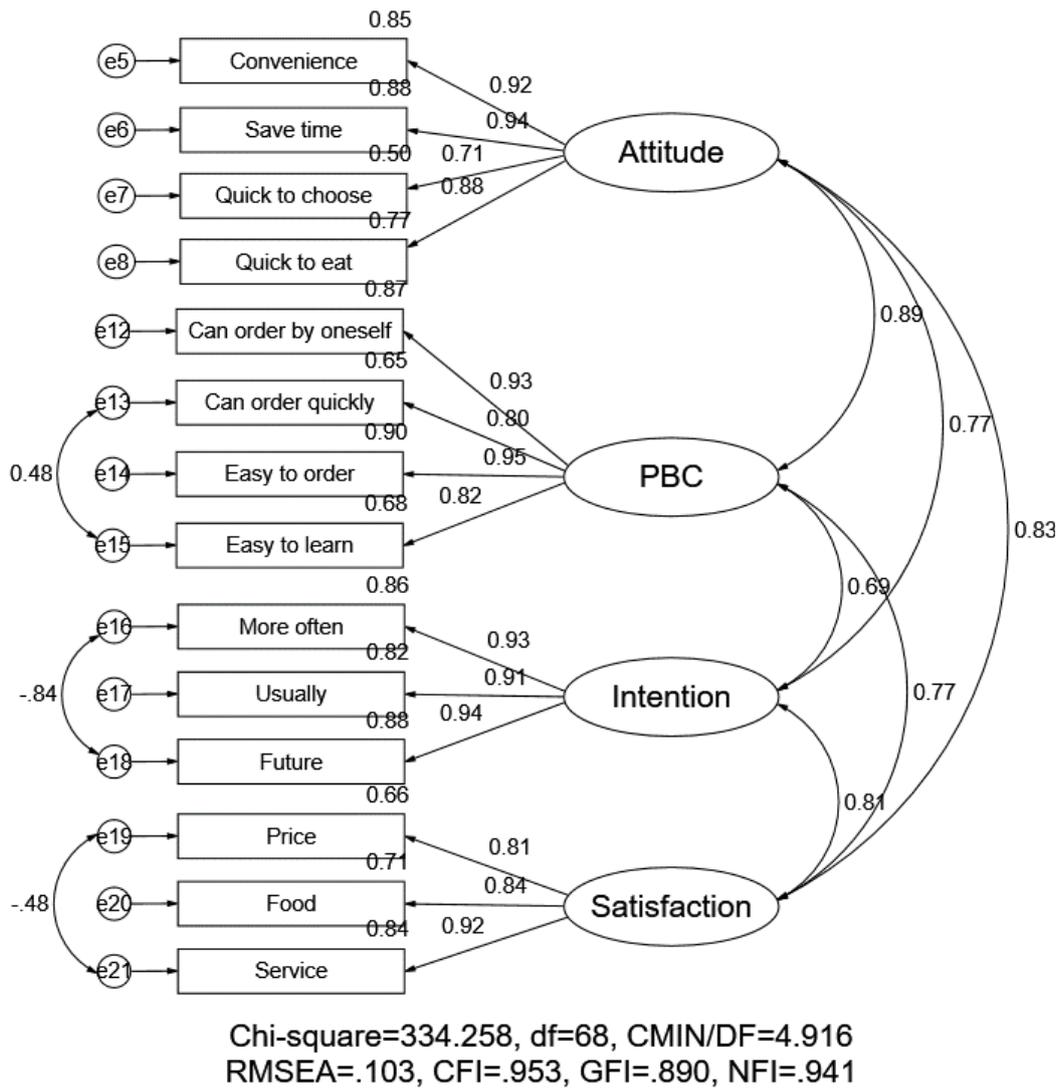
