



Why are Hanoi students giving up on bus ridership?

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Abstract

University students are regarded as a readily available market segment for public transport. In Hanoi, as elsewhere, they constitute a large portion of bus passengers. However, one portion has been quitting buses, and the reasons were so far unknown. Nor was it clear whether they planned on retuning. Through a survey of more than 800 students in seven higher education institutions, this study aimed to find the answers to these questions. The study revealed that bus ridership was determined by socio-demographic variables (year of studies, household income, employment status, motorcycle ownership), environmental variables (home-university distance), and psychological variables (convenience, bus staff behaviour, risk of sexual harassment, reliability and health, image and status). A negative disruptor such as the fear of Covid-19 infection had little effect on the decision to continue riding buses. Meanwhile, the prospect of riding ‘clean and green’ electric buses, which were introduced in a pilot program, was a positive disruptor that may lead a portion of students to return to public transport.

Keywords Public transport · Buses · Student travel · Hanoi · Vietnam · Covid-19 · Green technology

Introduction

University students are regarded as a readily available market segment for public transport. Riding buses allows students to travel on a budget while engaging in some physical exercise, in the form of walking or cycling, at the start and/or or end of their trips. Among planners, the hope, if not the expectation, is that students’ reliance on public transport will keep campus environments clean and green, it will reduce parking demand and congestion around campuses, and, finally, it will help young people form life-long sustainable travel habits (Albareda-Tiana et al. 2018; Soltani et al. 2019).

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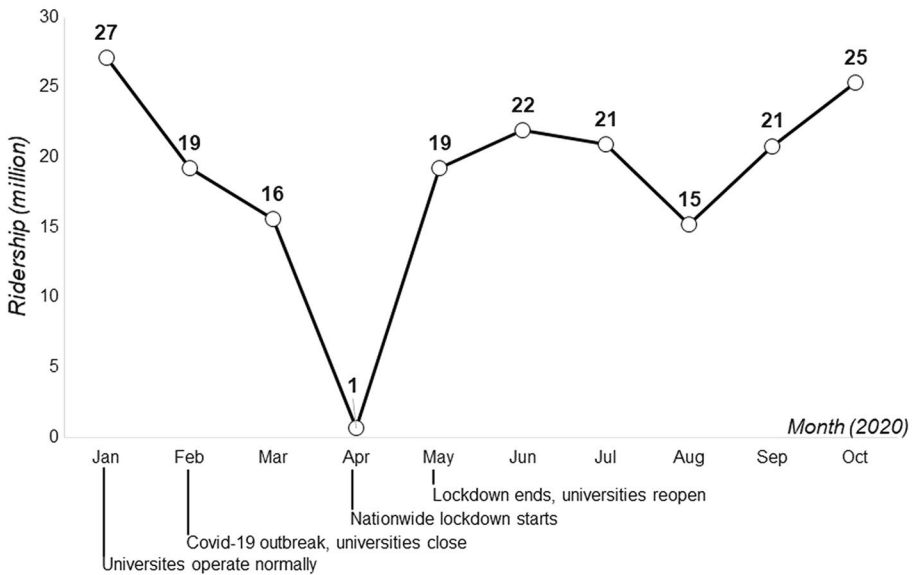


Fig. 1 Bus ridership along the pandemic timeline

In Hanoi, as elsewhere, students constitute a large portion of bus users. Most use discounted monthly passes, which are quite affordable.¹ While the overall bus modal share in the Vietnamese capital is only 7–9 percent (Department of Transport 2021; Nguyen et al. 2020, 2021b; TRAMOC 2019), student passengers account for more than a third of bus trips (Nguyen et al. 2017). Their contribution to public transport patronage became clearer in 2020 at the outset of the Covid-19 pandemic. When university closures were mandated at the start of the year, bus ridership fell from 27 million in January to 19 in February and 16 in March (Fig. 1). Once the national lockdown ended and students returned to face-to-face classes in May, bus ridership spiked to 19 million. It kept growing but never returned to pre-pandemic levels. In October 2020, it had just reached 25 million—nearly 2 million short of January 2020 levels (Department of Transport 2021). That suggests (though it does not confirm) that one portion of student riders did not come back, at least not yet.

Through a survey of more than 800 students in seven higher education institutions, this study aims to find out why some Hanoi students resumed bus ridership after the Covid-19 lockdown while others were lost to this mode. Is the fear of infection a key factor here? Or have there been other reasons leading to particular choices with regard to public transport use? Are there gender differences in travel behaviours and preferences among students, and what drives those differences? Might service improvements persuade some students to return to public transport?

These questions are important not only for Hanoi—where the local People’s Committee (2016) has made it a priority to attract and retain students among public transport users—but also for other cities in Southeast Asia and beyond. Students’ use of public transport is

¹ All Hanoi bus tickets are subsidized, and student monthly passes are cheaper than others. A standard one-way ticket costs 30¢ and student monthly passes cost between US\$2.4 and US\$4.4 depending on network coverage.

poorly understood elsewhere too (Khattak et al. 2011). In particular, we know little about the reasons why students might *stop* using bus services. Studies focused on university campuses tend to combine data for students and staff (De Vos et al. 2020; Namgung and Akar 2014; Ribeiro et al. 2020; Shannon et al. 2006). Or, they take a snapshot of the modal split at one point in time (Danaf et al. 2014; Nguyen-Phuoc et al. 2018; Obregón Biosca 2020; Whalen et al. 2013; Zhou 2012) rather than considering modal shifts over time—for example, from public buses to private motorcycles or cars. Some studies only examine students' stated preferences and intentions around public transport (De Vos et al. 2020; Nguyen-Phuoc et al. 2018), which may not translate into actual behaviour. No existing studies on the modal choices of students have estimated the gender differences in the effects of variables. Given these research gaps, the findings from this study will be useful outside Hanoi and Vietnam.

By way of context, Hanoi is a typical Global South megacity in terms of transport and land-use issues (Stead and Pojani 2017). As a higher education hub, it attracts numerous students from all over Vietnam. Out of 8 million inhabitants, nearly 600,000 are students attending 78 universities and colleges (mostly public) (Hanoi Statistics Office 2019). Most of these are located in urban districts where access is relatively easy. Daily travel in Hanoi is largely based on motorcycles (Nguyen and Armoogum 2020; Huynh and Gomez-Ibañez, 2017), with ownership estimated at 776 motorcycles/1000 inhabitants. Automobile ownership is low but on the rise; it currently stands at 60 cars per 1000 inhabitants.² Cycling is a marginal mode, mainly used by children; adults mostly consider it as recreation (Hansen 2017; Nguyen et al. 2021a).

The public transport system comprises more than 100 formal bus routes, which are subsidised by the public sector (Nguyen and Pojani 2021). While this number sounds high, it is inadequate for a megacity like Hanoi. Most bus vehicles are conventional; CNG buses operate only along four routes. One BRT corridor was built in 2017 (Nguyen et al. 2019) and two urban rail lines are currently under construction and/or testing. Another major improvement comes in the form of a pilot program which added electric buses along ten routes. This program was officially launched in the second half of 2021. The electric buses—produced and operated by Vinbus, a newly established local company—are new and comfortable and emit no noise or air pollution. Free WiFi is provided on board. Buses are equipped with cameras which allow drivers to better control the interior and exterior of the vehicle. Drivers themselves are under camera surveillance as well, in order to avoid risky driving and ensure courteous behaviour towards passengers. However, the electric buses run along the existing road infrastructure, which is shared with cars and motorcycles. No segregated busways have been planned so far.

The study was conducted in this changing environment. On the one hand, the risk of catching Covid-19 in crowded buses may have pushed some students away from public transport – perhaps forever. On the other hand, the prospect of riding on modern and clean electric buses may lure some students back to public transport, or keep them from leaving. Prior to discussing the empirical portion of the study, we set forth the theoretical framework that guided the research.

² 2018 figure, estimated by authors based on the Hanoi Statistical Yearbook and a report from the Hanoi Police.

