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FACTORS INFLUENCING PARENTS' CHOICE OF SCHOOL BUS TRANSPORTATION FOR THEIR CHILDREN IN HANOI

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Abstract. In the context of rapid urbanization in major Vietnamese cities, students' daily travel demand has become a growing concern from both social and urban transport management perspectives. This study analyzes the factors influencing parents' mode choice with respect to school bus usage for primary and lower secondary school students in Hanoi. Data collected from 400 questionnaire surveys were analyzed using descriptive statistics, reliability testing of measurement scales, and binary logistic regression to estimate the probability of parents choosing school bus services. The results indicate that safety perception, service convenience, and trust in the service are the three key factors exerting a positive and statistically significant influence on parents' mode choice behavior. In contrast, travel cost and home–school distance do not show a significant effect. In addition, parental socio-demographic characteristics (including age, income, and vehicle ownership) differ between users and non-users of school bus services. These findings reflect the characteristics of school-related travel in Hanoi, where safety and service reliability are prioritized by parents over cost considerations. The study provides empirical evidence to support policy formulation and the organization of safe and appropriate school bus systems in the context of Vietnamese urban mobility.

Keywords: school bus service, safety perception, urban mobility, Hanoi.

1. INTRODUCTION

In the context of rapid urbanization in major Vietnamese cities, students' daily travel has become an increasingly important issue from both social and urban transport management perspectives. In particular, parents' reliance on private vehicles for school commuting not only places additional pressure on transport infrastructure during peak hours but also poses significant risks in terms of traffic safety and environmental pollution. School bus services are widely regarded as a sustainable solution that can help alleviate congestion, save travel time, and enhance student safety. However, the proportion of parents choosing this mode of transport remains relatively low, raising questions about the factors influencing school bus mode choice.

Previous national and international studies have shown that multiple factors, including travel cost, travel time, convenience, safety, and the socio-demographic characteristics of decision-makers, influence travel behavior and mode choice. Nevertheless, for the specific group of parents, mode choice decisions are further shaped by perceptions, attitudes, and trust in service safety and quality, as well as willingness to pay for convenience and peace of mind. These aspects have not yet been sufficiently examined in the Vietnamese research context.

Therefore, this study aims to extend existing analyses by integrating perception-, attitude, trust-, and cost-related factors into a comprehensive framework for examining school bus mode choice. In doing so, the study provides scientific evidence to support policies for the development of efficient, safe, and environmentally friendly student transport systems in the context of urban mobility in Vietnam.

2. LITERATURE REVIEW

2.1 Overview of Previous Studies

Globally, research on school travel mode choice has primarily followed two main approaches: (1) identifying factors influencing mode choice behavior, and (2) modeling travel mode choice using econometric methods. Studies conducted in the United States, Canada, Australia, and Europe have largely focused on the influence of the built environment, including population density, distance to school, traffic safety conditions, and pedestrian infrastructure [1, 2, 3]. More recent studies from Japan and South Korea have extended the analysis to psychosocial factors, such as trust in service quality, attitudes toward safety-related risks, and the acceptance of public transport use for children [4, 5].

Discrete choice modeling is the most commonly applied methodological approach, particularly binary and multinomial logit models, which allow for the estimation of the probability of choosing school bus services based on individual characteristics and transport mode attributes.

In Vietnam, empirical research on school bus mode choice remains limited and has primarily focused on public bus usage in general [6]. The factors typically examined include travel cost, waiting time, service frequency, and service reliability. Although several recent studies have addressed travel mode choice for school commuting, they have mainly emphasized the physical attributes of trips—such as travel distance, vehicle ownership, and parents' occupations—without quantitatively capturing the relationship between perceptual factors, safety concerns, and mode choice decisions [7].

Notably, key determinants such as trust and attitudes toward safety levels, service quality, and school image—factors that play a crucial role in parents' decision-making—have not yet been incorporated into quantitative analytical models. In addition, willingness to pay (WTP) for high-quality school bus services remains largely unexplored, while cost and service reliability continue to be identified as major barriers to adoption.

