



WHAT PUSH STUDENTS TO USE MOTORCYCLES? A STUDY BASED ON SOME UNIVERSITIES IN HANOI, VIETNAM

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Abstract. So far, little is known about the determinants of the intention to use motorcycles among the young generations in developing countries. This study has proposed an extension of the Theory of Planned Behaviours (TPB) to investigate various factors associated with the motorcycle use intention of students in Hanoi, Vietnam. The data from 399 students from three universities were collected and utilized. The methods used included exploratory factors analysis (EFA) and binary logit regression. Among six latent constructs found in EFA, independence & enjoy, norms & modernity, and convenience & parsimony fuel the intention while others were insignificant predictors. Students who are migrant and come from richer households had higher intention to use motorcycles whereas other demographics such as gender and vehicle ownership were irrelevant. A concerning result found was the positive association of the intention to use motorcycles and cars. Based on the found effects of influential factors, an array of policy implications were suggested.

Keywords: Motorcycle; TPB; university student; beliefs; Hanoi

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1. INTRODUCTION

The number of motorcycle users has been rapidly rising globally during the several last decades [1]; however, the picture is not same between developed and developing countries. In the developed contexts, where public transport services are provided at high levels of quality and cars are the dominant mode, motorcycles are mainly used for recreational activities [2,3]. A reason for this phenomenon is the absence of separation of the rider from the driving environment, which facilitates the feeling of freedom and enjoyable driving experience, particularly for citizens in southern European countries with warm weather conditions. However, motorcycle usage for utilitarian purposes in densely populated cities of developed countries has been still experiencing considerably continuing growth because motorcycles are advantageous over a car in terms of running fast(er) in congested roads, accessing freely or cheaply parking, and saving significant cost of purchasing, operating, and maintaining [4–6]. From Paris, owing to witnessing that riding by motorcycle takes significantly shorter time (49%) than cars, motorcycles are mentioned as a future mode of Europe.

Notwithstanding, the growth of motorcycle use in developed countries cannot be comparable to that in developing counterparts, especially in Asia where 60% of vehicles are powered two-wheelers [7]. The top five markets of motorcycles worldwide are India, China, Indonesia, Vietnam, and Thailand [7]. Motorcycles are used there for both utilitarian and recreational purposes and most have small engines (125 or less cubic centimetres). Intense usage and ownership of motorcycles stem mainly from the motorcycles' affordable cost and apparent advantages regarding speed, convenience, and ability of door-to-door access. The excessive use of motorcycles comes at cost. The most troubling aspect of motorcycle-oriented mobility is the high rate of crashes with serious injuries and fatalities due to the prevalence of risky driving behaviours and the lack of protective equipment (e.g., chassis or air bag) compared to cars [4,8]. Besides, motorcycles are a major source of pollutant contribution in urban areas [9,10].

Vietnam is a typical motorcycle-dependent country facing serious transport-related challenges due to the uncontrolled proliferation of motorised two-wheeled vehicles. For addressing this trend, transport authorities have put more concentration on forming a sustainable travel pattern among students who are more willing or at least react more actively to use environmentally friendly modes and to leave private motorized modes [11]. Unfortunately, although motivations of students' mode choices have been analysed by [12] (focusing on the effects of socio-demographics and environmental factors of choosing motorcycles among various travel options) and [11] (focusing on various factors associated with the end of bus use); so far, motorcycle-specific psychological factors determining the use intention of this mode among Vietnamese students have remained unexplored.

This study, therefore, aims at filling this gap by modelling the intention to use motorcycles by using an extension of the Theory of Planned Behaviour (TPB) in Hanoi. The rest of this paper is structured traditionally, as follows. Section 2 reviews the extant literature review of determinants of motorcycle use in concert with relevant TPB-based studies for proposing a conceptual framework for investigating factors associated with students' intention of motorcycle use. Afterwards, section 3 describes the data collection process and analytical methods used. In section 4, the results are presented coupled with discussions and policy implications. Section 5 closes this paper with conclusions and future research directions derived from this study's limitations.

2. CONCEPTUAL FRAMEWORK FOUNDATION

2.1. Theory of planned behaviour (TPB)

Behavioural belief generates (un)favourable attitude toward the behaviour; normative beliefs cause perceived social pressure or subjective norms; and control beliefs are involved in perceived behavioural control for the implementation of behaviour.