Theoretical framework

Students tend to use public transport more than other population segments (Zhou 2012). However, car use is quite popular among this group too (Hopkins et al. 2021). For example, the car vs. transit modal split is 41/31 percent at the University of California at Los Angeles, U.S. (Zhou 2012), 25/33 percent at Iowa State University, U.S. (Zhou et al. 2018), 20/24 percent at McMaster University, Canada (Whalen et al. 2013), and 39/28 percent in various British and Irish universities (Davison et al. 2015). The car offers both practical and symbolic advantages. Many North American cities are set up so that driving—as opposed to riding a bus or a train—provides more independence, flexibility, speed, protection from crime, weather, and prying eyes. To some motorists, driving also equates with freedom, excitement, identity, and social status (Ashmore et al. 2019; Páez and Whalen 2010; Pojani et al. 2018).

In the Global North, the rise of the urbane and environmentally conscious Millennial generation has kindled hope that automobile-based travel will be reduced and a shift to PT will occur (Delbosc et al. 2019; Kuhnimhof et al. 2012). Some studies have even reported the emergence of the ‘carfree’, a class of people who choose to give up car ownership altogether (Brown 2017; Paijmans and Pojani 2021). Cities have sought to facilitate these transitions by expanding transit coverage and adopting a range of other sustainable transport policies and tools, including reduced transit fares for students, congestion charging in inner cities, parking caps in new developments, and MaaS apps (Melia et al. 2018; Rotaris and Danielis 2015). Some cities have experimented with free public transport (Cats et al. 2017; De Witte et al. 2006). Yet, cars have remained a favourite choice among Millennials based in the Global North (Hopkins et al. 2021).

Car travel dominates even more in Global South cities (see Pojani and Stead, 2017). For example, in Beirut, Lebanon, a city of 2 million, the overall share of “formal” public transport use among students is only 10 percent (Danaf et al. 2014); it is less than 3 percent in Danang, Vietnam, a city of 1 million (Nguyen-Phuoc et al. 2018).³ Among youth in less developed cities, car ownership is a key life aspiration (Belgiawan et al. 2014; Pojani et al. 2018). The rest of the population uses cars or motorcycles for urban travel. This is unsurprising considering the poor quality and erratic nature of public transport services in much of Asia, Africa, and Latin America (Al-Ayyash and Abou-Zeid 2019; Huynh 2020; Nguyen et al. 2019; Nguyen and Pojani 2018; Pojani 2020). It is only in cities with superior BRT systems, such as Curitiba or Bogotá, that the share of transit use surpasses 50 percent among students; but even here, car use is popular (Duarte et al. 2016).

Besides the quality of public transport and the attachment to automobility, what other variables determine bus ridership among university students? A review of the relevant literature (see Appendix 1) reveals the following three groups of variables, which can “push” students to, or “pull” students from, public transport:

Socio-demographic variables. Findings from existing studies are highly contradictory. Evidence from Norway (Nayum and Nordfjærn 2021) and Mexico (Obregón Biosca 2020) suggests that female students are more inclined to use public transport. In contrast, a study set in Lebanon (Danaf et al. 2014) shows that male students are more likely to use public transport. Studies set in the US (Zhou 2012), Vietnam (Nguyen-Phuoc et al. 2018; Van

³ Danang is a medium-sized, harbor city, with a large tourist base. Findings on student travel here (see Nguyen-Phuoc et al. 2018) are not comparable to Hanoi, a dense university-centric megacity—certainly not under pandemic circumstances.

et al. 2014), Thailand, and the Philippines (Van et al. 2014) find that gender is unrelated to public transport use among students. Similar contradictions are evident with respect to income. In Lebanon (Danaf et al. 2014), the U.S. (Zhou et al. 2018), and Mexico (Obregón Biosca 2020), higher-income students are less likely to travel by bus, whereas in Vietnam income is irrelevant (Nguyen-Phuoc et al. 2018). The role of living arrangements is not clear either. In one study, these are not significant (Nguyen-Phuoc et al. 2018) whereas other studies find that students who live with their families, as opposed to living alone or with housemates, are more likely to use public transport (Zhou 2012; Whalen et al. 2013). A clearer finding is that bus use decreases over the years spent at university. Freshers are more likely to rely on public transport compared to seniors who gradually shift to the car or motorcycle (Duarte et al. 2016; Zhou 2012; Nguyen-Phuoc et al. 2018). In fact, vehicle ownership – either of a motorcycle (Nguyen-Phuoc et al. 2018) or a car (Danaf et al. 2014; Duarte et al. 2016) - is associated with lower public transport use. Having a part-time job while studying may also affect one's travel modes for a variety of reasons (Zhou 2012), but this variable has not been tested until now.

Environmental variables. The term 'environment' is used here to denote the natural, built, and policy environment. Climate and weather conditions are known to affect travel mode choices. In cities with very cold winters and/or very hot summers, carless students may limit their bus ridership to the season with increment weather and switch to cycling, scootering, and even walking the rest of the time (Nayum and Nordfjærn 2021). An urban setting, with a high street density, appears to be more conducive to public transport use among students (Whalen et al. 2013). However, where the inner cities are derelict, and bus vehicles are poor, students shun those – more so than in suburban and rural areas (Danaf et al. 2014). The home-university commute distance leads to more bus ridership among students in Brazil and Colombia (Duarte et al. 2016) some parts of the U.S. (Zhou et al. 2018), but is not a significant variable in Vietnam and other parts of the U.S. (Nguyen-Phuoc et al. 2018; Zhou 2012). Pro-car transport policies, such as free parking at university campuses, lead to more driving whereas "carrot" measures, such as free or discounted transit passes for students, lead to more bus use (Whalen et al. 2013; Zhou 2012). In addition, variables such as low population densities and excessive urban roads widths may disincentivise public transport use, but these have not been examined in the existing literature on student mode choice.

Psychological variables These comprise a wide array of perceptions around public transport, including safety, convenience, comfort, access, cost, environmental friendliness, and utility. Typically measured on a Likert scale, perceptions can determine both students' choice (Shaaban and Kim 2016) and intention (Nayum and Nordfjærn 2021; Van et al. 2014) to use public transport. As with socio-demographic and environmental factors, the significant variables vary by research setting and design. A study set in Thailand, Vietnam, and Indonesia finds that environmental friendliness and safety are crucial here. Vietnamese students, in particular, care about travel convenience and speed (Van et al. 2014). Similarly, studies from Qatar (Shaaban and Kim 2016), Belgium (Simons et al. 2014) and Norway (Nayum and Nordfjærn 2021) highlight the importance of bus reliability, frequency, and access, as well as driver's behaviour and security onboard and at bus stops. A common crime in public transport is pickpocketing (Smith and Clarke 2000). Sexual harassment is prevalent too – albeit underreported (Ding et al. 2020). Women are more concerned with security and sexual harassment and consequently tend to avoid taking buses alone after dark (Ceccato et al. 2021; Chowdhury and van Wee; 2020; Currie et al. 2013; Loukaitou-Sideris et al. 2020; Simons et al. 2014) or quit using public transport altogether (Quinones 2020).

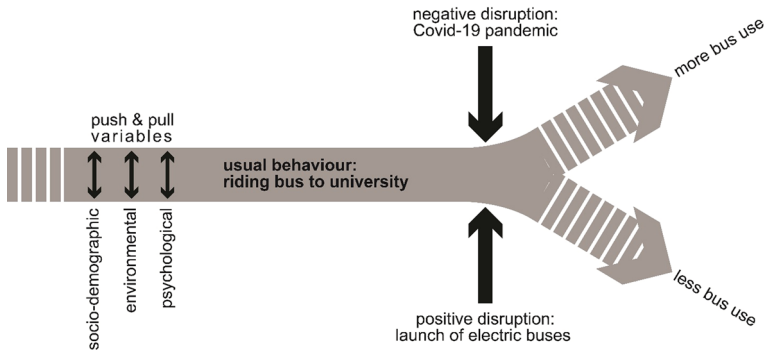


Fig. 2 Theoretical framework

In addition to the variables above, which play a role under normal circumstances, public transport use is also affected by major disruptions which impact entire cities and societies rather than select individuals or population subgroups. These disruptions can be positive or negative. Natural disasters, including epidemics, are negative disruptors that tend to reduce public transport use (De Vos 2020; Tirachini and Cats 2020). On the other hand, technological innovations, such as MaaS apps or BRT, can be positive disruptors that spur transit ridership. In the case of Hanoi, recent disruptors have included the Covid-19 pandemic (negative) and the launch of electric buses on select routes (positive).