2.2. Research Gaps and Proposed Analytical Framework

Based on the reviewed literature, several critical research gaps can be identified. First, there is a lack of integrated models that simultaneously incorporate economic, psychosocial, and safety-related factors in travel mode choice decisions. Second, spatial analysis has rarely been employed to quantify the geographical characteristics associated with mode choice behavior. Third, there is insufficient measurement of parents' willingness to pay (WTP) for school bus services.

To address these gaps, this study proposes a binary logit modeling approach that integrates spatial variables with psychological factors, including perceptions, trust, safety concerns, and willingness to pay. This approach enables the estimation of the probability that parents choose school bus services while also revealing the relative contribution of each group of factors to travel behavior and mode choice.

2.3. Current Conditions of School Commuting Demand and the Development of School Bus Services in Hanoi

In recent years, rapid urbanization combined with growth in the school-age population has led to a substantial increase in school commuting demand in Hanoi, particularly at the primary and lower secondary education levels. The city currently has more than 1.9 million students, including approximately 850,000 primary school students and 620,000 lower secondary school students [8]. The majority of students are escorted by their parents using motorcycles or private cars, exerting considerable pressure on urban traffic during morning (6:45–7:45) and afternoon (16:30–17:30) peak hours. Although school bus services have been introduced by some private and international schools, the overall coverage remains limited. According to a 2023 report by the Hanoi Public Transport Management Center, only about 2–3% of students citywide use school bus services, primarily those enrolled in international schools and a small number of high-quality public schools.

Hanoi's school bus transportation system continues to face several challenges: (i) limited route coverage, with many residential areas lacking convenient pickup points; (ii) relatively high service costs compared to the affordability of most households (approximately VND 1.5–2.5 million per month); (iii) parental concerns regarding safety and student supervision on board; and (iv) the absence of supportive policies and standardized technical regulations for this mode of transport. Meanwhile, conventional public bus services, despite their potential to serve students, are rarely chosen due to schedules and stop locations that are poorly aligned with school hours [9].

2.4. Research Hypotheses and Conceptual Framework

Based on the literature review and the current development of school bus services in Hanoi, this study formulates a set of research hypotheses (H1–H6) to examine the effects of multiple factor groups on parents' intentions and mode choice regarding school bus use. The hypotheses are theoretically grounded in the Theory of Planned Behavior [10], the Extended Technology Acceptance Model [11], and discrete choice theory [12], allowing an integrated

investigation of psychological, service-related, and economic determinants of school travel behavior in a dense urban context.

Socio-demographic characteristics—including parents' age, gender, income, education level, household structure, and home–school distance—are incorporated as control variables to capture individual heterogeneity and differences in service accessibility, which may indirectly influence transport decisions [13, 14].

Trip characteristics, such as travel time, pickup and drop-off convenience, route directness, and schedule flexibility, represent operational attributes that shape perceived travel efficiency and daily practicality [15].

Perceived safety is identified as a central determinant of school-related transport choices, encompassing in-vehicle safety, pickup-point conditions, driver competence, and compliance with safety regulations [16, 17].

Perceived convenience reflects ease of use and time savings for parents, while trust in service providers and perceived service quality capture psychological evaluations influencing acceptance and behavioral intention [10, 11].

Finally, cost and willingness to pay represent economic considerations related to affordability and value perception [13, 18].

Within the discrete choice framework [12], parents' school bus mode choice is viewed as the outcome of interactions between service attributes, psychological perceptions, and socioeconomic constraints.

