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What makes us use the shared mobility model? Evidence from Vietnam

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ABSTRACT

Sharing economy models are expanding and making substantial contributions to economic transitions and quality of life globally. This has been made possible mainly because of the development of information and communication technologies. Vietnam – an emerging economy with high technology adaptability – cannot escape the inevitable global trend by which sharing economy models – mainly Uber, Grab and Airbnb – have recently made a significant appearance throughout the country to meet the high demand for transportation or to enhance individuals' quality of life. We employ a rich set of quantitative techniques, such as logit and probit estimations and propose that eight antecedents of customer intention to use Uber/Grab services exist, including gender, age, living costs, distance, utility of Uber/Grab, dissemination of Uber/Grab, tendency to use Uber/Grab from relatives and the community and attractiveness of public and private transport. This study provides new empirical evidence on customer behaviour within the context of new technological infrastructure. Hence, based on the findings of the paper, we propose recommendations for stimulating and enhancing the development of Uber/Grab services in Vietnam.

1. Introduction

Many countries throughout the world have recently witnessed the rapid emergence of a new type of business, the peer-to-peer platform, which is widely known as the sharing economy. This new phenomenon has attracted attention from several economists and communities for its capability to bring benefits. Through support from information and communication technologies, the sharing economy has the promise to be widespread and auspicious in the future, bringing significant value added to businesses and the community. According to PricewaterhouseCooper (PWC, 2014), American customers who were familiar with the peer-to-peer platform accounted for the bulk (44%) of total customers, whereas a proportion (19%) of adults was reported to participate in this new type of economy. ECNS (2018) demonstrated that in the US, the total value of enterprises participating in this sharing economy to date reached more than $463.9 billion, accounting for more than 3% of the US GDP. A similar trend was witnessed in China, in which the scale of the shared economic market in 2015 surpassed 4.92 trillion yuan (more than $778 billion). In Japan, sales of the sector were

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still relatively small, but the Ministry of Economy, Trade and Industry forecasted that the economy's global revenue would likely increase significantly from $15 billion to approximately $335 billion in the near future (ECNS, 2018).

This inevitable global trend could not be avoided and several models of the sharing economy have emerged in Vietnam, including Uber, Grab, Airbnb, Triip.me, Travelmob and Traveloka. Among these models, the highlight is the extraordinary appearance of the shared mobility companies, typically Uber/Grab. Although Uber and Grab penetrated the Vietnamese market starting in 2014, they have gained recognition and approval among both consumers and the market. They are believed to be more convenient and economical than conventional taxis and other traditional transportation. The two companies have gained a solid development pace. The number of Uber and Grab users in significant cities is drastically increasing. For example, by the end of 2015, Uber created more than four million transportation movements and the number of Uber vehicles was not inferior to that of the two sizeable traditional taxi firms Vinasun and Mai Linh at the time. Moreover, Grab accounted for the largest market share (62%) and achieved the status of leader, followed by Uber with 21%. Other players, such as Easy-taxi, made up a smaller proportion (17%).

Shared mobility models are now showing signs of contributing high profitability to Vietnam. Concerning the social economy, Uber/Grab transportation contributes to improving social labour productivity by saving time during travel and transport. By using redundant vehicles with advanced technology, society can reduce traffic congestion problems and, thus, save time and costs (Li et al., 2016). However, many different perspectives exist in the context of traffic congestion. Alexander and González (2015) argued that Uber has two-sided effects on the number of traffic vehicles. This type of transportation can induce additional traffic volume, increasing traffic congestion. Moreover, developing the Uber/Grab transport service model means creating jobs, reducing unemployment across the city and helping people improve their lives. Furthermore, utilising vehicles through the Uber/Grab models takes advantage of economies of scale and network externalities, hence considerably increasing the value added of products in particular and of the social economy in general.

Additionally, in terms of health and the environment, the Uber/Grab mobility model is believed to ensure the health and safety of passengers. A 2018 report by the World Health Organization indicated that more than 1.35 million people die each year from road traffic accidents. However, Greenwood and Agarwal (2015) demonstrated that the existence of Uber is likely to decrease the number of drunk road users related to motorbike homicides. Hence, the application of Uber in Vietnam is expected to kerb traffic accident rates that stem from the staggering increase in the number of private vehicles, substantial degradation of public transportation and infrastructure and traffic density. Captivatingly, Li et al. (2016) delivered the conclusion that Uber's entry significantly decreases not only traffic congestion but also carbon dioxide emissions. The Uber/Grab model of expansion is expected to eliminate unnecessary vehicles, solve environmental pollution problems and control the burden on public transportation. As a result, the Uber/Grab model can improve health quality and safety for people.

However, a contradicting study conducted by The New York Times[1] indicated that when Uber/Grab models are expanded, they may generate more traffic congestion during rush hours (statistically 10%). Similarly, government officials in Manhattan announced that Uber worsened the city's traffic situation.[2] Surprisingly, these studies are inconclusive and the issue is currently being debated in the research field. Therefore, the current activities in the market of Uber and Grab are attracting scholars' attention. As of 2019, Uber stopped operating in Vietnam, which is interpreted as a failure of its model in that country.[3] However, we do not believe that Uber failed in the Vietnamese market. Two main reasons explain why Uber exited from Southeast Asia in general and specifically from Vietnam. First, Uber sold its complete platform, including the customer database, online infrastructure and other assets, to Grab to reduce its losses that appeared from a newly levied tax on shared mobility models. In particular, Vietnam imposed antitrust enquiries. Second, Uber does not fit the Vietnamese business culture. For example, most Vietnamese people commute by motorbike, but Uber introduced the Uber-moto quite later—after Grab. Therefore, this paper also speaks to the literature by providing further evidence of what makes Vietnamese people use shared mobility models for further reference if a new company wants to penetrate our market.