We combined these two disruptors with most of the socio-demographic, environmental, and psychological variables reported as significant in the literature to formulate our theoretical framework (Fig. 2).⁴ While our analysis is based on data reduction and regression, this framework paves the way for more powerful statistical tools in future studies, such as Structural Equation Modelling, based on existing models such as ‘goal-directed behaviour’ (Perugini and Bagozzi 2010) or ‘theory of planned behaviour plus habit’ (de Bruijn et al. 2012).

Data and analysis

This study employs primary data collected in May 2021 via a structured survey, designed to examine students’ behaviours and attitudes around public transport. To provide some context: Hanoi universities shifted to online learning in April 2020 as the city went into its first lockdown due to the Covid-19 pandemic. Thereafter, infection rates fell considerably in Hanoi. University activities returned to normal, and proceeded as such until May 2021, when the capital of Vietnam experienced a resurgence of Covid-19 cases. At that point, university activities shifted online once again. The survey was conducted during that time (before the official launch of the electric bus program).

The first part of the survey collected socio-demographic and environmental data, including gender, age, year of studies, employment status, residential district, living

⁴ Given the study design, we could not include variables on weather and climate.

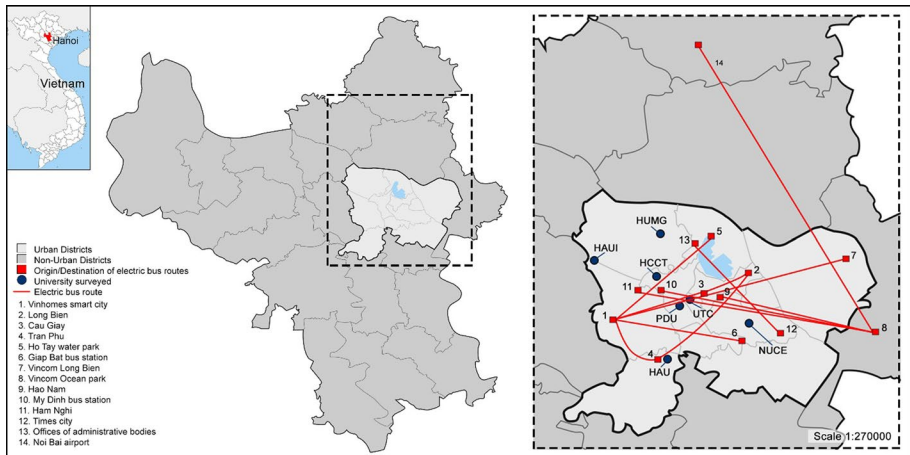


Fig. 3 Research area

arrangements, home-university distance, and vehicle ownership.⁵ The second part collected travel behaviour data, including the main commute mode to university and the frequency of bus use. Respondents who did not commute by bus were asked whether they had shifted from the bus to another mode during the year preceding the survey. The third part of the survey contained a series of attitudinal statements, measured on a 7-point Likert scale, which explored the potential reasons for choosing or quitting bus transport. These statements were derived from the literature (see summary in Appendix 1) and constituted the psychological variables in our theoretical framework.⁶ The effects on bus use of the two disruptors—Covid-19 (negative) and the launch of electric buses (positive) – were measured through several attitudinal statements around the fear of infection (Nguyen 2021) and a binary question on the intention to return to riding buses once electric vehicles became available.

The survey was administered online through Google Forms, with all the questions marked as mandatory. The questionnaire was pre-tested with twenty students, and upon validation, a link was sent to the students of six universities and one college: Hanoi University of Mining and Geology (HUMG), National University of Civil Engineering (NUCE), University of Transport and Communications (UTC), Hanoi Architectural University (HAU), Phuong Dong University (PDU), Hanoi University of Industry (HAUI), and Hanoi College of Commerce and Tourism (HCCT). All but PDU are public. HAU, HUMG, and HAUI are located near the urban edge whereas the rest are in rather central locations (Fig. 3). These institutions were selected in order to achieve an even distribution of campuses across the urban districts. However, this choice has a shortcoming: excluding students in certain

⁵ We only asked about motorcycle ownership; car ownership is minimal among students in Hanoi.

⁶ The use of attitudinal statements in research is subject to the usual qualification that what people say may not match what they do. Some respondents may provide statements that rationalize their modal choices (such as driving) even where they are aware that these choices are environmentally unsustainable. Also, in this case, responses were based on current beliefs or memories regarding a choice (giving up bus ridership) that was made up to one year prior. So there is a level of unreliability embedded in the responses.

disciplines, such as health and law for example, may introduce a bias in the sample (see Soltani et al. 2019).

In total, 862 responses were received, which constituted a representative sample. Of these responses, 29 were eliminated as unreliable. Thus the sample was reduced to 833 responses. Of these, 249 respondents had always used a commute mode other than the bus (mostly a motorcycle) and were therefore set aside. The final sample consisted of 584 responses eligible for inclusion in the study. These responses were provided by students who either used buses currently, or had used them in the past but quit in the year preceding the survey. It is difficult to determine whether this sample is representative because the populations of students who are current bus users and former bus users are unknown.

To combine the observable variables (socio-demographic and environmental variables) and unobservable variables (psychological variables) we employed a hybrid method (see Loo and Wang 2018; Nguyen 2021; Zhen et al. 2016). In a first step, we identified the latent (psychological) variables by reducing the 23 attitudinal statements into 7 constructs. Then, single factor scores were estimated for each construct, which could be used in a model. Given that the attitudinal statements we used were derived from different studies rather than a standardised questionnaire, we applied exploratory factor analysis (EFA) instead of confirmatory factor analysis. The results of the Bartlett's Test of Sphericity and the Kaiser–Meyer–Olkin Measure of Sampling Adequacy confirmed that the use of EFA was appropriate.

Subsequently, two binary logit models were fitted to evaluate the effects of socio-demographic, environmental, and psychological variables, and the two disruptors, on bus ridership. Model 1 included the entire sample. Female students were expected to experience a different set of issues to male students (Poiani 2014); therefore, interactions between gender and the remaining variables were added Model 1. Model 2 considered only former bus users. Because all interactions (between gender and other variables) were not significant in Model 2, they were removed.

To diagnose the risk of multicollinearity we estimated pairwise correlations between the independent variables. All the coefficients were either not significant or weak—i.e., with values smaller than 0.4 (Nguyen and Armoogum 2021). The Pseudo R^2 value (0.2543) of the first model, which focused on past and current behaviour, fell within the recommend range: 0.2–0.4 (Hensher et al. 2015). Model 2, which measured future intentions, had a lower but still acceptable Pseudo R^2 of 0.1304 (see Hopkins et al. 2021; Zhou et al. 2018).

All the statistical analyses were carried out in STATA 15.0.

Findings and discussion

The findings are reported in three parts: descriptive statistics, factor analysis, and regression analysis. Table 1 presents the key characteristics of the study sample ($N=584$). As seen, the distributions by gender and year of study were balanced. Overall, incomes were relatively low, with more than three fourths of respondents coming from households earning less than US\$550 per month.⁷ More than half of the students, in particular women,

⁷ To determine what constitutes a 'lower income' at the household level, we reasoned that: most university students in Hanoi come from other provinces and rent rooms in shared houses; the Student Associations of several universities surveyed indicate that, typically, students room in groups of four and students' individual monthly income is less than US\$140 on average; on this basis, a student household of four has a monthly income of about US\$550–560 on average; it follows that a household income of less than US\$550 is lower than average.