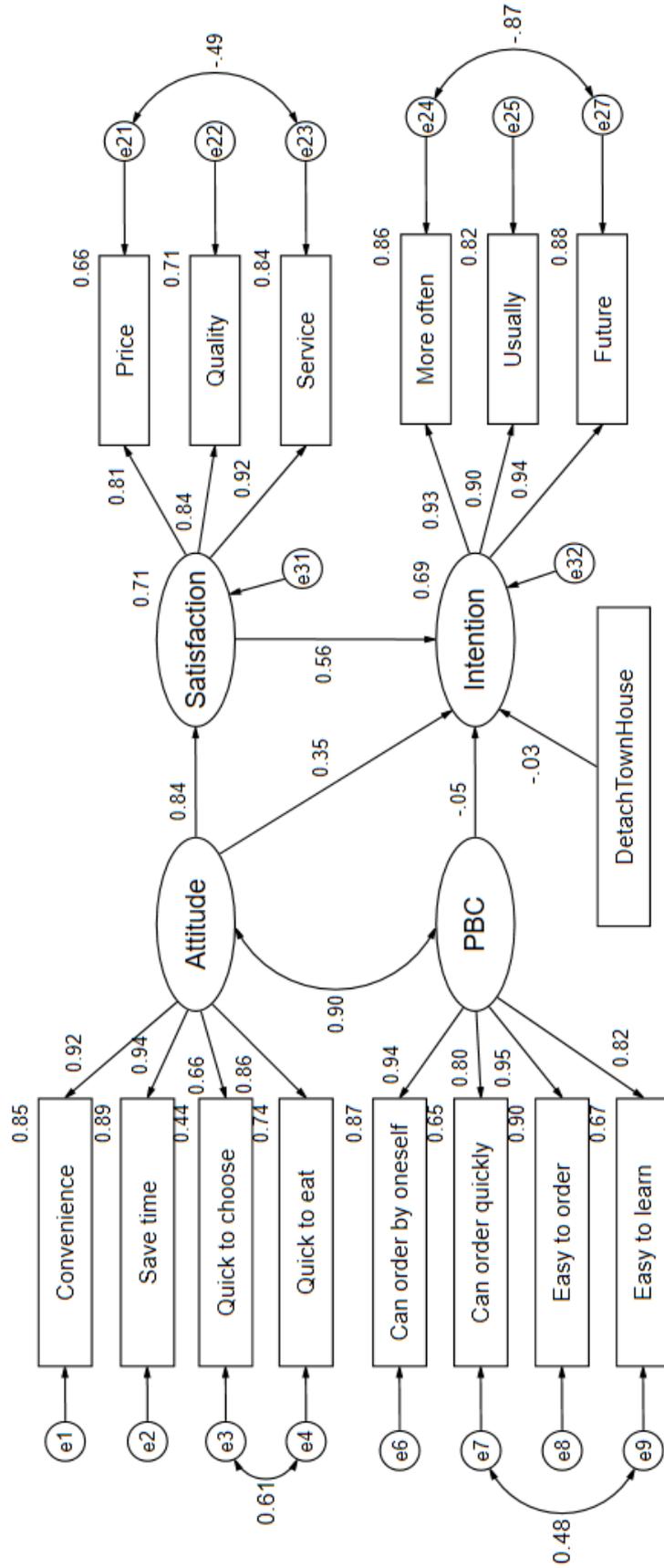