Normative beliefs refer to individual's perception of others' beliefs related to a particular behaviour; therefore, they carry the effects of social context on behaviour [13]. The importance of subjective normative beliefs in terms of predicting travel mode choice has been frequently reported [14]. In many developing countries, riding motorcycles are a major part of daily lives. To put it another way, it would be a social norm there. Besides, because for most citizens (and students also) in developing countries, their daily travel relies largely on paratransit or active transport, the use of a motorized mode like motorcycles can be as a norm of modern city. Therefore, normative beliefs in this current study are considered through social norms and perceived modernity of motorcycles.

Control beliefs determine the ability to influence what will take (or is taking) place through perceptions of factors whose presence are perceived to facilitate or impede the performance of a behaviour [15]. Control beliefs can be measured through internal (e.g., 'For me, traveling by mode A is cheap) or external (e.g., 'Travelling by mode A is cheap') items [16]. Control beliefs are dominant predictors of adolescents' model choices. Both quantitative and qualitative studies emphasize convenience (in movement and parking) together with cheap cost (of purchasing, maintaining, and operating) are major advantages fostering the motorcycle use [17]. Hence, this current study takes convenience and parsimony into consideration as control beliefs of motorcycle use intention.

Behavioural beliefs are predictive of attitudes, which are conceptualized as (overall) positive or negative assessment of the behaviour [16]. Therefore, behavioural beliefs refer to the perception of the likely consequences or other attributes of the behaviour [15]. The quantitative study of [18] indicate the sense of freedom and belonging to a social group as the big advantages while high risk of crashes, contribution and exposure to air pollution as the clear disadvantages of motorcycle use. As demonstrated in [19], travelling heavily by motorized modes, particularly motorcycles, is a habitual sedentary behaviour with proved detrimental health impacts. Accordingly, six dimensions of behavioural beliefs on using motorcycles are considered in this research consist of 'independence', 'enjoyment', 'environmentally friendly', 'unsafe', 'unhealthy', and 'status'.

Behavioural intention is an indication of an individual's readiness to perform a given behavior [20]. A strong intention reveals the willingness to invest physical and psychological attempts in implementing the selected behavioural option [21]. Numerous transport researchers have made endeavour to attain in-depth understanding of the intention of using different modes to predict correctly the future travel behaviour pattern [22]. Behavioural intention can be measured through the planned frequency of using a specific mode or a plan of using the mode in next trips [23].

2.2. Control variables

Socio-demographics are frequently tested in studies of motorcycle use and mode choices of students. Gender gap is reported insignificant among motorcyclists [17]. Recent scholars has proved the importance of gender when modelling mode choice among students [24].

Income was found to be deterrent of the choice of motorcycles in Taiwan [25]. Because the majority of students have to leave hometown to cities to study at university degree [11]; it would be interesting to look at the relationship between migrant status and intention to use motorcycles. The development and availability of alternatives (e.g., bus, car, bicycles) can influence the motorcycle choice [25]. The authors of [26] emphasize a concern about the desire to upgrade to car from motorcycle among the young generation in developing countries; therefore, this study considers car use intention to validate the existence of the afore-said association.

2.3. Conceptual framework

Based on the rigorous review above, four hypotheses were proposed and shaped in a theoretical framework (*Figure 1*).