Table 1 Descriptive statistics

Variable	Value	All (N = 594)		Male (N = 306)		Female (N = 288)		Former bus users (N = 308)	
		<i>Freq</i>	<i>%</i>	<i>Freq</i>	<i>%</i>	<i>Freq</i>	<i>%</i>	<i>Freq</i>	<i>%</i>
Gender	Male	306	52	306	100	0	0	166	54
	Female	288	48	0	0	288	0	142	46
Year of studies	1st year	154	26	75	25	79	27	48	16
	2nd year	151	25	85	28	66	23	63	20
	3rd year	146	25	72	24	74	26	96	31
	4th year	143	24	74	24	69	24	101	33
Household monthly income	< 550 USD†	463	78	234	76	229	80	211	69
	≥ 550 USD†	131	22	72	24	59	20	97	31
Motorcycle ownership	Yes	277	47	157	51	120	42	175	57
	No	317	53	149	49	168	58	133	43
Residential district	Urban district	374	63	196	64	178	62	188	61
	Non-urban district	220	37	110	36	110	38	120	39
Living arrangements	Rent house	475	80	241	79	234	81	243	79
	Live with family	119	20	65	21	54	19	65	21
Part-time job	Yes	351	59	171	56	180	63	221	72
	No	243	41	135	44	108	37	87	28
Home-university distance	Short (< 2 km)	159	27	45	15	114	39	58	19
	Medium (2–5 km)	257	43	140	46	117	41	152	49
	Long (> 5 km)	178	30	121	39	57	20	98	32
Stopped using buses	Yes (<i>shift to other modes</i>)	308	52	166	54	142	49	308	100
	No (<i>still using buses now</i>)	286	48	140	46	146	51	0	0
Intention to reuse buses after e-bus launch	Yes	n/a	n/a	n/a	n/a	n/a	n/a	163	53
	No	n/a	n/a	n/a	n/a	n/a	n/a	145	47

†US\$1 = 22.500 VND

worked part-time to support themselves while studying. The vast majority of respondents lived in urban districts, 2–5 km away from their university, and shared rental accommodations with roommates.⁸

Overall, 52 percent of the respondents had stopped riding buses in the previous year. Those tended to be male and older students (in the third or fourth year of their studies). They had part-time jobs and were more likely to own motorcycles. On the positive side, more than half (53 percent) of the “quitters” intended to return to bus transport once electrical buses were introduced. This finding supports the view that youth have more pro-environmental attitudes than older adults (D’Souza et al. 2006; Torgler et al. 2008). Other

⁸ In northern latitudes, a 2-km distance is considered as walkable. But in Vietnam’s tropical climate, 2 km is generally considered too long a distance for walking in summer. Air pollution and poor pedestrian infrastructure, in addition to heat, make walking unpleasant too. Therefore, studies set in Vietnamese cities use 2 km as the threshold for public transport use (see Nguyen-Phuoc et al. 2018).

Table 2 Results of Exploratory Factor Analysis (EFA)

Code	Attitudinal statements	Loadings of factors extracted		
		Convenience	Theft	Sexual harassment risk
<i>Psychological variables</i>				
CON1	I have to walk on a long way to access bus stops from/to home/university	0.7401		
CON2	I usually have to wait too long at bus stops	0.8118		
CON3	Changes in bus operations are not updated and communicated promptly	0.5479		
CON4	It is hard to find information on bus operations	0.8265		
CON5	I have to wake up too early to catch a bus to attend my classes on time	0.8209		
PTR1	I am concerned about losing my belongings at bus stops		0.9243	
PTR2	I am concerned about losing my belongings while getting on and off		0.9206	
PTR3	I am concerned about losing my belongings onboard		0.8860	
PSR1	I am concerned about sexual harassment at bus stops			0.8527
PSR2	I am concerned about sexual harassment while getting on and off			0.8411
PSR3	I am concerned about sexual harassment on board			0.8790

Table 2 (continued)

Code	Attitudinal statements	Loadings of factors extracted				
		Convenience	Theft	Sexual harassment risk	Bus staff behaviour	Reliability & health Image & status Covid-19 risk
PER1	Drivers/ticket conductors do not pay enough attention to their uniform			0.8317		
PER2	Drivers/ticket conductors are often distracted (chatting, using cell phone)			0.8691		
PER3	Drivers/ticket conductors are not courteous to passengers			0.8433		
HEA1	I usually feel tired after trips from/school				0.7889	
REL1	Buses usually run behind schedule				0.8110	
REL2	There are often differences between the posted and the actual bus schedule				0.8189	
SV1	Buses are responsible for congestion					0.7959
SV2	Buses are responsible for pollution					0.7027
SV3	Buses are responsible for collisions and accidents					0.7951
<i>Disruptor*</i>						
PIR1	The risk of Covid-19 community infection is high					0.7505
PIR1	The risk of Covid-19 infection is high on public transport					0.8579

Table 2 (continued)

Code	Attitudinal statements	Loadings of factors extracted
PIR1	I may catch Covid-19 if the bus carries infected passengers	<i>Convenience</i> <i>Theft</i> <i>Sexual harassment risk</i> <i>Bus staff behaviour</i> <i>Reliability & health</i> <i>Image & status</i> <i>Covid-19 risk</i>

0.7834

Items measured on a 7-point Likert scale; Number of observations: 594

Bartlett's Test of Sphericity: chi-square = 7816.048; degrees of freedom = 253; p -value = 0.000 (H0: variables are not intercorrelated);

Kaiser–Meyer–Olkin Measure of Sampling Adequacy = 0.797; Method: principal-component factors with eigenvalue > 1; Rotation: orthogonal oblimin (Kaiser on);

Retained factors = 7; Variance explained by six factors extracted: 0.7406; Score estimation method: Regression

*The other disruptor, the launch of electric buses, was measured through a binary question and therefore is not included here

Table 3 Descriptive statistics of extracted (psychological) factors

Variable	All sample (N = 594)		Male (N = 306)		Female (N = 288)		Anova test male vs female	Former bus users (N = 308)	
	Mean	Std	Mean	Std	Mean	Std		Mean	Std
Sexual harassment risk	0	1	-0.326	1.064	0.347	0.792	**	0.048	1.029
Theft risk	0	1	-0.016	0.992	0.017	1.010	n/s	-0.012	1.062
Convenience	0	1	-0.062	1.039	0.066	0.953	n/s	0.235	0.913
Bus staff behaviour	0	1	-0.044	1.112	0.047	0.865	n/s	0.100	0.990
Reliability and health	0	1	0.072	1.082	-0.076	0.900	*	0.117	0.951
Image and status	0	1	-0.102	1.121	0.108	0.840	**	0.174	0.908
Covid-19 risk	0	1	0.034	1.076	-0.036	0.912	n/s	0.038	0.974

n/s = not significant

* $p < 0.1$

** $p < 0.05$

studies have similarly found that, where public transport is regarded as more environmentally friendly, it is more likely to be patronised (Simons et al. 2014; van Lierop et al. 2018).

The application of exploratory factor analysis (EFA) to the survey responses generated seven constructs or factors: (1) convenience, (2) theft risk, (3) sexual harassment risk, (4) bus staff behaviour, (5) reliability and health, (6) image and status, and (7) Covid-19 risk. These factors accounted for 74 percent of the total variance underlying the 23 attitudinal items in the survey (Table 2). Women were much more concerned about sexual harassment risk, as well as and image and status, compared to men (Table 3). Conversely, women did not care as much as men about reliability and health.

The first model (Table 4) confirmed that gender was irrelevant in the decision to stop using buses. This result contradicts previous reports that women, including students, are the most loyal bus users (Chowdhury and van Wee 2020; Nayum and Nordfjærn 2021; Obregón Biosca 2020), despite their more complex travel needs and the risk of harassment they face on public transport (Pojani 2014).

Similar to peers in other developing cities (Nguyen-Phuoc et al. 2018; Duarte et al. 2016), Hanoi freshers and sophomores were more likely to rely on buses relative to juniors and seniors. There are a few plausible explanations for this finding. Students who come from rural areas and smaller towns are accustomed to lower-quality public transport services at home. Hanoi's bus system, while not at the level of Tokyo's or Seoul's, is considered the best in Vietnam, surpassing even Ho Chi Minh City's. Hence its attraction among younger students. As the novelty wears off, and students start getting jobs and internships in their last few years of study, public transport no longer caters to their needs and wants, and they shift to other travel modes. Also, once students are more familiar with Hanoi, some move, choosing to live farther from the university but in better-equipped and cheaper accommodation (Nguyen-Phuoc et al. 2018).

In this study, students who lived the closest to their university (less than 2 km away) were the most likely bus users (although the associations were weak). This finding can be interpreted in several ways. For one, female students, who are the most frequent bus users, tend to live closer to their university than male students. Bus reliability decreases over longer distances (e.g., toward the end of a route) while the time spent on board increases.