Notwithstanding, although the sharing economy and shared mobility services are becoming an increasingly important aspect of global businesses because of the benefits they bring, this new area has not received significant attention from professionals or the scientific community. Identifying a solid definition of 'sharing economy' from economic scholars (Schor, 2016) and the shared mobility industry is sufficiently challenging. However, to be more comfortable for businesses to understand, some organisations have proposed unofficial definitions. According to the definition by PWC (2014), a sharing economy is a socio-economic system constructed from the sharing of physical and intellectual resources, including ideas, manufacturing and distribution systems, products and services, among different individuals and organisations. In this way, asset owners can earn enormous profits by sharing their resources. In business, a sharing economy is merely understood as referring to a business model that exploits end-users' available resources and incorporates technological elements to form a peer-to-peer platform. Thus, a sharing economy is a model through which consumers can share each other's excess resources, such as houses, vehicles and appliances, instead of shopping for new resources.

[1] By Liya Palagashvili, economics professor at the State University of New York-Purchase, https://www.nytimes.com/2018/08/02/opinion/uber-new-york-city-traffic-de-blasio.html.

[2] Blame Uber for Congestion in Manhattan? Not So Fast by Jeremy B. Merrill and Alastair Coote, with the link here: http://www.nytimes.com/2015/07/28/upshot/blame-uber-for-congestion-in-manhattan-not-so-fast.html.

[3] Uber's exit from Southeast Asia upsets regulators and drivers (https://www.nytimes.com/2018/05/28/technology/uber-grab-southeast-asia.html).

Yet, a limited number of studies concentrated on sharing economy in general and shared mobility models in particular (Li et al., 2016). Nevertheless, along with the remarkable development of technology era 4.0 in Vietnam (Huynh, 2019)—expressed partly through the new technology business model—, some economists emphasised their fascinating research areas in different aspects of a sharing economy. Notably, according to Kumar et al. (2018), the primary target customer of the sharing model is the Y generation, whereas others are in the very first stage of adoption. Möhlmann (2015) introduced the characteristics of the Y generation that influence the choice of using a sharing economy for their satisfaction. Regarding subjects to be served by the model, Lutz and Newlands (2018) proposed a method to segment customers that was used by companies in a sharing economy. These authors argued that customers could be differentiated by both demographics and behaviours by providing them with several services.

Currently, in Vietnam, the sole study on Uber's acceptance and utilisation model is that of Thanh et al. (2016), which stated that political knowledge, user-friendliness, objective norms and price are the elements that affected the decision to choose Uber in Vietnam. Therefore, limited research exists that emphasises the antecedents of a customer's intention to choose to share economy models. In the academic world, several empirical studies were conducted to understand customer behaviour when using share mobility models, including the impact of rain on using taxi, Lyft and Uber (Brodeur and Nield, 2018), Uber awareness and the legal framework (Noto La Diega, 2016), the restriction and disruptive changes in the Uber market (Cramer and Krueger, 2016) and others. However, a shortage gap exists in studying customers' intentions to use Uber, especially from the developing country of Vietnam. This study employs probit and logit regressions to determine the factors that may influence the decision to use Uber/Grab customer models. A rich set of quantitative techniques, such as Cronbach's alpha test and exploratory factor analysis (EFA), is implemented to validate and corroborate our results. Our initial results show that customer intention is statistically influenced by personal features, distance from the transportation, utility, availability of Uber/Grab, tendency for use and attractiveness at a significant level. Given these findings, we can contribute to managerial practices from the perspectives of customers, enterprises and policymakers. This study is also considered to provide a shred of new empirical evidence as a reference for scholars to construct a theoretical framework of the sharing economy. Regarding the contribution of quantitative techniques, we relied on the statistical literature to combine the Likert scale generated by the Cronbach's alpha test and on the EFA for the binary identification model, including probit and logit regressions. This effort helps further the research on the methodology of investigating customer intentions.

This paper proceeds as follows. In Section 2, we briefly reflect on and acknowledge the current theoretical background. Section 3 presents the data and methodologies. Section 4 presents the empirical findings that lead to the conclusion in Section 5.

2. Theoretical framework and literature review

We mainly employ a combined C-TAM-TPB (C means combination) model as the fundamental concept of our study. In 1985, Davis successfully developed the Technology Acceptance Model (TAM) based on the Ajzen and Fishbein model (1973, 1980) of reasoned action theory, which explains the intention to engage in behaviour in the field of information technology. Subsequently, the theory of planned behaviour (TPB) was developed by Ajzen (1991) from Ajzen and Fishbein (1973), which assumed that behaviour could be predicted or explained by the intention to perform that behaviour. In 1995, Taylor and Todd found evidence that the TAM model is better at predicting technology adoption, whereas the TPB model provides a more comprehensive understanding of behavioural intention. Thus, Taylor and Todd (1995) argued that the addition of elements to TAM combined with the TPB behavioural theory provides a sufficient model for the consumption of information technology product explanations, called the C-TAM-TPB model. In this model, intention is a function of the three following factors: (i) attitude, which is conceptualised as positive or negative attitudes towards behaviour; (ii) subjective norms, which refers to the social pressure to determine whether or not to perform that behaviour and (iii) perceived behavioural control, which is complemented by Ajzen and Fishbein (1973). The model reflects the degree of ease with which behaviour is implemented and depends on the availability of resources and the opportunity to perform the behaviour. Ajzen and Fishbein (1973) suggested that the perceived behavioural control factor directly influences the intention and if the person is correct in perceiving his or her level of control, perceived behavioural control can predict the actual behaviour.

Moreover, as adopted from the TAM model, the attitude factor in C-TAM-TPB is measured through the two following technology acceptance variables: perceived usefulness (PU) and perceived ease of use (PEU). PU illustrates the probability of consumers themselves believing that the use of technology can increase their productivity for a specific job, whereas PEU indicates the probability of the consumers subjectively believing that they do not have to make an effort when using the product (Davis, 1985). The new model eliminates the constraints of previous models in explaining the intentions of consumer behaviour. The C-TAM-TPB is demonstrated in Fig. 1.