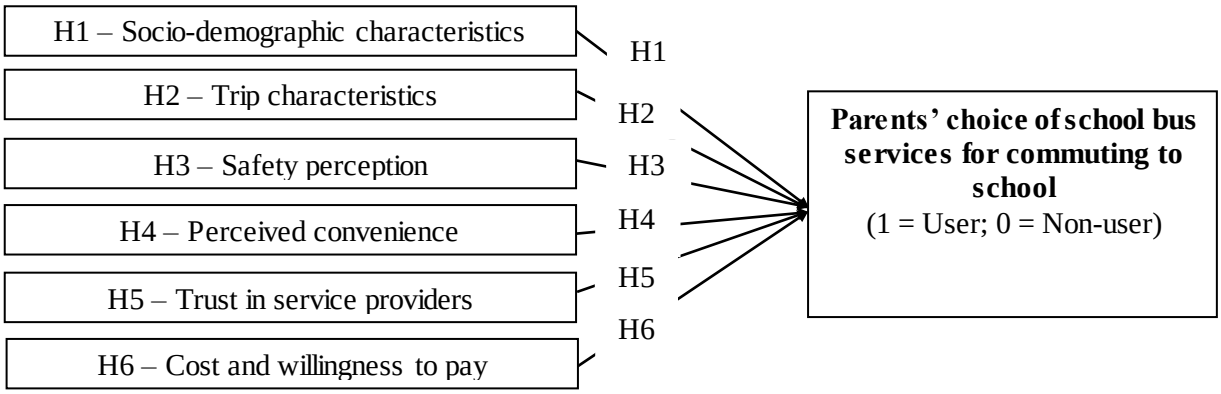

Figure 1. Research Hypotheses.

Overall, the proposed research model conceptualizes school bus mode choice as an integrated decision-making process that combines psychological–perceptual factors with economic and technical considerations. The model reflects the balance that parents seek among safety, convenience, trust, and affordability when making travel mode choices for their children within the context of urban mobility in Hanoi.

2.5. Development of Measurement Scales

The measurement scales employed in this study were adapted from previous research on travel behavior, mode choice, and school transportation. The safety construct was developed based on the scales proposed by McMillan [11], Faulkner et al. [15], and Hensher [18], with a focus on perceived risk and the level of safety assurance provided by the service. The trust in service construct was derived from studies on trust in school transportation by Kim and

Ulfarsson [4] and Taniguchi et al. [5], and was further informed by the extended Technology Acceptance Model (TAM) proposed by Venkatesh and Davis [11].

The convenience and logistics construct was adapted from prior studies examining trip characteristics and time-related costs in mode choice decisions (Ewing and Cervero [2]; Zhou [3]; Rhohlac [13]). Overall, these measurement constructs are well suited to the Hanoi context and capture the core factors influencing parents' decisions when choosing school bus services.

3. RESEARCH METHODOLOGY

3.1. Analytical Model

This study employs a binary logit model to examine the factors influencing parents' travel mode choice, specifically the decision to use school bus services for commuting to school. The binary logit model produces results comparable to those of binomial probit and Tobit models when applied to the same dataset, while offering greater interpretability in result analysis [19]. Moreover, the binary logit model is particularly suitable when the dependent variable is categorical. It has been widely applied in previous studies on travel behavior and vehicle usage [20–22].

The functional form of the model is expressed as follows:

$$Ln\left(\frac{P(Y=1)}{P(Y=0)}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_n X_n + U_i \quad (1)$$

Where:

- **Y = 1** denotes the probability of choosing school bus services.
- **Y = 0** denotes the probability of not choosing the service.
- $\mathbf{X_1, X_2, \ldots, X_n}$ represent independent variables.
- $\boldsymbol{\beta_0}$ is the intercept; $\boldsymbol{\beta_1 \ldots \beta_n}$ are regression coefficients.
- $\mathbf{U_i}$ denotes the error term.

3.2. Research Data

For quantitative regression-based models, sample size was determined using the following formula [17]:

$$n \geq 50 + 8.k \quad (2)$$

Where k denotes the number of independent variables and n represents the sample size. Given that the proposed model includes 25 independent variables, the minimum required sample size is 250 observations.

The study focuses on parents of primary and lower secondary school students, a group characterized by a high degree of dependence on adults for daily travel. According to reports by the Hanoi People's Committee and the Hanoi Department of Education and Training presented at the 2024–2025 academic year review conference, Hanoi currently has approximately 2,3 million students, of whom 1.440.000 are enrolled at the primary and lower secondary levels. Inner-city districts account for about 62% of this population due to high urban density and strong educational demand, equivalent to approximately 892.800 students.