Table 4 Regression results

Variables	Model 1: Respondent has stopped using buses <i>All sample (N=594)</i>			Model 2: Former bus user intends to return to buses after EB launch <i>Former bus users only (N=308)</i>		
Dependent variables	(Yes = 1 and No = 0)			(Yes = 1 and No = 0)		
Independent variables	Coef	SE	p	Coef	SE	p
<i>1. Socio-demographic variables</i>						
Gender [Ref = male]	n/s			n/s		
Year of studies [Ref = 1st year]						
2nd year	n/s			n/s		
3rd year	1.158**	0.400	0.004	n/s		
4th year	0.935**	0.403	0.021	n/s		
Year of studies x Gender	n/s			n/a		
Household monthly income [Ref = < USD550]†						
≥ USD550	0.607**	0.352	0.045	n/s		
Household monthly income x Gender	n/s			n/a		
Motorcycle ownership [Ref = yes]						
No	-0.600**	0.281	0.033	1.229**	0.270	0.000
Motorcycle ownership x Gender	n/s			n/a		
Living arrangement [Ref = rental house]						
Homeowner/other	n/s			n/s		
Living arrangement x Gender	n/s			n/a		
Part-time job [Ref = yes]						
No	-0.567**	0.277	0.041	0.693**	0.308	0.024
Part-time job x Gender	n/s			n/a		
<i>2. Environmental variables</i>						
Home-university distance [Ref = short (< 2 km)]						
Medium (2–5 km)	0.806*	0.431	0.062	n/s		

Table 4 (continued)

Variables	Model 1: Respondent has stopped using buses <i>All sample (N= 594)</i>			Model 2: Former bus user intends to return to buses after EB launch <i>Former bus users only (N= 308)</i>		
	Coef	SE	<i>p</i>	Coef	SE	<i>p</i>
Dependent variables	(Yes = 1 and No = 0)					
Independent variables	(Yes = 1 and No = 0)					
Long (> 5 km)	0.793*	0.466	0.089	-1.161**	0.430	0.007
Home-university distance x Gender	n/s	n/a				
Living area [Ref = urban districts]						
Non-urban districts	n/s			n/s		
Living area x Gender	n/s			n/a		
<i>3. Psychological variables[§]</i>						
Sexual harassment risk‡	n/s			n/s		
Sexual harassment risk‡ x Female	0.616**	0.267	0.021	n/a		
Theft risk‡	n/s			n/s		
Theft risk‡ x Female	n/s			n/a		
Convenience‡	0.576**	0.139	0.000	n/s		
Convenience‡ x Female	n/s			n/a		
Bus staff behaviour‡	0.173*	0.128	0.073	0.278**	0.130	0.033
Bus staff behaviour‡ x Female	0.218*	0.220	0.058	n/a		
Reliability and health‡	0.478**	0.133	0.000	n/s		
Reliability and health‡ x Female	-0.501**	0.217	0.021	n/a		
Image & status‡	0.369**	0.125	0.003	0.409**	0.153	0.007
Image & status‡ x Female	n/s			n/a		
<i>4. Disruption</i>						
Covid-19 risk‡	n/s			n/s		
Covid-19 risk‡ x Female	n/s			n/a		

Table 4 (continued)

Variables	Model 1: Respondent has stopped using buses <i>All sample (N= 594)</i>			Model 2: Former bus user intends to return to buses after EB launch <i>Former bus users only (N= 308)</i>		
Dependent variables	(Yes = 1 and No =0)			(Yes = 1 and No =0)		
Independent variables	Coef	SE	p	Coef	SE	p
<i>Cons</i>	-0.551	0.529	0.298	0.071	0.556	0.899
<i>Log likelihood</i>	-306.72296					
<i>LR chi²</i>	LR chi ² (35) = 209.20					
<i>Prob > chi²</i>	0.0000					
<i>Pseudo R²</i>	0.2543					

§The score of each psychological variable was estimated by summing the product (multiplication) the factor scores (found in the factor score coefficient matrix) and the standardized values of the indicators (attitudinal statements) which belonged to that psychological variable. This score was then used in Models 1 and 2

†USD1 = 22.500 VND; ‡factor extracted through EFA; ** $p < 0.05$; * $p < 0.1$; n/s: not significant; n/a: not applicable

In Model 2 all the interactions between gender and other variables were not significant, and therefore were removed (a n/a note was added to the table)

Given that men value convenience more highly, these factors may lead them to give up bus ridership. At the same time, travelling by motorcycle or even by car over long distances in Hanoi is tiring, risky, and enervating. It may be that male students are more prepared to battle the congestion, pollution, and noise in the city.

Living arrangements (whether with family or with roommates) were not a predictor of the shift from buses to other modes. This may be because, in either case Hanoi students have access to the same modes: they can take the bus or borrow a motorcycle from their roommates, siblings, or parents if needed. Studies set in North America (Whalen et al. 2013; Zhou 2012) have found that students who live with their families are more likely to ride buses than those who live with roommates. This may be simply due to lower spending power among students who have chosen to attend university in their hometown.

Returning to our findings: higher household incomes, private motorcycle ownership, and part-time employment all increased the odds of students' quitting public transport. Other studies set in Vietnam have pointed to the same issue: an increase in motorcycle ownership is associated with a decrease in bus use among students (Nguyen et al. 2017; Nguyen-Phuoc et al. 2018). Students purchase motorcycles not only for their own transport but also as a means of earning some income by joining app-based moto-taxi services (Nguyen-Phuoc et al. 2020). Conversely, those students who work while attending university tend to have more complex schedules throughout the day, which cannot be followed using unreliable, low-frequency, trunk-line bus services. Studies set in other countries have found that students who come from higher-income families are more likely to own private vehicles and less likely to ride buses, regardless of employment status (Danaf et al. 2014; Obregón Biosca 2020; Zhou et al. 2018).

As for psychological factors, fear of sexual harassment was a significant factor in women's decision to quit using buses (it was irrelevant for men). Women, however, remain the main public transport users, as noted. These findings are quite concerning—generally, but especially in the context of the pandemic. During this time, buses have been less crowded than usual, and based on previous studies, a lower bus load was expected to lessen concerns around the risk of harassment (Orozco-Fontalvo et al. 2019). But we found that not to be the case. It may be that sexual harassment on public transport has increased rather than decreased during the pandemic, due to a higher level of anonymity afforded to perpetrators by the mandatory use of face masks. Or, less crowded buses may have led to less frequent but more severe sexual harassment.

In addition to outright harassment, female respondents were also more sensitive to the poor conduct of bus staff. They were more likely to take notice if drivers and ticket conductors were distracted, ununiformed, or impolite. Note that the vast majority of Hanoi buses are staffed by men, and in some cases, staff have been known to engage in the sexual or gender harassment of female passengers.⁹

Meanwhile, male students cared much more about bus reliability and the fatigue associated with bus trips – perhaps because they tended to live farther from their university than female students. Other gender-based differences were not statistically significant. Both genders were more likely to quit using the bus where they perceived it as a lower status and a less convenient mode. This is understandable: inconvenience is a known factor that makes public transport unattractive (de Oña, 2021).

⁹ Gender harassment is different to sexual harassment. It refers to insulting, hostile, and degrading behaviors toward women, not necessarily aimed at sexual cooperation.

The risk of theft was not significant; neither men nor women were particularly concerned about it. While pickpocketing does occur in Hanoi, it may not be seen as a major problem by students, who are regular or frequent bus users and know how to protect themselves from thieves. Also, students often commute accompanied by their friends, classmates, or roommates and this perhaps makes them feel more secure on buses.

Among former bus riders, those who lived closer to their university, did not own a motorcycle, or did not hold a part-time job were more inclined to want to return to public transport after the advent of electric buses. Former bus users who disliked the image of conventional buses and the behaviour of existing drivers and conductors were also more likely to want to return to public transport once electric buses were introduced. Clearly, young people entertain high hopes that the vehicle and service quality in the pilot program will be superior to what they have experienced so far. It is crucial not to disappoint them and risk losing them forever as bus passengers.

The fear of Covid-19 infection was not a significant factor in the decision to quit riding buses. Note that, until recently, Hanoi has been exemplary for managing to successfully control the pandemic (CNN 2020). On public transport, face masks have been mandatory and this rule has been strictly enforced. One study (Manh et al. 2021) reported that the rate of mask wearing is 100% on-board with nearly 90% of passengers using masks correctly. As a consequence, no cases of infection have been detected on public transport and the perception of risk has been minimized. Given these special circumstances, this finding may not be applicable elsewhere. In other cities, Covid-19 has decimated public transport ridership (Tirachini and Cats 2020).