Moreover, to explain consumer behaviour, Kotler (1965) outlined four main groups of factors that can affect consumer behaviour, including cultural, social, psychological and personal factors, as illustrated in Fig. 2. The group of cultural factors that has a substantial impact on consumer behaviour consists of culture, sub-culture and social class. Culture is the root cause of a person's needs and actions. The social factors group includes influence from the reference group, family and role—social status. The group of individual elements includes individual characteristics such as age, occupation, lifestyle, personality and self-awareness. Preferences and habits also influence consumer behaviour.

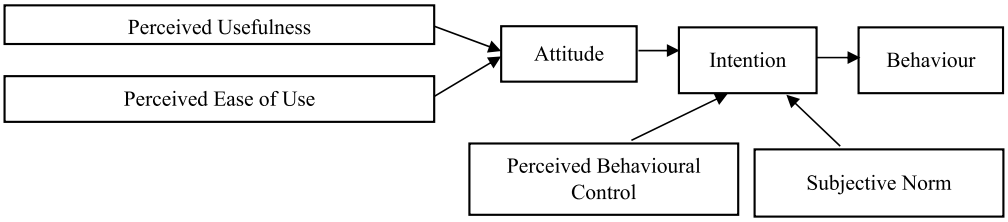

Fig. 1. Combined TPB and TAM (C-TAM-TPB) model.
Source: Taylor and Todd (1995).

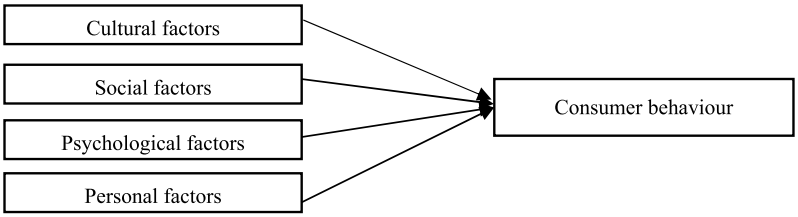

Fig. 2. Factors affecting consumer behaviour.
Source: Kotler (2002).

In summary, the theoretical framework of C-TAM-TPB, together with Kotler's model, haa adequately revealed the fundamental factors affecting human behaviour. Hence, these models are considered to be the underlying fundamental elements in the theoretical framework that explains the intention to use the Uber and Grab sharing model. The selection and application of these factors in specific conditions in Ho Chi Minh City (HCMC) enabled the research problem to be considered more broadly and multi-dimensionally.

Mainly adopted from the C-TAM-TPB model, utility and subjective norm factors are constructed. The utility factor is derived from the combination of the PU and PEU elements in the C-TAM-TPB model. Usefulness is also mentioned in Zhang et al. (2016). The theory indicates that if passengers are sensitive to the usefulness of a new form of mobile application, they will shift to select this model. Moreover, the subjective norm factor in the proposed research model is compatible with the subjective norm element in the C-TAM-TPB model. Qualitative measures reflect the opinions of family, friends and the public and government policies. These measures are also adapted from the model of factors that affect consumer behaviour as established by Kotler (2002). Moreover, it is evident that internal factors from the consumer are indispensable to further explain the intention to use Uber/Grab services. Hence, by embracing and facilitating Kotler (2002), we propose that individual characteristics (age, gender, living cost, environmental awareness, travel distance and own vehicle attractiveness) are included in the theoretical framework.

In particular, age (AGE) is based on a July 2015 demographic publication of the Chart of the Day. In the US, 3% of adults use Uber services at least once a month. Individuals in the age range of 16–34 years are the most common users of Uber and account for three-quarters of US Uber customers. Gender (SEX) was previously published in 'The Demographics of Uber's US User' in the Chart of the Day in the United States on 29 July 2015. Up to 54% of men in the US use Uber for transport relative to 46% of women. The monthly cost of living (LIVING COST) is also based on the mentioned research. According to the study, 15% of Americans who have below average incomes use Uber, as do 34% of middle-income individuals and 26% of high-income individuals. During the survey, the authors found that when determining whether or not to use Uber/Grab, customers tend to base their decision making on the average monthly cost of living. Environmental awareness (ENVIR) is based on statements made by Rodrigue and Notteboom (2013). They highlighted the impact of human perceptions of the environment on transport activities, including the general passenger transport model and Uber/Grab transport service in particular. Distance travelled (DISTANCE) is also believed to affect the selection of a transportation model for travel.

As previously mentioned, the factors in the theoretical framework were adopted from the combination of the two fundamental models TAM and TPB (C-TAM-TPB; Taylor and Todd, 1995) and factors affecting consumer behaviour (Kotler, 2002), as well as published practical experiments in the US, where the first Uber service was successfully established and developed. However, to suitably modify and apply the service to Vietnam's situation, we proposed another factor—attractiveness of private vehicles and other public transport. This element does not only belong to the personal factor of Kotler's model but also reasonably reflects Vietnam's transportation condition. According to statistics of the National Traffic Safety Committee, as of 2011, Vietnam had more than 35 million private vehicles. The convenience and mobility of private vehicles also partly influence the intention to use other modes of transport. Furthermore, many proposals have been made for regulations to restrict personal vehicles in HCMC and to promote the utilisation of public transport. Many complications occur when using the public transportation system, including those resulting from the severe degradation