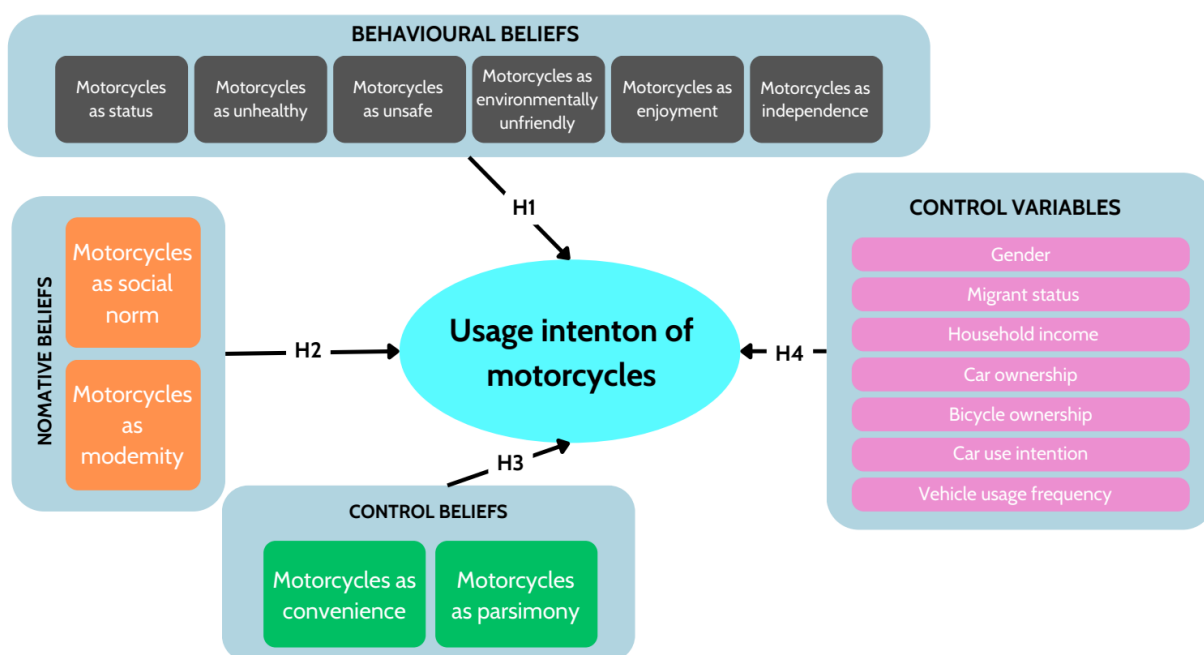


Figure 1. Conceptual framework proposed.

H1: Behavioural beliefs significantly affect motorcycle use intention.

H2: Normative beliefs significantly affect motorcycle use intention.

H3: Control beliefs significantly affect motorcycle use intention.

H4: Control variables (including gender, household income, migrant status, ownership of vehicles [cars and bicycles], and car use intention) significantly affect motorcycle use intention.

3. DATA AND METHODS

3.1. Research areas

Prior to presenting the data collection process, the authors provide an overview of the urban transport contexts in Hanoi and HCMC, where students were surveyed. The Hanoi capital (695 motorcycles per 1000 persons), which is situated in the North and the largest city,

and HCMC (779 motorcycles per 1000 persons), which is located in the South and the most populous city, are typical motorcycle-dominated megacities of not only Vietnam but also Asian emerging countries [27].

Hanoi is the largest educational centres attracting a host of students from other provinces and cities in Vietnam. In Hanoi, over 600,000 students are studying at nearly 80 universities and colleges, the majority of which are public [27]. Almost all educational institutions are public and located in urban districts where access is much more convenient and straightforward. In a recent research carried out in Hanoi, of 833 students questioned, 308 end the bus use and the vast majority of them shift to riding motorcycles.

3.2. Questionnaire

A structured self-administered questionnaire was designed to collect the data for this study. After being briefly informed of the research purposes, participants were asked for providing their individual and household characteristics together with current and future transportation patterns. The next parts encompass a series of attitudinal statements to measure latent variables included in the proposed conceptual framework and measured on a 5-point Likert scale ranging from strongly degree to strongly agree. The questionnaire was first prepared in English and then translated into Vietnamese. A pre-test with 10 students in each city was conducted to collect feedback, which was used to finalize the questionnaire.

3.3. Survey and sample

The used sample was gathered in January 2024 using Google Forms with all questions marked obligatory. Participant recruitment was carried out using the snowball convenience sampling with the support of lecturers, who are friends of the authors, and the students' associations of universities/colleges chosen. Three selected universities included: University of Transport and Communications (UTC), Hanoi College of Commerce and Tourism (HCCT), and Hanoi University of Industry (HAUI). This selection strategy enabled comprising both universities and college; however, it could not support to collect a representative sample.

Of the total 432 collected answers, only 399 were valid for further analyses. Based on *Table 1*, slightly more female students (51%) were included. The majority of respondents were migrant (69%). About 55% of the participants came from households with a higher monthly income (>650 US\$). Most were living in a carless household while the families of 39% of participants had bicycles. A large number of respondents (71%) reported to have a motorcycle. About 73% intended to purchase a car when they can afford it.

Table 1. Sample characteristics (N=399).