Conclusion and recommendations

This study set in the capital of Vietnam sought to pinpoint the forces that “push” students to, or “pull” students from, public transport. To this end, we combined a series of socio-demographic, environmental, and psychological variables with two disruptors, one negative (Covid-19) and the other positive (the launch of electric buses) and modelled their effects. We found that bus ridership was determined by first or second year of studies, lower household income, and a smaller home-university distance. Motorcycle ownership, part-time employment, and fear of sexual harassment (among women only) led students to quit riding buses. Women tended to value polite bus staff behaviour whereas men were more focused on reliability and health. Both genders were equally concerned about the inconvenience and the poor image and status of buses. Somewhat surprisingly, the fear of Covid-19 infection had little influence on the decision to discontinue riding buses. Meanwhile, the prospect of riding ‘clean and green’ electric buses may well lead a portion of students to return to public transport.

From a practice perspective, these findings point to a number of issues which policy makers should consider in order to make public transport more attractive for students – in particular non-captive users and women. Any strategies to sustain public transport ridership need to be comprehensive and involve gender mainstreaming. All aspects—including service, infrastructure, vehicles, and marketing—need to be targeted in order to challenge gender biases at each stage of public transport planning, development, and operation. Specific measures, which are being tried across Asia and farther afield, include: designating seats for women in buses,

providing women-only buses (or train carriages), employing more women as bus drivers and ticket conductors, and promoting more women in transport policy-making positions (Duchène, 2011; Dunkel-Graglia 2013; Graham-Harrison 2015). However, note that gender-based segregation has not been successful everywhere, and in some countries has even backfired. As Orozco-Fontalvo et al. (2019) note, “one of the challenges is that groups of men now target these wagons and wait for female passengers to exit the vehicle to harass them.” Gekoski et al. (2015) provide a full summary of the evidence.

The challenge is major because, in emerging economies such as Vietnam young passengers (existing and prospective) are increasingly demanding, and much less willing than their parents to put up with the poor bus services of yesteryear. Owing to more exposure to the wider world, and the availability of other travel options, they expect reliability, safe driving, frequency of service, comfort on board, clean vehicles, courteous and professional behaviour from staff, harassment-free vehicles and stations, and real-time information on digital platforms (Nguyen and Pojani 2018). In sum, they expect public transport to match the convenience, status, and image of private cars, motorcycles, and ride-hailing. Under these circumstances, “carrot” measures that make public transport more attractive (such as the launch of electric buses) may work better than “stick” measures that restrict vehicle ownership and use.

Appendix

Appendix 1 Summary of studies on university students’ bus use.

Indicators Authors	(Danaf et al. 2014)	(Nguyen-Phuoc et al. 2018)	(Obregón Biosca 2020)	(Van et al. 2014)	(Duarte et al. 2016)	(Nayum & Nordfjærn 2021)	(Shaaban and Kim 2016)	(Simons et al. 2014)	(Whalen et al. 2013)	(Zhou 2012)	(Zhou et al. 2018)
Area	Lebanon	Vietnam	Mexico	Thailand, China, Vietnam, Indonesia, Philippines	Colombia, Brazil	Norway	Qatar	Belgium	Canada	USA (Los Angeles)	USA (Ames, Iowa)
Modes considered	Car, PT, jitney	Walk, cycle, PT, car	Active modes, bus, car	car, PT	Walk, cycle, car, bus	PT	Car and bus	Walk, cycle, PT, car, motorcycle	Walk, cycle, PT, car	Walk, cycle, car, carpool, PT, telework	Driving, carpooling, transit, biking, walking
Sample size	594	503	594	716	786 (Colombia) / 653 (Brazil)	424	330	19	1385	769	1661
Dependent variable	Mode choice	Mode choice	Mode choice	Intention	Mode choice	Intention	Mode choice	Mode choice	Mode choice	Mode choice	Mode choice
<i>Independent variables</i>											
<i>Socio-demographic</i>											
Gender	✓		✓			✓				✓	
Year of studies / age		✓			✓						✓
Income	✓		✓								✓
Living arrangements									✓		
Car/motorcycle ownership	✓	✓			✓						

Indicators Authors	(Danaf et al. 2014)	(Nguyen- Phuoc et al. 2018)	(Obregón Biosca 2020)	(Van et al. 2014)	(Duarte et al. 2016)	(Nayum & Nordfjærn 2021)	(Shaaban and Kim 2016)	(Simons et al. 2014) ¥	(Whalen et al. 2013)	(Zhou et al. 2012)	(Zhou et al. 2018)
<i>Environmental</i>											
Living area / street density	√				√			√			
Home-university distance					√						√
Travel Demand Management								√	√	√	
Weather						√					
<i>Psychological</i>											
Reliability											
Safety and security				√ †		√ †	√ †			√	
Convenience and access				√ †			√ †			√	
Bus staff behaviour							√ †				
Health				√ †							
Environmental pollution				√ †							
Traffic											√ †

√ significant variable; † construct extracted through data reduction; ¥ qualitative study; PT Public Transport

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Declarations

Conflict of Interest The authors declare no conflict of interest.

References

- Al-Ayyash, Z., Abou-Zeid, M.: Investigating commute satisfaction differences of private car users and public transport users in a developing country context. *Transportation* **46**, 515–536 (2019). <https://doi.org/10.1007/s11116-019-10000-2>
- Albareda-Tiana, S., Vidal-Raméntol, S., Fernández-Morilla, M.: Implementing the sustainable development goals at University level. *Int. J. Sustain. High. Educ.* **19**, 473–497 (2018). <https://doi.org/10.1108/IJSHE-05-2017-0069>
- Ashmore, D.P., Pojani, D., Thoreau, R., Christie, N., Tyler, N.A.: Gauging differences in public transport symbolism across national cultures: implications for policy development and transfer. *J. Transp. Geogr.* **77**, 26–38 (2019). <https://doi.org/10.1016/j.jtrangeo.2019.04.008>
- Belgiawan, P.F., Schmöcker, J.-D., Abou-Zeid, M., Walker, J., Lee, T.-C., Ettema, D.F., Fujii, S.: Car ownership motivations among undergraduate students in China, Indonesia, Japan, Lebanon, Netherlands, Taiwan, and USA. *Transportation* **41**, 1227–1244 (2014). <https://doi.org/10.1007/s11116-014-9548-z>
- Brown, A.E.: Car-less or car-free? Socioeconomic and mobility differences among zero-car households. *Transp. Policy* **60**, 152–159 (2017). <https://doi.org/10.1016/j.tranpol.2017.09.016>
- Cats, O., Susilo, Y.O., Reimal, T.: The prospects of fare-free public transport: evidence from Tallinn. *Transportation* **44**, 1083–1104 (2017). <https://doi.org/10.1007/s11116-016-9695-5>
- Ceccato, V., Näsman, P., Langefors, L.: Sexual Violence on the move: an assessment of Youth's victimization in public transportation. *Women Crim. Just.* **31**, 294–312 (2021). <https://doi.org/10.1080/08974454.2020.1733732>
- Chowdhury, S., van Wee, B.: Examining women's perception of safety during waiting times at public transport terminals. *Transp. Policy* **94**, 102–108 (2020). <https://doi.org/10.1016/j.tranpol.2020.05.009>
- CNN, 2020. How Vietnam managed to keep its coronavirus death toll at zero [WWW Document]. URL <https://edition.cnn.com/2020/05/29/asia/coronavirus-vietnam-intl-hnk/index.html>
- Currie, G., Delbosc, A., Mahmoud, S.: Factors Influencing Young peoples' perceptions of personal safety on public transport. *J. Public Transp.* (2013). <https://doi.org/10.5038/2375-0901.16.1.1>
- D'Souza, C., Taghian, M., Lamb, P.: An empirical study on the influence of environmental labels on consumers. *Corporate Commun. An Int. J.* **11**, 162–173 (2006). <https://doi.org/10.1108/13563280610661697>
- Danaf, M., Abou-Zeid, M., Kaysi, I.: Modeling travel choices of students at a private, urban university: Insights and policy implications. *Case Stud. Transport Policy* **2**, 142–152 (2014). <https://doi.org/10.1016/j.cstp.2014.08.006>
- Davison, L., Ahern, A., Hine, J.: Travel, transport and energy implications of university-related student travel: a case study approach. *Transp. Res. Part d: Transp. Environ.* **38**, 27–40 (2015). <https://doi.org/10.1016/j.trd.2015.04.028>
- de Oña, J.: Service quality, satisfaction and behavioral intentions towards public transport from the point of view of private vehicle users. *Transportation* (2021). <https://doi.org/10.1007/s11116-021-10175-7>
- de Bruijn, G.-J., Rhodes, R.E., van Osch, L.: Does action planning moderate the intention-habit interaction in the exercise domain? A three-way interaction analysis investigation. *J Behav Med* **35**, 509–519 (2012). <https://doi.org/10.1007/s10865-011-9380-2>
- De Vos, J.: The effect of COVID-19 and subsequent social distancing on travel behavior. *Transp. Res. Int. Perspectives* **5**, 100121 (2020). <https://doi.org/10.1016/j.trip.2020.100121>
- De Vos, J., Waygood, E.O.D., Letarte, L.: Modeling the desire for using public transport. *Travel Behav. Soc.* **19**, 90–98 (2020). <https://doi.org/10.1016/j.tbs.2019.12.005>