Figure 4.6 CFA – Food delivery service

4.3.3 SEM

The EFA and CFA results were considered when constructing a Structural Equation Model (SEM). The estimation result is shown in Figure 4.7. The model fit was valid where the fit indicators were within acceptable ranges. All the parameters are statistically significant at 0.001 level, except that the regression coefficient of PBC on Intention, which is not statistically significant.



Chi-square=198.209, df=81, CMIN/DF=2.447, RMSEA=.063, CFI=.979, GFI=.936

Figure 4.7 SEM – Food delivery service

4.4 Online Shopping

4.4.1 EFA

EFA was conducted with the valid data (n=500). After removing the items with cross-loadings, the final EFA was done on the eight measurement items with Varimax rotation. The first three factors were extracted and accounted for 85.64% of the total variance. The KMO value was 0.872 (>0.8) and the Chi-square value in Bartlett's test of sphericity χ^2 (df = 28) was 3845.737 with significance at $p = 0.000$, indicating that the data was valid for the factor analysis. The standardized factor loadings of each measurement item and Cronbach's alpha value for each latent construct are shown in Table 4.3.

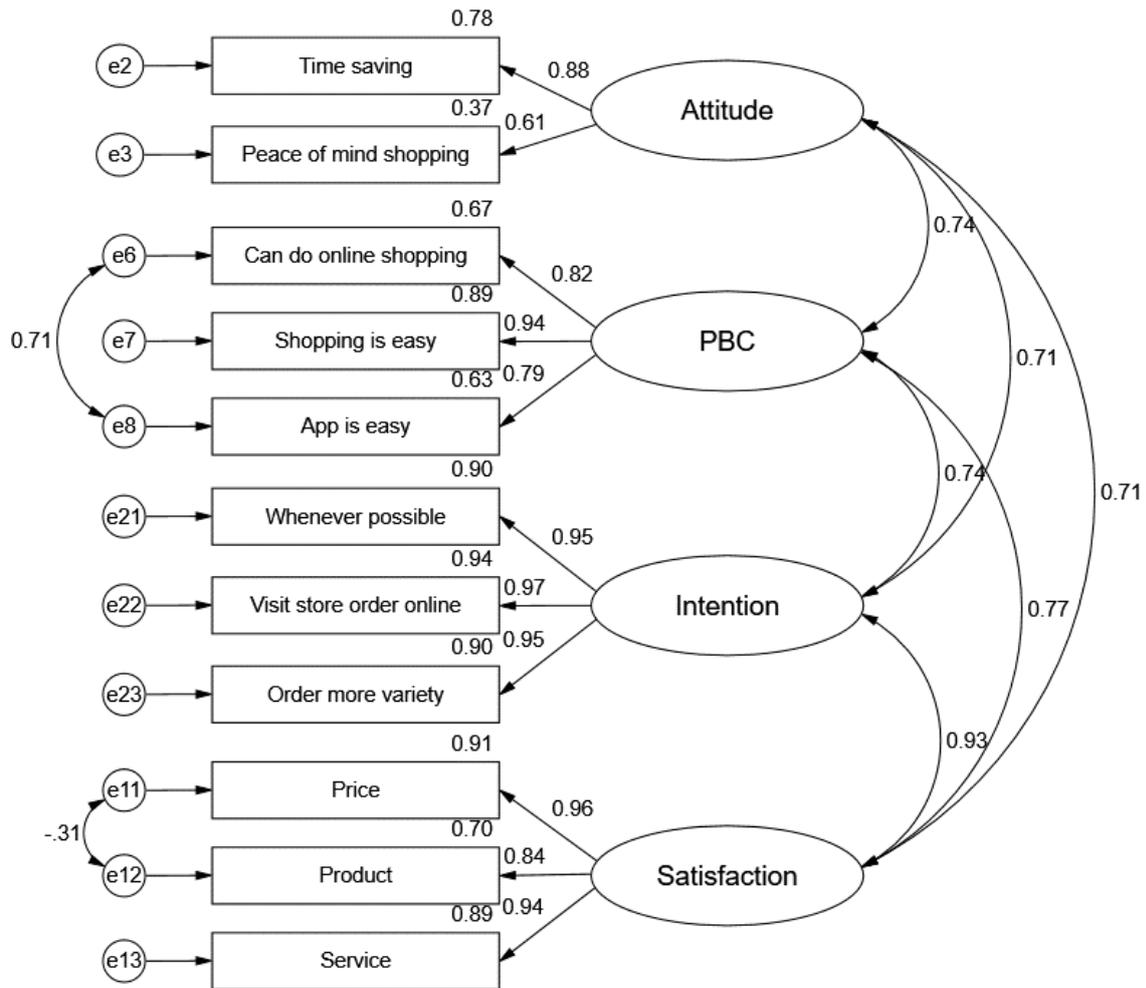
Table 4.3 EFA – Online Shopping

Latent construct	Measurement Items	Components			Cronbach's alpha
		1	2	3	
Intention	More variety	0.888			0.957
	Visit store order online	0.885	0.320		
	When possible	0.832	0.355		
PBC	Easy to learn		0.903		0.921
	Can order quickly	0.310	0.888		
	Easy to order	0.473	0.729		
Attitude	Peace-of-mind			0.918	0.695
	Save time	0.403	0.365	0.631	

Remark: Factor loadings less than 0.3 are not shown.