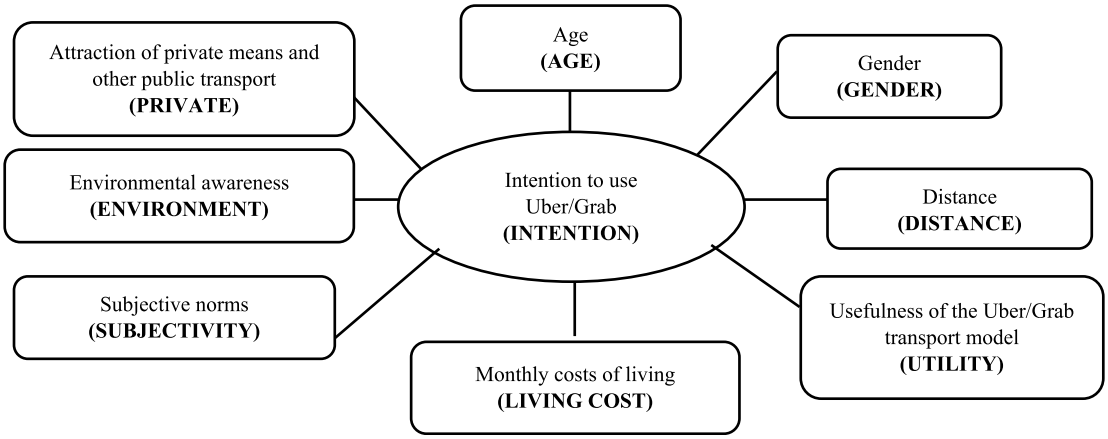

Fig. 3. Proposed research model.

of the national infrastructure, the negative attitude of officers, or efforts that are time-consuming. Therefore, most people have decided to use the Uber/Grab transport service model instead for its convenience and safety.

Intention to use Uber/Grab (INTENTION) is based on theories that relate to the formation of intent and behaviour, such as the Theory of Action by Ajzen and Fishbein (1973, 1980), the theory of intentional behaviour by Ajzen (1991) and C-TAM-TPB of Taylor and Todd (1995). The Uber/Grab transport model is a function of several variables, such as age, gender, travelling distance, living cost, utility, subjective norm, environmental awareness and private vehicle attractiveness. Based on the inheritance of theories and the results of the empirical research, the authors proposed a model to explain the intention to use Uber/Grab, as illustrated in Fig. 3.

3. Methodology

3.1. Data collection, research procedure and random data distribution test

We refer to Hazen et al. (2015), Ashenbaum (2018), Wang et al. (2012) and Smith et al. (2013) as empirical studies when designing the data collection procedures.

To explore the significant factors affecting the consumer behaviour of Uber/Grab's customers in HCMC, a survey was conducted throughout several companies, schools and public places. Data were collected using an online survey and interviews with citizens. Respondents were students, officers and other types of workers. Initially, the authors executed a pre-test with 60 respondents to ensure the suitability of the designed questionnaire. Subsequently, the research was officially carried out. At the beginning of the official survey, respondents were asked to answer demographic questions to measure individual elements, including age, gender, living cost and distance travelled. Next, they provided information on whether or not they used Uber/Grab. During the last stage of the survey, participants answered questions about the Uber/Grab shared economic model to measure other variables, such as subjective norms, utility and environmental awareness. Finally, 286 samples were obtained using the random sampling technique. Descriptive statistics for gender, age, occupation, monthly average income and daily travel distance are provided in Table 1.

To ensure that our data sample is random, we developed a scatter plot of the datasets to capture the normal distribution (Fig. 4). Furthermore, we realise that the data rightly describe the nature of each variable. For example, the average age of the Vietnamese population is approximately 25 years, which is statistically considered a semi-young generation with high adaptability for technological use. Another is the living cost variable, which the General Statistics Office of Vietnam measured at approximately $204 (equivalent to 4.491.666 VND). Additionally, our entire procedure aimed to randomly collect data from respondents. Given our two principal analyses, the data collected from the survey are unbiased and random.

3.2. Regression model methodology

The dependent variables in most of the regression models are numbers, usually measured with a ratio scale. However, in many situations, the dependent variables are nominal and represent categories, such as male or female, married or unmarried, employed or unemployed, in the labour force or not in the labour force. Specifically, this research was developed to determine whether or not consumers use Uber/Grab services. When a dependent variable is binary, a sequence or an identifier, the ordinary least squares method is no longer the best-unbiased estimate. As a result, researchers developed many types of regression models for nominal dependent variables. Mainly, regression models with

Table 1
Sample description *(Unit: %)*.

Content	Use Uber/Grab	Do not use Uber/Grab	Total %
In total respondents	49.65	50.35	100
Gender			
Male	16.9	43.75	30.42
Female	83.1	56.25	69.58
Age			
18–25	74.65	61.11	67.83
25–36	24.65	20.83	22.73
36–45	0.7	12.5	6.64
Above 45	0	5.56	2.8
Occupation			
Students	51.09	72.67	62.02
Private company	33.58	13.33	23
Government company	15.33	14	9.41
Monthly average income			
Under 3 million VND	26.76	38.89	32.87
3–5 million VND	50	36.80	43.36
Above 5 million VND	23.24	24.31	23.77

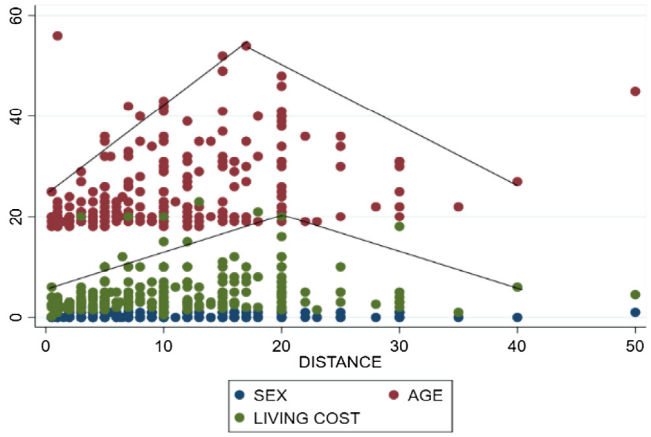

Fig. 4. Data scattering showing distribution of surveyed sample.

binary variables can be estimated using logit and probit methods. The logit and probit models are based on maximum likelihood estimations. The maximum reasonable estimate requires an assumption about the probability distribution function, such as the logit function and the log–log complement function. Logit models use the normal logit distribution function, whereas probit models assume a standardised normal distribution function (see Table 2).