- De Witte, A., Macharis, C., Lannoy, P., Polain, C., Steenberghen, T., Van de Walle, S.: The impact of “free” public transport: The case of Brussels. *Trans. Res. Part A: Policy Practice* **40**, 671–689 (2006). <https://doi.org/10.1016/j.tra.2005.12.008>
- Delbosch, A., McDonald, N., Stokes, G., Lucas, K., Circella, G., Lee, Y.: Millennials in cities: comparing travel behaviour trends across six case study regions. *Cities* **90**, 1–14 (2019). <https://doi.org/10.1016/j.cities.2019.01.023>
- Department of Transport, 2021. Review, amend and promulgate mechanisms and policies to continue subsidizing public transport in the Hanoi city
- Ding, H., Loukaitou-Sideris, A., Agrawal, A.W.: Sexual harassment and assault in transit environments: a review of the english-language literature. *J. Plan. Lit.* **35**, 267–280 (2020). <https://doi.org/10.1177/0885412220911129>
- Duarte, F., Gadda, T., Moreno Luna, C.A., Souza, F.T.: What to expect from the future leaders of Bogotá and Curitiba in terms of public transport: opinions and practices among university students. *Transport. Res. f: Traffic Psychol. Behav.* **38**, 7–21 (2016). <https://doi.org/10.1016/j.trf.2015.12.013>
- Duchêne, C., 2011. Gender and Transport (No. Discussion Paper 2011). OECD, Paris, France
- Dunckel-Graglia, A.: Women-only transportation: how “Pink” public transportation changes public perception of women’s mobility. *JPT* **16**, 85–105 (2013). <https://doi.org/10.5038/2375-0901.16.2.5>
- Gekoski, A., Gray, J.M., Horvath, M.A.H., Edwards, S., Emirali, A., Adler, J.R.: “What works” in reducing sexual harassment and sexual offences on public transport nationally and internationally: a rapid evidence assessment (Monograph). Middlesex University; British Transport Police; Department for Transport, London (2015)
- Graham-Harrison, E., 2015. Women-only carriages around the world: do they work? The Guardian Hanoi Statistics Office: Hanoi Statistical Yearbook. Statistical publishing house, Hanoi (2019)
- Hansen, A.: Hanoi on wheels: emerging automobility in the land of the motorbike. *Mobilities* **12**, 628–645 (2017). <https://doi.org/10.1080/17450101.2016.1156425>
- Hensher, D.A., Rose, J.M., Greene, W.H.: Applied choice analysis, 2nd, edition Cambridge University Press, Cambridge (2015)
- Hopkins, D., García Bengoechea, E., Mandic, S.: Adolescents and their aspirations for private car-based transport. *Transportation* **48**, 67–93 (2021). <https://doi.org/10.1007/s11116-019-10044-4>
- Huynh, D., 2020. Making Megacities in Asia: Comparing National Economic Development Trajectories, SpringerBriefs in Regional Science. Springer Singapore, Singapore. <https://doi.org/10.1007/978-981-15-0660-4>
- Huynh, D.T., Gomez-Ibañez, J.: Vietnam, in Pojani, D., Stead, D. (Eds.), *The Urban Transport Crisis in Emerging Economies*. Springer, Cham, pp. 267–282 (2017). https://doi.org/10.1007/978-3-319-43851-1_13
- Khattak, A., Wang, X., Son, S., Agnello, P.: Travel by university students in Virginia: is this travel different from travel by the general population? *Transp. Res. Rec.* **2255**, 137–145 (2011). <https://doi.org/10.3141/2255-15>
- Kuhnimhof, T., Armoogum, J., Buehler, R., Dargay, J., Denstadli, J.M., Yamamoto, T.: Men shape a downward trend in car use among young adults—evidence from six industrialized countries. *Transp. Rev.* **32**, 761–779 (2012). <https://doi.org/10.1080/01441647.2012.736426>
- Loo, B.P.Y., Wang, B.: Factors associated with home-based e-working and e-shopping in Nanjing, China. *Transportation* **45**, 365–384 (2018). <https://doi.org/10.1007/s11116-017-9792-0>
- Loukaitou-Sideris, A., Brozen, M., Ding, H., Pinski, M., Siddiq, F., 2020. Public Transportation Safety Among University Students (Final report No. UCLA-18–31, TO-010). UCLA Lewis Center for Regional Policy Studies
- Manh, T.H., Duong, D.A., Anh, N.N., Duc, N.T., Minh, N.B., Huong, M.T., Hieu, N.M.: Adherence to mask wearing on public transport during the COVID-19 pandemic and influential factors: the case of Hanoi. *Transp. Commun. Sci. J.* **72**, 486–497 (2021). <https://doi.org/10.47869/tcsj.72.4.8>
- Melia, S., Chatterjee, K., Stokes, G.: Is the urbanisation of young adults reducing their driving? *Transp. Res. Part a: Policy Practice* **118**, 444–456 (2018). <https://doi.org/10.1016/j.tra.2018.09.021>
- Namung, M., Akar, G.: Role of gender and attitudes on public transportation use. *Transp. Res. Rec.* **2415**, 136–144 (2014). <https://doi.org/10.3141/2415-15>
- Nayum, A., Nordfjærn, T.: Predictors of public transport use among university students during the winter: a MIMIC modelling approach. *Travel Behav. Soc.* **22**, 236–243 (2021). <https://doi.org/10.1016/j.tbs.2020.10.005>
- Nguyen, M.H.: Factors influencing home-based telework in Hanoi (Vietnam) during and after the COVID-19 era. *Transportation* **48**, 3207–3238 (2021). <https://doi.org/10.1007/s11116-021-10169-5>