4.4.2 CFA

Confirmatory factory analysis (CFA) was conducted based on the three latent constructs, as suggested by EFA, namely, attitude, PCB, and intention. An additional latent construct, named Satisfaction, was included with the three measurement items. The CFA result is shown in Figure 4.8. The model fit indicators were found within an acceptable range and validated the measurement models.

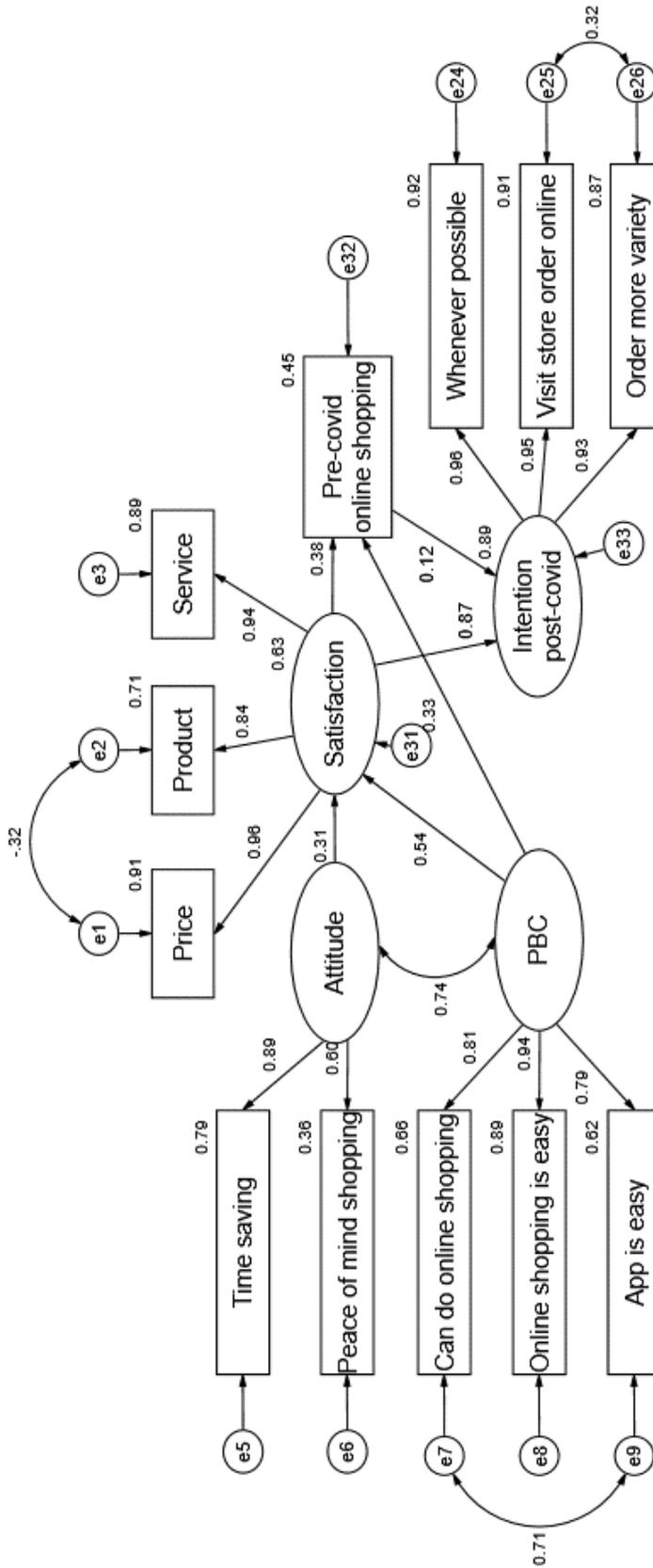


Chi-square=85.087, df=36, CMIN/DF=2.364
 RMSEA=.052, CFI=.992, GFI=.971, NFI=.986

Figure 4.8 CFA – Online shopping

4.4.3 SEM

Structural Equation Model (SEM) was constructed based on the CFA result. The estimation of the SEM is shown in Figure 4.9, where the fit indicators indicated a good fit and all the parameters are statistically significant at 0.001 level.