	Variables	Frequency	%
Gender	Male	194	48.62%
	Female	205	51.38%
Migrant status	Yes	275	68.92%
	No	124	31.08%
Monthly household income	Higher (> 650 US\$)	221	55.39%
	Lower (\leq 650 US\$)	178	44.61%
Personal motorcycle ownership	Yes	284	71.18%
	No	115	28.82%
Car ownership in household	Yes	47	11.78%
	No	352	88.22%
Bicycle ownership in	Yes	156	39.10%

household	No	243	60.90%
	Rarely (1-2 days per month)	292	73.18%
	Sometimes (3-4 days per month)	65	16.29%
	Frequent (2-3 days per week)	31	7.77%
Frequency of car use (either as drivers or passengers)	Regular (4-7 days per week)	11	2.76%
	Rarely (1-2 days per month)	264	66.17%
	Sometimes (3-4 days per month)	68	17.04%
	Frequent (2-3 days per week)	43	10.78%
Frequency of bicycle use	Regular (4-7 days per week)	24	6.02%
	Yes	291	72.93%
	No	108	27.07%

3.4. Methods of analysis

The statistical analysis process were carried out employing STATA 15.0. First, the attitudinal statements were extracted using exploratory factor analysis based on principal component analysis (eigenvalue>1, Oblimin rotation method with Kaiser normalization). Subsequently, a binary logit model was run to identify the factors associated with the intention to use motorcycles among students.

4. RESULTS AND DISCUSSIONS

4.1. Results of exploratory factor analysis

The Kaiser-Meyer-Olkin measure (KMO = 0.8108) validated the sampling adequacy. The results of Bartlett’s test of sphericity (*Table 2*) indicated that correlations between items were large enough to apply EFA. The extracted factors explained 68% of the data variance. Therefore, the application of EFA was suitable. EFA’s results recommended six latent constructs with the combination of some latent ones, as follows:

- *Behavioural beliefs*: (1) Motorcycles as Independence & enjoy, (2) Motorcycles as Unfriendly Environmentally, (3) Motorcycles as Unsafe & unhealthy, (4) Motorcycles as Status
- *Normative beliefs*: (1) Motorcycles as Norms & modernity,
- *Control beliefs*: (1) Motorcycles as Convenience & parsimony

Table 2. EFA results.

Items	Independence & enjoyment	Convenience & parsimony	Social norms & modernity	Unsafe & unhealthy	Status	Environmentally unfriendly
inde_1: A motorcycle offers me freedom	0.7049					
inde_2: With a motorcycle, I can travel whenever I wish	0.8074					
inde_3: On a motorcycle, no one can push or harass me	0.7482					
inde_4: Everyone has the right to travel by motorcycle	0.7292					

enjoy_1: Riding a motorcycle is fun	0.8953	
enjoy_2: Riding motorcycles is more fun compared to driving a car	0.7549	
enjoy_3: Riding a motorcycle is more fun compared to riding a bicycle	0.8238	
envi_1: Motorcycles cause much pollution		0.8258
envi_2: Motorcycles are the main cause of congestion		0.8746
unsafe_1: Riding a motorcycle is dangerous	0.7603	
unsafe_2: I have heard of many people being injured or dying in motorcycle-involved crashes	0.7718	
health_1: People who travel by motorcycle do not get much exercise	0.7236	
health_2: To keep fit, walking is better than using a motorcycle	0.8189	
health_3: To keep fit, riding a bicycle is better than using a motorcycle	0.8381	
status_1: I envy people who possess a car		0.8497
status_2: I like fancy motorcycles		0.8042
status_3: Possessing a motorcycle means that you have more status in society		0.8214
norm_1: I need to ride a motorcycle to fit in with my friends	0.7839	
norm_2: Most people I know ride motorcycles	0.8483	
norm_3: My family supports my selection to use a motorcycle	0.7928	
moder_1: Motorcycles are part of modern life in my country	0.7472	
moder_2: In this day and age, all adults should know how to ride a motorcycle	0.7008	

conve_1: Motorcycles are the easiest way to get around my city	0.7825
conve_2: In my city, you need a motorcycle to get anything done	0.8297
conve_3: With a motorcycle you can travel even when it is too hot	0.8189
parsi_1: Motorcycles are the cheapest way to travel in my city	0.7382
parsi_2: Cars cost too much	0.7891
Model parameters:	
Sample size: 399	
Bartlett's Test of Sphericity: p-value (0.000); H0: variables are not intercorrelated	
Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy: 0.8108	
Method: principal-component factors with eigenvalue >1	
Rotation: orthogonal oblimin (Kaiser on)	
Retained factors = 6	
Variance explained by nine factors extracted: 0.6820 (~68%)	

4.2. Results of binary logit regression and discussions of associated factors

For factor results, as can be seen in *Table 3*, regarding hypothesis 1, among latent factors of behavioural beliefs, only independence & enjoy ($\beta=0.724$) had a significant and positive direct effect on the intention to use motorcycles whereas the impacts of status, unsafe & unhealthy, and unfriendly environmentally were insignificant.