From a previous study, we decided to use the logit and probit binomial regression models combined with the EFA to accomplish the research purpose. The general regression function has eight independent variables that represent and explain the selected factors and the UG dependent variable, with UG = 1 for the intentioned surveyor using Uber/Grab and UG = 0 for respondents not using Uber/Grab.

$$\mathrm{Ln}\left(\frac{P\,(U-G=1)}{P\,(U-G=0)}\right)=\beta_0+\beta_1\mathrm{AGE}+\beta_2\mathrm{GENDER}+\beta_3\mathrm{LIVINGCOST}+\beta_4\mathrm{DISTANCE}+\beta_5\mathrm{UTIL}+\beta_6\mathrm{SUBJ}+\beta_7\mathrm{ENVIR}+\beta_8\mathrm{PRIVA}+U_i$$

where β_0: coefficient of freedom; β_i: regression coefficients and U_i: error of the model. Then, the *UTIL*, *SUBJ*, *ENVIR* and *PRIVA* variables may change after the EFA discovery factor analysis.

4. Results and findings

4.1. Cronbach's alpha and EFA results

First, we demonstrate the results from the Cronbach's alpha test by testing the reliability and validity of a survey competence scale. The strict condition is over 0.6. Therefore, we eliminate variables that do not satisfy the condition, as

Table 2
Summary of logit and probit regressions.

Logit regression	Probit regression
The logistic function model is as follows: $P(Y=1)=\frac{e^x}{1+e^x}$ *Take two natural logarithms*: $\mathrm{Ln}\frac{P\ (Y=0)}{P\ (Y=1)}=\ln(e^x)=Z=\beta_0+\beta_1 X$ The binary logit regression coefficients are significantly different from the normal regression coefficients with the decimal dependent variables: $\frac{P\ (Y=1)}{P\ (Y=0)}=e^{\beta_0+\beta_1 X}$ *Estimation coefficient* β_1 is a measure of the variation in the logarithm of the event probabilities given one unit of change in the independent variable X. A positive factor increases the probability of being predicted, whereas a negative coefficient decreases the predicted probability rate. The estimated regression coefficient of X_1 is β_1; therefore, if the other factors are constant, the probability of occurrence is X_1 times e^{β_1} times that of another case.	The probit model has the form: $Z_i=\beta_1+\beta_2X_{2i}+\cdots+\beta_kX_{ki}$ $P\ (Y_i=1\|Z_i)=f\ (Z_i)$ Given that f is the density function of a normal distribution, the model has a mean value of 0 and a variance of 1: N(0,1) $f(Z_i)=\frac{1}{\sqrt{2\pi}}\times e^{\frac{-Z_i^2}{2}}$ Similar to the logit model, B_j will have the same sign with $\frac{\partial P(Y_i=1\|Z)}{\partial X_j}$ (The boundary value of $P\ (Y_i=1\|Z_j)$ in X_j) means that B_j shows a direction of action of X_j to the probability that Y receives a value of Z_i.

Table 3
Results of Cronbach's alpha test.

Observation variables	Mean scale when eliminating variables	Variance scale when eliminating variables	Sum of correlation	Cronbach's alpha when eliminating variables
Utility of Uber/Grab (UTIL): Cronbach's alpha = 0.816				
UTIL1	16.78	12.011	0.617	0.779
UTIL2	17.16	12.800	0.589	0.785
UTIL3	17.13	13.559	0.539	0.796
UTIL4	17.07	12.203	0.606	0.781
UTIL5	17.06	12.824	0.571	0.789
UTIL6	16.88	12.292	0.562	0.792
Subjectivity (SUBJ): Cronbach's alpha = 0.794				
SUBJ1	41.18	38.358	0.433	0.780
SUBJ2	40.97	34.933	0.649	0.758
SUBJ3	41.19	37.527	0.521	0.773
SUBJ4	41.03	38.157	0.480	0.776
SUBJ5	40.57	34.913	0.682	0.755
SUBJ6	40.65	34.391	0.690	0.753
SUBJ7	40.59	36.053	0.633	0.762
SUBJ8	40.67	35.296	0.600	0.763
SUBJ9	40.55	42.494	0.071	0.809
SUBJ10	40.69	40.791	0.226	0.797
SUBJ11	40.22	39.487	0.312	0.791
SUBJ12	40.77	42.178	0.100	0.806
SUBJ13	40.32	42.000	0.094	0.809
Environment (ENVIR): Cronbach's alpha = 0.842				
ENVIR1	5.77	3.060	0.721	0.766
ENVIR2	5.90	3.098	0.726	0.761
ENVIR3	5.67	3.128	0.673	0.813
Private (PRIVA): Cronbach's alpha = 0.610				
PRIVA1	13.56	6.493	0.518	0.470
PRIVA2	13.84	6.949	0.490	0.494
PRIVA3	13.05	6.499	0.521	0.469
PRIVA4	13.53	7.225	0.343	0.567
PRIVA5	13.64	9.045	0.025	0.718

in Landmann et al. (2015). Subsequently, we employ the EFA method to generate independent variables for regressions (see Table 3).