Chi-square=98.108, df=45, CMIN/DF=2.180, RMSEA=.049, CFI=.992, GFI=.969, NFI=.985

Figure 4.9 SEM – Online shopping

CHAPTER 5 CONCLUSION

5.1 Findings and implications

The statistical analyses, including EFA, CFA, and SEM models, suggested factors that encourage people to do various activities from home post-COVID-19. However, the current study had some different findings than the existing studies such as (Jain et al., 2021) in that social norm was not found influential.

5.1.1 Work from home

Working from home has been found to be flexible and relaxing because people could spend time more efficiently and pleasantly. Those who prefer living in the suburban area tend to do work from home. To support WFH, a house would be preferred to have some features that encourage working from home, including:

- Space, preferably a dedicated space or co-working space, for relaxed and more efficient working.
- Exercise facilities or environment for doing exercise regularly. In addition, walkable neighborhoods may be a compliment factor in this regard.
- Having access to healthy food either self-cooking, so must have kitchen or cooking facilities and good ingredients or buying good foods.
- High-speed internet at an affordable cost. Technical proficiency, such as the ability to use a computer for doing remote-work or tele-conference, as well as and having necessary device will be an important condition. Real estate developers would consider building smart homes having such features.

Moreover, working from home was found agreed to prevent COVID-19 transmission and save time, which was mostly taken by travel. WFH is, therefore, contributing to alleviating the traffic congestion, reducing traffic accident, and reducing pollution. This will be a large social benefit. However, as not everyone can do work from home, they need to be allowed by their employers. Consequently, the employers will need incentive to realize

working from home. Such incentives as tax reduction for the participating employers may be interesting.

5.1.2 Food delivery service

Food delivery service demand will be influenced by several factors, mainly the past satisfaction, in terms of price, quality, and delivery service, which is in turn influenced by the attitudes. However, PBC was not found to significantly influence the intention to use food delivery service. Moreover, the dummy of detached house residence was found having negative influence on intention, implying that food delivery service demand in the detached housing area, mostly suburban, would be lower than in the city center where many people are living in condominium and high-density housing. To support food delivery, condominiums would need to provide amenity such as food delivery lockers.

While the private trips may be suppressed for some amounts, the food delivery trips will increase, in which most of them are made by motorcycles. Further regulations and guidelines would be necessary.

5.1.3 Online shopping

This study found similar factors that were influential for the future online shopping intention post-COVID, in similar to that of food delivery service demands, ranging from one's experience of online shopping to their past satisfactions.

5.1.4 Travel demand

If work-from-home is more practical post-COVID, which is conditional on several factors, some amount of the work trips could be suppressed, especially in suburban area and for the workers living in the detached house.

If the food delivery service is as popular as it was during the lockdown, some amount of the private trips for buying food and eating will be suppressed for some amounts, especially for people living in condominium.

While some amount of shopping trips would be suppressed by the online orders, some trips will remain as some people will still visit the store to see and try the actual products but order it from online for less price.

The findings shed light on the future of activity from home after the COVID pandemic and provided insights on sustainable transport policy and transit-oriented development. This will altogether be a move towards SDG goals to alleviate urban traffic congestion, enhance urban mobility & accessibility, sustain the economic efficiency & social equity, reduce energy consumption, improve urban air quality, and ultimately enhance the inhabitant's quality of life.

5.2 Recommendations for future studies

Based on the finding, the following topics are recommended for the future studies:

- Influential factors on intention of doing other activities at home post-COVID that would impact travel demand. For example, online study, as it is observed that although most of the schools and universities have resumed on-site, many off-curriculum studies such as tutorial or preparation class for university entrance examination has becoming more popular online.
- Spatial impact of housing development type and location on doing activity at home and its associated travel demand.
- Impact of heavy rainfall or urban flooding to online activity, as many of travel could be reduced if it is done online, so will lessen the impact to the congestion.
- Impact of doing activities from home on travel demand compared to pre-COVID such as mode, distance, and travel time of whole travel diary.

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