Hypotheses 2 and 3 were confirmed with the significantly positive associations between norms & modernity (normative beliefs) ($\beta=0.237$), convenience & parsimony (control beliefs) ($\beta=0.316$) and the intention.

When it comes to hypothesis 4, among control variables, migrant students were more inclined to have higher intention of using motorcycles. Higher household income was found to result in larger intention. The association between car use intention and motorcycle use intention was significantly positive. Gender, frequency of using car and bicycle, and vehicle ownership were not predictors of intention.

Table 3. Results of factors associated with the intention to use motorcycles among students.

<i>Independent variables</i>	<i>Coefficient</i>	<i>SE</i>	<i>P> z </i>
Gender (ref=Male)			
Female	-0.089	0.217	0.422
Migrant status (ref=No)			
Yes	1.110	0.516	0.048
Monthly household income (ref= > 650 US\$)			
≤ 650 US\$	-0.482	0.245	0.029
Personal motorcycle ownership (ref= Yes)			
No	0.227	0.224	0.313
Car ownership in household (ref=Yes)			

No	0.482	0.245	0.149
Bicycle ownership in household (ref=Yes)			
No	-0.442	0.289	0.126
Frequency of car use (either as drivers or passengers) (ref= Rarely (1-2 days per month))			
Sometimes (3-4 days per month)	0.374	0.388	0.246
Frequent (2-3 days per week)	-0.774	0.408	0.149
Regular (4-7 days per week)	0.974	0.342	0.451
Frequency of bicycle use (ref= Rarely (1-2 days per month))			
Sometimes (3-4 days per month)	0.113	0.364	0.569
Frequent (2-3 days per week)	0.257	0.412	0.240
Regular (4-7 days per week)	0.374	0.307	0.411
Car use intention (ref= Yes)			
No	0.113	0.384	0.769
Factor 1: Independence & enjoy	0.724	0.103	0.030
Factor 2: Unfriendly Environmentally	0.317	0.114	0.213
Factor 3: Unsafe & unhealthy	0.137	0.105	0.124
Factor 4: Status	0.116	0.111	0.293
Factor 5: Norms & modernity	0.237	0.156	0.024
Factor 6: Convenience & parsimony	0.316	0.211	0.033
<i>Constant</i>	0.229	0.649	0.260
Number of observations (N)	399		
Pseudo R ²	0.1931		

For interpretation of factor results, Norms & modernity were among the most influential determinants of the intention possibly because of the collectivistic culture of Vietnam, where the influences of others, particularly the relatives and friends, play an important role in the decision of individuals [28].

While concrete evidence demonstrates motorcycle use is detrimental to safety, health, and environment [9,29,30], unsafe & unhealthy and unfriendly environmentally were found to be insignificant factors. This finding empirically validated the qualitative report of [18] that lack of safety is not a motivation for the end/intention of using motorcycles. A reason may be students' agreement with the trade-off between mobility and safety. Some may consider the origin of collisions as the objective conditions (e.g., raining, slippery roads) or a matter for others because they have good driving skill [31]. Additionally, students can have other sources of physical activity to keep fit (sports) and have effective strategies to reduce the level of being impacted by pollutants (e.g., wearing masks). Equally importantly, new motorcycle generations, particularly using electricity, are more environmentally friendly. Accordingly, the impacts of side effects of motorcycles use may not be perceived as significant barriers to intention of utilizing this mode.

The findings of insignificant effect of status revealed that students rode a motorcycle since it is essential to do so rather than they liked it, coming from the symbolic value of a motorcycle. This can be understandable because a motorcycle is not a special or rare thing in society and university environment.

The significantly positive association between independence & enjoy and intention may result from the strong sense of seeking freedom and enjoyment of riding motorcycles among

students. At universities in Hanoi, there is more and more campaigns or strategies towards gender equality. Such programmes encourage female students to achieve more independence in terms of travelling and choose wisely modes to avoid sexual/gender harassment.