- Nguyen, M.H., Armoogum, J.: Hierarchical process of travel mode imputation from GPS data in a motorcycle-dependent area. *Travel Behaviour and Society* **21**, 109–120 (2020). <https://doi.org/10.1016/j.tbs.2020.06.006>
- Nguyen, M.H., Armoogum, J.: Perception and preference for home-based telework in the COVID-19 Era: a gender-based analysis in Hanoi Vietnam. *Sustainability* **13**, 3179 (2021). <https://doi.org/10.3390/su13063179>
- Nguyen, M.H., Pojani, D.: Covid-19 need not spell the death of public transport: learning from Hanoi's safety measures. *J. Transp. Health* (2021). <https://doi.org/10.1016/j.jth.2021.101279>
- Nguyen, M.H., Ha, T.T., Tu, S.S., Nguyen, T.C.: Impediments to the bus rapid transit implementation in developing countries—a typical evidence from Hanoi. *Int. J. Urban Sci.* **4**, 464–483 (2019). <https://doi.org/10.1080/12265934.2019.1577747>
- Nguyen, H.N., Tu, S.S., Nguyen, M.H.: Evaluating the maiden BRT corridors in Vietnam. *Trans. Commun. Sci. J.* **71**, 4 (2020). <https://doi.org/10.25073/tcsj.71.4.3>
- Nguyen, M.H., Pojani, D., Nguyen, T.C., Ha, T.T.: The impact of Covid-19 on children's active travel to school in Vietnam. *J. Transp. Geogr.* (2021a). <https://doi.org/10.1016/j.jtrangeo.2021.103191>
- Nguyen, T.C., Nguyen, M.H., Armoogum, J., Ha, T.T.: Bus crash severity in Hanoi Vietnam. *Safety* **7**, 65 (2021b). <https://doi.org/10.3390/safety7030065>
- Nguyen, M.H., Pojani, D., 2018. Chapter Two - Why Do Some BRT Systems in the Global South Fail to Perform or Expand?, in: Shiftan, Y., Kamargianni, M. (Eds.), *Preparing for the New Era of Transport Policies: Learning from Experience*, Advances in Transport Policy and Planning. Academic Press, pp. 35–61. <https://doi.org/10.1016/bs.atpp.2018.07.005>
- Nguyen, M.H., Ha, T.T., Le, T.L., Nguyen, T.C., 2017. Challenges to Development of Bus System Evidence from a Comparative Analysis of Surveys in Hanoi, in: *Transportation for a Better Life: Mobility and Road Safety Managements*. Presented at the Atrans Annual Conference, Bangkok, Thailand, pp. 1–10.
- Nguyen-Phuoc, D.Q., Amoh-Gyimah, R., Tran, A.T.P., Phan, C.T.: Mode choice among university students to school in Danang Vietnam. *Travel Behav.Soc.* **13**, 1–10 (2018). <https://doi.org/10.1016/j.tbs.2018.05.003>
- Nguyen-Phuoc, D.Q., De Gruyter, C., Nguyen, H.A., Nguyen, T., Ngoc, Su., D.,: Risky behaviours associated with traffic crashes among app-based motorcycle taxi drivers in Vietnam. *Transp. Res. f: Traffic Psychol. Behav.* **70**, 249–259 (2020). <https://doi.org/10.1016/j.trf.2020.03.010>
- Obregón Biosca, S.A.: College student mobility in emerging countries: case study on Universidad Autónoma de Querétaro México. *Transp. Res. Interdiscipl. Perspect.* **6**, 100155 (2020). <https://doi.org/10.1016/j.trip.2020.100155>
- Orozco-Fontalvo, M., Soto, J., Arévalo, A., Oviedo-Trespalcacios, O.: Women's perceived risk of sexual harassment in a bus rapid transit (BRT) system: the case of Barranquilla Colombia. *J. Transp. Health* **14**, 100598 (2019). <https://doi.org/10.1016/j.jth.2019.100598>
- Páez, A., Whalen, K.: Enjoyment of commute: a comparison of different transportation modes. *Transp. Res. Part A Policy Practice* **44**, 537–549 (2010). <https://doi.org/10.1016/j.tra.2010.04.003>
- Paijmans, H., Pojani, D.: Living car-free by choice in a sprawling city: desirable and ... possible? *Case Studies on Transport Policy* **9**, 823–829 (2021). <https://doi.org/10.1016/j.cstp.2021.04.001>
- People's Committee of Hanoi, 2016. *Master public transport plan in Hanoi to 2020 and vision to 2025*
- Perugini, M., Bagozzi, R.P.: The role of desires and anticipated emotions in goal-directed behaviours: broadening and deepening the theory of planned behaviour. *Br. J. Soc. Psychol.* **40**, 79–98 (2010). <https://doi.org/10.1348/014466601164704>
- Pojani, D.: Women's issues/gender issues. In: *Encyclopedia of Transportation: Social Science and Policy*, pp. 1731–1734. Sage Publications, Thousand Oaks, CA, USA (2014)
- Pojani, D.: *Planning for Sustainable Urban Transport in Southeast Asia: Policy Transfer, Diffusion, and Mobility*. Springer International Publishing, The Urban Book Series (2020). <https://doi.org/10.1007/978-3-030-41975-2>
- Pojani, E., Van Acker, V., Pojani, D.: Cars as a status symbol: youth attitudes toward sustainable transport in a post-socialist city. *Transp. Res. f: Traffic Psychol. Behav.* **58**, 210–227 (2018). <https://doi.org/10.1016/j.trf.2018.06.003>
- Quinones, L.M.: Sexual harassment in public transport in Bogotá. *Transp. Res. Part A Policy Practice* **139**, 54–69 (2020). <https://doi.org/10.1016/j.tra.2020.06.018>
- Ribeiro, P., Fonseca, F., Meireles, T.: Sustainable mobility patterns to university campuses: evaluation and constraints. *Case Studies on Transport Policy* **8**, 639–647 (2020). <https://doi.org/10.1016/j.cstp.2020.02.005>

- Rotaris, L., Danielis, R.: Commuting to college: the effectiveness and social efficiency of transportation demand management policies. *Transp. Policy* **44**, 158–168 (2015). <https://doi.org/10.1016/j.tranpol.2015.08.001>
- Shaaban, K., Kim, I.: The influence of bus service satisfaction on university students' mode choice. *J. Adv. Transp.* **50**, 935–948 (2016). <https://doi.org/10.1002/atr.1383>
- Shannon, T., Giles-Corti, B., Pikora, T., Bulsara, M., Shilton, T., Bull, F.: Active commuting in a university setting: assessing commuting habits and potential for modal change. *Transp. Policy* **13**, 240–253 (2006). <https://doi.org/10.1016/j.tranpol.2005.11.002>
- Simons, D., Clarys, P., De Bourdeaudhuij, I., de Geus, B., Vandelanotte, C., Deforche, B.: Why do young adults choose different transport modes? A focus group study. *Transp. Policy* **36**, 151–159 (2014). <https://doi.org/10.1016/j.tranpol.2014.08.009>
- Smith, M.J., Clarke, R.V.: Crime and Public Transport. *Crime Justice* **27**, 169–233 (2000). <https://doi.org/10.1086/652200>
- Soltani, A., Allan, A., Nguyen, H.A., Berry, S.: Students' commuting pattern from the viewpoint of environmentalism: comparing Australia with China. *Int. J. Sustain. High. Educ.* **20**, 91–114 (2019). <https://doi.org/10.1108/IJSHE-08-2018-0146>
- Stead, D., Pojani, D.: 2017. The Urban Transport Crisis in Emerging Economies: A Comparative Overview, in: Pojani, D., Stead, D. (Eds.), *The Urban Transport Crisis in Emerging Economies*. Springer International Publishing, Cham, pp. 283–295. https://doi.org/10.1007/978-3-319-43851-1_14
- Tirachini, A., Cats, O.: COVID-19 and public transportation: current assessment, prospects, and research needs. *J. Public Transp.* (2020). <https://doi.org/10.5038/2375-0901.22.1.1>
- Torgler, B., Garcia-Valiñas, M.A., Macintyre, A., 2008. Differences in Preferences Towards the Environment: The Impact of a Gender, Age and Parental Effect (SSRN Scholarly Paper No. ID 1105320). Social Science Research Network, Rochester, NY. <https://doi.org/10.2139/ssrn.1105320>
- TRAMOC, 2019. The annual report of bus services in Hanoi. Hanoi
- Van, H.T., Choocharukul, K., Fujii, S.: The effect of attitudes toward cars and public transportation on behavioral intention in commuting mode choice—A comparison across six Asian countries. *Transp. Res. Part A Policy Practice* **69**, 36–44 (2014). <https://doi.org/10.1016/j.tra.2014.08.008>
- van Lierop, D., Badami, M.G., El-Geneidy, A.M.: What influences satisfaction and loyalty in public transport? A review of the literature. *Transp. Rev.* **38**, 52–72 (2018). <https://doi.org/10.1080/01441647.2017.1298683>
- Whalen, K.E., Páez, A., Carrasco, J.A.: Mode choice of university students commuting to school and the role of active travel. *J. Transp. Geogr.* **31**, 132–142 (2013). <https://doi.org/10.1016/j.jtrangeo.2013.06.008>
- Zhen, F., Cao, X., Mokhtarian, P.L., Xi, G.: Associations Between Online Purchasing and Store Purchasing for Four Types of Products in Nanjing, China. *Transportation Research Record* **2566**, 93–101 (2016)
- Zhou, J.: Sustainable commute in a car-dominant city: factors affecting alternative mode choices among university students. *Transp. Res. Part A Policy Practice* **46**, 1013–1029 (2012). <https://doi.org/10.1016/j.tra.2012.04.001>
- Zhou, J., Wang, Y., Wu, J.: Mode choice of commuter students in a college town: an exploratory study from the United States. *Sustainability* **10**, 3316 (2018). <https://doi.org/10.3390/su10093316>

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