After performing the EFA, the initial 27 variables are organised into five factors, including utility of Uber/Grab (UTIL), popularity of Uber/Grab (SUBJ_1), environmental awareness (ENVIR), influence from family and community (SUBJ_2) and attraction of other means of transportation (PRIVA). From the five influence factors, we conduct a binominal regression by utilising the logit and probit regressions to explore the antecedent factors that can explain a customer's behaviour of selecting Uber/Grab in HCMC. Interestingly, the sign of the EFA test is 0.000, which is satisfactory for analysing the factors to be used. The Kaiser–Meyer–Olkin factor for the appropriateness of factors is $0.916 > 0.5$. Hence, we conclude the appropriateness of factors, including the five elements extracted based on eigenvalues (1.045) and the sum of the

Table 4
Rotated Component Matrix.

Variable	Component				
	1	2	3	4	5
UTIL4	0.750				
UTIL6	0.726				
UTIL1	0.709				
UTIL2	0.686				
UTIL5	0.678				
UTIL3	0.659				
SUBJ6		0.850			
SUBJ5		0.847			
SUBJ7		0.797			
SUBJ8		0.737			
ENVIR2			0.857		
ENVIR1			0.846		
ENVIR3			0.831		
SUBJ1				0.788	
SUBJ3				0.766	
SUBJ2				0.699	
SUBJ4				0.590	
PRIVA2					0.786
PRIVA1					0.753
PRIVA3					0.710
PRIVA4					0.622

extracted variance (64.014%), all of which are higher than 0.5. These results are demonstrated for the Rotated Component Matrix in Table 4.

4.2. Logit and probit regressions

Initially, we conducted a full regression of all of the independent variables affecting the choice to use Uber/Grab (including environmental awareness). However, the regression results indicated that the environmental awareness variable does not have a significant effect. Consequently, the environmental awareness variable was excluded from the table and the remaining variables, which were statistically significant, were used for another regression. More importantly, the subsequent regression results did not alter the statistical significance of the remaining variables in the model and ensured that the research model was not biassed as to whether or not the environmental awareness variable was included (see Table 5).

The results of the logit regression show that, of the nine variables included in the model, eight had strong correlations with the dependent variable as follows: gender, age, monthly living expenses, usefulness of Uber/Grab, popularity of Uber/Grab, influence from family and the community and attractiveness of public transportation and other means. The environmental awareness factor was excluded from the model. Specifically, the regression model is rewritten as

$$\ln\left(\frac{P(U-G=1)}{P(U-G=0)}\right) = 2.404137 - 1.321523GENDER - 0.0749815AGE + 0.2185517LIVINGCOST - 0.1466734DISTANCE + 0.3647844ULTI + 1.020449SUBJ1 + 0.5770709SUBJ2 - 0.3410478PRIVA+U_i$$

Based on the results of the probit regression, we can interpret the regression model. The probit regression results indicate that the intention of the customer to consume Uber/Grab services also strongly depends on the following eight independent variables: gender, age, monthly living costs, distance, Uber/Grab utility, Uber/Grab popularity, family and community influence and attraction of private–public means of transportation.

$$\ln\left(\frac{P(U-G=1)}{P(U-G=0)}\right) = 1.4635 - 0.7577GENDER - 0.0457AGE + 0.1250LIVINGCOST - 0.0848DISTANCE + 0.2175ULTI + 0.5969SUBJ1 + 0.3342SUBJ2 - 0.2152PRIVA+U_i$$

Second, the p-values for both models prove that the proposed models are acceptable for verifying the factors that influence the intention to use the Uber/Grab shared mobility transportation model. To conclude that this is the final model, we employ the Hosmer–Lemeshow test (Hosmer, 2004) to inspect the comparison between the predicted and the observed values. The initial assumption is that the observed value equals the predicted value; therefore, the larger

Table 5
Estimations by logit and probit regressions.
Source: Data collection from software.

Variables/Models	Initial logit	Corrected logit	Initial probit	Corrected probit
Gender	−1.2979***	−1.3215***	−0.7463***	−0.7577***
	[0.3698547]	[0.3690002]	[0.2127263]	[0.2121696]
AGE	−0.07510**	−0.0749**	−0.00460**	−0.0457**
	[0.0339516]	[0.0338099]	[0.0199031]	[0.0198014]
LIVINGCOST	0.2130***	0.2185***	0.1224***	0.1250***
	[0.0631342]	[0.0625779]	[0.0346902]	[0.0343277]
DISTANCE	−0.1461***	−0.1466***	−0.0844***	−0.0848***
	[0.0296186]	[0.0294915]	[0.0163704]	[0.0163634]
UTIL	0.3609**	0.3647**	0.2131**	0.2175**
	[0.1736598]	[0.1726056]	[0.0962518]	[0.0958742]
SUBJ1	1.0221***	1.0204***	0.5985***	0.5969***
	[0.1930563]	[0.1928339]	[0.1066455]	[0.1064694]
SUBJ2	0.5812***	0.5770***	0.3373***	0.3342***
	[0.1640783]	[0.1633093]	[0.093223]	[0.0928427]
PRIVA	−0.3475*	−0.3410*	−0.2188*	−0.2152**
	[0.1782784]	[0.1779616]	[0.1028881]	[0.1027945]
ENVIRO	−0.101413		−0.0605681	
	[0.1556966]		[0.0911692]	
Constant	2.4221	2.4041***	2.4221***	1.4635***
	[0.6803556]	[0.6776113]	[0.3964491]	[0.3946438]
Observation	286	286	286	286
LR $chi^2(9)$	142.24***	141.81***	142.68***	142.68***
Pseudo R^2	0.3588	0.3577	0.3599	0.3588
Hosmer–Lemeshow Test		269.11		274.31
p-value Hosmer–Lemeshow		0.6218		0.5344

*The symbol denote significance at the 10% level.
**The symbol denote significance at the 5% level.
***The symbol denote significance at the 1% level.
The standard deviation of the corresponding coefficients is reflected in the square brackets. We only perform Lemeshow's Test for the corrected models, including the logit and probit regressions.