In line with an array of earlier studies [17], convenience and cheap cost were found to encourage the use of motorcycles. However, the strength of this variable was not large. This may be due to the relatively wide coverage of bus-based public transport with cheap subsidized ticket prices and long operation time (5:30-22:00). The availability of convenient and cheap transport options makes the motorcycles' effect of convenience and parsimony smaller.

The positive effect of income on the intention in this study was in disagreement with the finding in Taiwan where motorcycle ownership and use are proved to relate closely to low(er)-income groups [17]. A possible explanation is that the price of a motorcycle is not very expensive but not cheap in Vietnam. Hence, with a low household income, purchasing a motorcycle is not easy and it is used mainly for breadwinners. As such, students may have low intention to use motorcycles because perceived low opportunity for owning it.

In contrast to the reductions in car use among the young in developed countries [32,33], the rapid growth of car ownership and/or car use intention among young people that possibly originates from the desire to upgrade from motorcycles is a burning concern in developing countries [26,34]. This study confirmed the worrying trend with a found significantly positive association between motorcycle and car use intentions. This finding would not be in line with the case of Kuala Lumpur (Malaysia) where motorcycles are owned as a substitute for car, reflected by the negative association between car and motorcycle ownership [35].

Migrant students were found to have higher intention to use motorcycles. This may come from the transport context of their living areas. As demonstrated previously [6], the development of alternatives influences the intention to use motorcycles. It is important to note that the car is out of reach for the vast majority of migrant students who are living in provinces with limited income levels. In addition, public transport in such areas is inferior and small, thus leading the motorcycle to be nearly the only mode for travelling for various purposes. By contrast, students have more (public) transport options in order to be less dependent upon motorcycles.

For practical implications, since students do not acknowledge the disadvantages related to environment, health, and safety, these disadvantages should not be employed as a way to push students to leave this mode. The social and educational strategies to change from conservative to more responsible lifestyles among students are obviously necessary. Such solutions should focus more on migrant students who are more or less unfamiliar with the urban living contexts, also including urban public transport modes. Another possibly effective solution is to create a sustainable environment in universities or campuses. Besides, it is important to modify and/or correct the strong connection between motorcycles and a part of modernity or social norms of urban life. The norms showed by parents or lecturers should be towards considering motorcycles simply as a transportation mode.

Making the use of motorcycles more expensive and less convenient can play a role in mitigating the intention use of this mode; however, the implementation of these interventions should be carefully evaluated. Students generally do not have or have a limited income; therefore, price-related policies would not be encouraged. Instead of this, giving more promotion and parking slots for green modes (i.e., bicycles) or applying a quota of motorcycle parking at universities would be prioritized. In addition, students, who have low income,

should be the highest potential travel group to shift from motorcycles to public transport. The continuing improvement of public transport through an inauguration of higher-capacity public transport modes (BRT and metro) can play a role.

Discussions about the solutions to limit car use intention are clearly beyond the scope of this paper. However, it is vital to note that the decrease in motorcycle use intention can reduce the car use in the future. In this regard, efforts and resources used to limit the use of cars should be shared with lessening the intention to use motorcycles among students.

5. CONCLUSIONS

Adopting campaigns of motorcycle usage management to keep congested traffic conditions from becoming worse and thus contributing to environmental protection and prevention of crashes is a priority among governmental transport-related policies in major cities of developing countries. Notwithstanding, the quality and efficiency of interventions rely largely on the understanding of determinants of modal use among the young generations, particularly students [36,37]. This study has extended the TPB to rigorously analyse various factors associated with intention to use motorcycles among undergraduate students in Hanoi, Vietnam. Independence & enjoy, norms & modernity, and convenience & parsimony fuel the intention. Students who are migrant and come from richer households had higher intention to use motorcycles. A concerning result found was the positive association of the intention to use motorcycles and cars. Based on the found effects of influential factors, an array of policy implications were suggested.

This study is subject to several limitations. First, recruitment was carried out based on a convenience technique with voluntary students, thereby leading to biases limiting the generalization of findings. Second, the self-reported cross-sectional data used in this study are insufficient for claiming causal directions. Third, intention to use transportation modes are different between developing and developed countries due to difference in transport conditions, therefore, the findings of this study may need for confirmation and further extension using the data of students in developed economies.

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