With a confidence level of 95%, the survey sample size was estimated using the following formula:

$$n = \frac{N}{1+N(e)^2} \quad (3)$$

Where N denotes the population size and e represents the acceptable standard error. Accordingly:

$$n = \frac{892.800}{1 + 892.800 * (0,05)^2} = 400 \text{ (respondents)} \quad (4)$$

Based on these calculations, a total of 400 questionnaires was selected to ensure representativeness, with balanced allocation between public and non-public schools. Six schools located in different inner-city districts of Hanoi were selected to enhance spatial representativeness, including: Giang Vo Lower Secondary School (Ba Dinh), Foreign Language Specialized Lower Secondary School (Cau Giay), Doan Ket Primary School (Ha Dong), Hoang Mai Primary School (Hoang Mai), West Hanoi Inter-level School (Nam Tu Liem), and The Dewey Schools (Tay Ho). The sample was evenly divided, with 50% of respondents being parents who use school bus services and 50% being non-users. The survey was conducted from 15 May to 1 June 2025 using a mixed-method approach, combining face-to-face interviews and online questionnaires. Face-to-face surveys targeted parents who commute with their children using private vehicles (motorcycles or private cars), while online surveys were administered to parents whose children travel by bicycle, public bus, or school bus. Online respondents were randomly selected through coordination between homeroom teachers and parents.

3.3. Data Processing Methods

Quantitative data analysis was conducted using SPSS 20.0. Following completion of the official survey, the data were processed according to the following steps:

Step 1: Descriptive statistical analysis was carried out to examine the basic characteristics of the collected sample.

Step 2: The reliability and validity of measurement scales for qualitative variables were evaluated using Cronbach's Alpha to assess internal consistency.

Step 3: Exploratory Factor Analysis (EFA) was applied to reduce the initial set of k observed variables into a smaller set of meaningful latent factors (F < k), eliminate insignificant variables, and identify representative factors for each construct to be used in the binary logit regression.

Step 4: Prior to estimating the binary logit model, multicollinearity among independent variables was tested using the Variance Inflation Factor (VIF) and tolerance indices in SPSS 20.0.

Step 5: The binary logit regression model was estimated using the representative factors obtained from Step 3, along with quantitative and socio-demographic variables from the survey. Model goodness-of-fit, the statistical significance of regression coefficients, and estimation results were subsequently evaluated and interpreted.

4. RESEARCH RESULTS

4.1. Descriptive Statistics

The survey of 400 parents with children enrolled in primary and lower secondary schools in Hanoi—including 200 users and 200 non-users of school bus services—indicates that parents' school travel mode choice is significantly associated with gender, age, educational attainment, occupation, and household income.

Table 1. Socio-demographic characteristics of parents and school bus mode choice behavior.

No	Criteria	Non-users	Users	Total
1. Total respondents surveyed		200	200	400
2. Gender				
2.1	Male	44,00%	49,00%	46,50%
2.2	Female	56,00%	51,00%	53,50%
3. Age (%)				
3.1	Under 30 years		11,0%	5,5%
3.2	30–40 years	21,0%	41,0%	31,0%
3.3	41–50 years	39,5%	38,5%	39,0%
3.4	Over 50 years	39,5%	9,5%	24,5%
4. Educational attainment				
4.1	High school	16,5%	3,5%	10,0%
4.2	Vocational/College	22,5%	22,5%	22,5%
4.3	University	31,5%	44,5%	38,0%
4.4	Postgraduate	29,5%	29,5%	29,5%
5. Occupational characteristics				
5.1	Stationary administrative workers	22,5%	30,0%	26,3%
5.2	Mobile service workers	27,0%	25,0%	26,0%
5.3	Stationary freelancers	27,5%	13,5%	20,5%
5.4	Mobile freelancers	23,0%	31,5%	27,3%
6. Average monthly household income				
6.1	Below VND 15 million	22,5%		11,3%
6.2	VND 15–25 million	27,5%	31,0%	29,3%
6.3	VND 25–40 million	24,0%	44,5%	34,3%
6.4	VND 40–60 million	16,0%	16,0%	16,0%
6.5	Above VND 60 million	10,0%	8,5%	9,3%

Table 2. Students' socio-demographic characteristics and trip characteristics.