the p-value, the more appropriate the model. From this table, the values of the Hosmer–Lemeshow tests are 0.6218 and 0.5344 for the probit and logit regressions, respectively. Therefore, we conclude that these models are appropriate. Based on the theorem for the goodness-of-fit test Hosmer and Lemeshow (1980); Lemeshow and Hosmer (1982); Hosmer et al. (1988) and Hosmer (2004), we interpret that this logarithm employs M covariate patterns and quantiles to predict the groups. Therefore, this approach is quite appropriate with the logistics distribution, which is the fundamental concept for the probit or logit regressions in our paper. Then, the hypotheses for this goodness-of-fit statistics are as follows. H0: The models do not need interaction and non-linearity. HA: The models need interaction and non-linearity. Hence, if the p-value (prob > chi^2) is less than 0.05, they are not well distributed and we need to refine our models. Based on our results, the p-values are 0.6218 and 0.5344, which do not provide the evidence needed to reject the null hypothesis. Therefore, our models do not have interaction and non-linearity, which show appropriateness for estimations.

4.3. Robustness validation

After executing the logit and probit regressions, we analysed the defects (if any) of the two models using the multicollinearity test. Multicollinearity is a phenomenon of independent variables in a regression model with correlations that may lead to biassed regression estimates. To ensure the model's accuracy, we calculated the variance inflation factor (VIF). According to many previous quantitative studies, if the VIF of any variable is greater than 10, that variable is said to have multicollinearity (Kleinbaum et al., 2013). Table 6 shows that all of the variables in the model have a VIF < 10; therefore, we can conclude that the model does not have high multicollinearity.

4.4. General discussion

According to the logit and probit regression results, we conclude that the intention of the customer towards selecting the appropriate shared mobility business model depends on eight factors. They are gender, age, cost of living, distance travelled, Uber/Grab utility, Uber/Grab popularity, family and community influences and the attraction of other means of transportation.

Table 6
Variance inflation factors.

Factor	VIF
AGE	5.51
LIVINGCOST	3.83
DISTANCE	3.30
Gender	1.62
PRIVA	1.08
SUBJ1	1.02
SUBJ2	1.01
UTIL	1.01

Specifically, AGE had a negative relationship with the intention to use Uber/Grab. The marginal effect indicates that as the age increases, the number of people who intend to use Uber/Grab decrease and vice versa. Meanwhile, monthly living expenses (LIVING COST) have a positive relationship with Uber/Grab utilisation intention, indicating that people with different wealth levels make different decisions regarding whether or not to use Uber/Grab. This result is also acknowledged in Zhang et al. (2016), which indicated that low-income people are more sensitive to prices and tend to choose lower-cost moving models. Moreover, travelling distance (DISTANCE) has a reverse relationship with intention. People prefer Uber/Grab for short travel distances but tend to select public transport or private vehicles for long distances. The attraction of public and private vehicles has a negative relationship with the dependent variable. As a result, Uber/Grab should pay attention to attracting more customers from the low-income segment by allowing them to share the transportation fare when they have a standard transition route. Similarly, Uber/Grab should attract more middle-aged people by offering them compelling incentives when travelling with new sharing mobility models.

Moreover, subjective norms (SUBJ1—family and community opinions—and SUBJ2—the popularity of the model) have been shown to possibly have a positive effect on the intention to choose the Uber/Grab model. Therefore, Uber and Grab should pay attention to pushing their popularity through mass media and building advertising strategies on television, in newspapers and on social media. Besides, according to the descriptive statistics, service users are mainly aged 18–25 years, can easily access new information and are highly adaptable to technological change. Therefore, Uber and Grab should have suitable media strategies that are oriented towards millennial beneficiaries.

Furthermore, utility (UTIL) and popularity of the model (SUBJ2) have a positive effect on the consumer's intention to use Uber/Grab. The results also show that the GENDER variable is statistically significant, indicating that customer intention differs between males and females. In particular, gender has a negative effect on the intention to use Uber/Grab by HCMC citizens and the probability that males use Uber/Grab services is 30.23% lower than that of females. Therefore, improving the level of convenience, safety and popularity of the services will positively affect perceptions of the quality and usefulness of Uber/Grab, assisting in increasing the number of customers using the model. For example, Uber/Grab should promote the exploitation of crowded areas with high demand for services, such as around movie theatres and large company buildings, and focus on objects such as office workers, entertainment areas in the central district and foreigner-concentrated areas. Enterprises need to pay attention to upgrading their applications and navigation systems and must provide transparent information to enhance companies' images and value.

5. Conclusions

This study is ultimately expected to contribute to the scaling system that measures the determinants of customers' intention to use Uber and Grab. The scale can be utilised not only in the Vietnamese market but also in other markets. Additionally, our scale is the first step for those who retest and confirm the unified scales in multinational research on customer behaviour. One of the problems with qualitative customer behaviour is the lack of a scaling system for an individual country to build a consistent one for many countries, especially for emerging markets (Craig and Douglas, 2000). The actualisation of domestic and foreign research shows that the topic is recognised to have the following special contributions. (i) The research was the first in Vietnam to use a binary identification model (analysed under logit and probit regressions) to study the intention to use an economic sharing model, specifically the Uber/Grab model. (ii) The study uses a combination of logit regression, binomial probit regression and results from the EFA analysis. Currently, throughout the world, very few studies use this combination method and it is rare in Vietnam. (iii) The research considers factors by aggregating variables from previous empirical studies done by a variety of economists throughout the world and results of statistical research, following the specific conditions in Vietnam. The research results suggest that eight factors strongly influence the intention to use the Uber/Grab model by the people of HCMC. (iv) The topic combines academic theories of scientific research throughout the world and results from experimental observations tested for reliability through accurate statistical modelling. The topic also contributes to the further development of methodologies for future research and to proposed practical, effective and significant recommendations for businesses. (v) The research result is considered to be a useful reference for shared mobility models for regulators, managers and entrepreneurs. (vi) The novelty of the study is illustrated through the authors' exploration of aspects of the shared economic model when

Table A.1
Description of qualitative variables from the survey.