No	Criteria	Non-users	Users	Total
1. Total respondents surveyed		200	200	400
2. Type of shool				
2.1	Public	63,0%	37,0%	50,0%

No	Criteria	Non-users	Users	Total
2.2	Private (non-public)	37,0%	63,0%	50,0%
3. Age				
3.1	6–8 years	58,0%	42,0%	50,0%
3.2	9–10 years	25,0%	20,5%	22,8%
3.3	11–14 years	17,0%	37,5%	27,3%
4. Trip distance				
4.1	Less than 1.5 km	22,5%		11,3%
4.2	1.5–3 km	24,0%	23,5%	23,8%
4.3	3–7 km	44,0%	63,5%	53,8%
4.4	Over 7 km	9,5%	13,0%	11,3%
5. Average one-way travel time				
5.1	Less than 10 minutes	19,5%		9,8%
5.2	10–15 minutes	37,0%		18,5%
5.3	15–30 minutes	17,5%	41,0%	29,3%
5.4	Over 30 minutes	26,0%	59,0%	42,5%

Descriptive statistics suggest that parents' decisions to use school bus services are shaped by a combination of socio-demographic characteristics, student attributes, and trip characteristics. Among survey respondents, female parents and those aged 30–50 are more prevalent in the group using school buses, reflecting mothers' dominant role in children's daily commuting and a heightened concern for safety and convenience. Parents with university and postgraduate degrees are also more likely to choose school bus services, indicating a positive relationship between educational attainment, cognitive awareness, and behavioral decision-making. In terms of income, households earning VND 25–40 million per month constitute the largest share of school bus users, suggesting that this income bracket aligns well with the affordability of the service.

With regard to student characteristics, school bus usage is higher among students attending private schools and among those aged 11–14, an age range in which children typically exhibit greater independence. From a trip-based perspective, households with commuting distances of 3–7 km and travel times exceeding 15 minutes show a higher propensity to select school buses, implying that this mode is perceived as an efficient solution for longer and more time-consuming daily travel. Overall, these findings underscore the combined influence of socio-economic conditions, parental perceptions, and spatial factors on school bus mode choice.

4.2. Reliability Analysis (Cronbach's Alpha)

Reliability testing indicates that all construct scales achieve Cronbach's alpha values above 0.8, demonstrating high internal consistency and suitability for further analysis. Specifically, the perceived safety scale records an alpha coefficient of 0,875; convenience and operational aspects reach 0,828; travel cost yields 0,819; and trust in service providers and service quality obtains 0,804. All item–total correlation coefficients exceed the recommended threshold of 0,7 confirming strong internal coherence among observed variables within each construct. These results indicate that the proposed measurement model is both consistent and

reliable, providing a sound basis for subsequent exploratory factor analysis (EFA) and regression modeling.

Table 3. Results of Cronbach's Alpha Reliability Test.

Observed Variables	Item–Total Correlation	Cronbach's Alpha if Item Deleted
1. ***Perception of Safety*** *(Cronbach's Alpha = 0,875; N = 5)*		
1. School buses operate safely and comply with traffic regulations.	0,792	0,826
2. Drivers and supervisors are professionally trained and capable of handling emergencies.	0,714	0,765
3. Buses are regularly inspected and maintained.	0,761	0,847
4. Routes and stops are well-designed to minimize risks for students.	0,723	0,815
5. Parents feel reassured knowing their children are supervised during the trip.	0,713	0,805
2. Perception of Convenience and Logistical Organization (Cronbach's Alpha = 0,828; N = 5)		
1. I choose school buses for their convenience (time, punctuality, and cost efficiency).	0,882	0,815
2. Pick-up/drop-off locations are convenient for my family.	0,789	0,821
3. I am willing to wait an additional 3/5/7/10/15 minutes at the stop.	0,773	0,803
4. I am willing to pay slightly more for convenient pick-up/drop-off points.	0,761	0,857
5. The bus tracking system (via mobile app) makes me feel more secure.	0,797	0,835
3. Travel Cost: Cronbach's Alpha = 0,819 (N=3)		
1. My family currently spends an average of ___ VND per month on my child's school commute.	0,724	0,783
2. The tuition I pay for school bus service per month is approximately: (1) <300.000 VND; (2) 300.000–800.000 VND; (3) 800.000–1.200.000 VND; (4) 1.200.000–2.000.000 VND; (5) >2.000.000 VND.	0,710	0,713
3. I believe "a higher price reflects better safety and quality of service."	0,679	0,755
4. Trust in Service Provider and Service Quality: Cronbach's Alpha = 0,804 (N=7)		
1. I believe the school bus service provider always prioritizes student safety.	0,721	0,765
2. I trust the company's insurance and liability policies.	0,751	0,757
3. I feel safe with the surveillance camera system installed on the buses.	0,793	0,825
4. I believe the bus management team responds promptly to parental feedback.	0,761	0,857
5. I am confident in the professional attitude and communication of the drivers and supervisors.	0,796	0,735