Variable	Explanation	Measurement
UTIL	Uber/Grab Utility	**UTIL1**: 'I think using Uber/Grab is convenient'. **UTIL2**: 'I think using Uber/Grab is safe'. **UTIL3**: 'I think the cost of using Uber/Grab is low'. **UTIL4**: 'I think using Uber/Grab helps me save time (including walking and waiting time)'. **UTIL5**: 'I think the new Uber/Grab payment method (credit card) is very convenient'. **UTIL6**: 'I think the Uber/Grab app is handy and convenient to book a car'.
SUBJ	Subjective norms	**SUBJ1**: 'I think I should use Uber/Grab to protect the environment'. **SUBJ2**: 'My friends advised me to use Uber/Grab to save money and time'. **SUBJ3**: 'My family advised me to use Uber/Grab for safety'. **SUBJ4**: 'The media encouraged me to use Uber/Grab'. **SUBJ5**: 'Uber/Grab is popular in foreign countries and is gradually becoming popular in Ho Chi Minh City recently'. **SUBJ6**: 'Uber/Grab is gradually changing the trend of using transportation service of people'. **SUBJ7**: 'Uber/Grab gives me a new technological experience'. **SUBJ8**: 'Promoting Uber/Grab will help to improve the employment issue in Vietnam'. **SUBJ9**: 'I think Uber/Grab is very comfortable (with air conditioning, heating…)'. **SUBJ10**: 'I think the service attitude of drivers is nice'. **SUBJ11**: 'I think the Uber/Grab service will become more popular and available in many places in the future, so it will be more convenient to use'. **SUBJ12**: 'I think the Uber/Grab is well equipped with safety equipment (such as emergency hammers and fire extinguishers)'. **SUBJ13**: 'I believe the information of the trip will be provided transparently to the customer, help the customer to capture the trip information'.
ENVIR	Environmental awareness	**ENVIR1**: 'Environmental pollution in Ho Chi Minh City will be reduced as people use more Uber/Grab services'. **ENVIR2**: 'The use of Uber/Grab can help solve the traffic congestion problem in Ho Chi Minh City'. **ENVIR3**: 'The use of Uber/Grab can help limit traffic accidents in HCMC'.
PRIVA	The attraction of personal vehicles and other public transport means	**PRIVA1:** 'I think using personal vehicles and public transport means offers more freedom than Uber/Grab'. **PRIVA2**: 'I think using personal vehicles and other public transport means can help save more time and money than Uber/Grab'. **PRIVA3**: 'Personal vehicle is more flexible, I can go anywhere, at any time'. **PRIVA4**: 'I am more familiar with bicycle/motorbike/bus'. **PRIVA5**: 'Personal vehicle makes me spend some extra charges that I could save on Uber/Grab (maintenance fee, BOT fee, parking fee…)'.

The author constructed the questionnaire based on a five-point Likert-type scale. The response scales are 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neutral*, 4 = *Agree*, 5 = *Strongly Agree, which participants used to mark each statement*.

choosing to use Uber/Grab. Throughout the project, there will be many other approaches to shared economic models in Vietnam.

Regarding managerial implications, we propose three separate application schemes. First, policymakers cannot use environmental perceptions to encourage or discourage Uber/Grab users because this variable is insignificant. Instead, policymakers are advised to emphasise different significant aspects as follows: customers utility, subjectivity 1 (users might think that their use will contribute to a decrease in environmental pollution) and subjectivity 2 (friends' and relatives use). Therefore, to understand the sharing economy, especially Uber/Grab, propaganda activities should target masses of people. Second, regarding the Uber/Grab companies, the female segment is a potential market that should be taken advantage of because the proportion of female users is 28.51% higher than that of male users. This group values the safety and convenience of transportation. Hence, companies should implement appropriate marketing strategies to gain females' attention regarding enhanced safe and amiable services. Moreover, Uber/Grab should not forget 'word-of-mouth' marketing because customers have a higher tendency to choose a service based on a relative's (or community) recommendation. Third, for users, this research reflects new insights into the Vietnamese market regarding when people do not choose Uber/Grab in the case of long distance or other transport attractiveness. The 'age' variable results show that young people are fonder of using Uber/Grab than elder individuals. Then, our market reflects the concept that an increase in income leads to the increasing possibility of choosing Uber/Grab.

Our research has some limitations. (i) The research model only accounted for 35.88% of the intention to use the Uber/Grab service of the people in HCMC. (ii) The sample size of the study is relatively small compared with the overall population, which stems from the authors' limited resources. (iii) Because this transportation model is relatively new in Vietnam, access to it is comparably tricky for the research team, limiting the statistical process relative to reality. From the limitations, we make further research suggestions as follows: (i) expand the sample size and collect survey data for all subjects in HCMC to increase the overall representation; (ii) analyse the Uber/Grab model of HCMC using other models, such as tobit or panel; then, compare the results with those from the logit and probit regression models; (iii) study the

Uber/Grab transport service model in other big cities, such as Hanoi and Da Nang, to corroborate the reliability and validity of the results in this study and find the characteristics of the intention to use this transport model in particular areas to, subsequently, have the most comprehensive view of Uber/Grab services in Vietnam; (iv) employ the smoothing transition autoregressive model or the threshold regression for further investigation because this model applies a '1' (use) or '0' (non-use) choice for the customer decision; however, customer behaviour slowly changes over time; (v) use probability sample selection, such as Bayesian theorem, to increase the random characteristic and (vi) consider the role of environmental improvement of shared mobility models, which indeed increases scholars' attention (Nasir et al., 2019).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

See Table A.1.

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