4.3. Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) is conducted to validate the underlying structure of observed variables and to identify latent factors influencing parents' school bus mode choice in Hanoi. Variables representing key perceptual dimensions—namely safety, convenience, and service trust—are included in the analysis. The results yield a Kaiser–Meyer–Olkin (KMO) value of 0,876 and a Bartlett's Test of Sphericity significance level of 0,000, confirming the suitability of the dataset for factor analysis.

Based on the eigenvalue criterion (Eigenvalue > 1) and factor loading thresholds (≥ 0.5), three latent factors are extracted from 15 observed variables, jointly explaining 69.8% of the

total variance. These factors correspond clearly to safety, convenience, and service trust. Although a small number of indicators display moderate cross-loadings between the safety and service trust factors, these remain within acceptable limits and reflect the empirical interdependence between perceived safety and parental trust in school bus service providers.

4.4. Multicollinearity Diagnostics

Prior to estimating the binary logit model, multicollinearity diagnostics are performed to ensure that correlations among independent variables do not bias parameter estimates. Variance Inflation Factors (VIF) and Tolerance values are examined following O'Brien's recommendations. The results indicate that all variables exhibit VIF values below 5 and Tolerance values above 0.20, satisfying accepted thresholds in applied social science research.

Notably, the two variables most likely to be correlated—travel distance and travel time—show VIF values of approximately 2.1 and 2.4, respectively. These values fall well below both the conventional multicollinearity warning threshold (>10) and the more conservative criterion (>5). This suggests that, although positively correlated as commonly observed in urban mobility studies, the relationship between these variables does not pose a serious multicollinearity risk.

Perception–attitude constructs (safety, convenience, and service trust) and socio-demographic characteristics also display VIF values ranging from 1.3 to 1.9, indicating satisfactory independence among explanatory variables. This finding is consistent with the EFA results, which reveal a well-defined factor structure despite moderate interrelationships between safety and service trust. Overall, the diagnostics confirm that the independent variables can be included in the logit model without compromising estimation stability or reliability.

4.5. Binary Logit Regression Model

The binary logit model exhibits good overall fit, with a Nagelkerke R^2 of 0.527 and a classification accuracy of 82%, indicating that the selected explanatory variables account for a substantial proportion of variation in parents' mode choice behavior. The results confirm that socio-demographic characteristics, trip attributes, and parental perceptions and attitudes significantly influence the likelihood of choosing school bus services for children's commuting to school in Hanoi.

Model estimation statistics further demonstrate satisfactory goodness of fit, with a −2 Log Likelihood value of 321,5, a Cox & Snell R^2 of 0,396, and a Nagelkerke R^2 of 0,527, suggesting that approximately 52,7% of the variance in the dependent variable is explained by the model.

Among socio-demographic factors, household income (β = 0,615; p = 0,004) and educational attainment (β = 0,432; p = 0,016) exert positive and statistically significant effects on the probability of school bus use. Specifically, a one-unit increase in household income raises the odds of choosing a school bus by a factor of 1,85, while higher educational attainment increases the odds by 1,54. Occupational status does not exhibit statistical significance at the 5% level.

Regarding trip characteristics, school type (private), student age, travel distance, and travel time all exert positive and statistically significant effects ($p < 0,05$). Among these variables, school type has the strongest influence (Exp(B) = 2,40), indicating that students

attending private schools are 2,4 times more likely to use school bus services than those in the reference group.

Table 4. Summary of Binary Logistic Regression Results.

Variable Group	Independent Variable	B Coefficient	Standard Error (SE)	Wald Statistic	Sig. (p)	Exp (B)	95% Confidence Interval for Exp(B)
Parent Characteristics	Household income	0,615	0,212	8,416	0,004	1,85	1,22 – 2,82
	Educational level	0,432	0,179	5,839	0,016	1,54	1,08 – 2,34
	Occupation (administrative/technical)	0,298	0,174	2,913	0,088	1,35	0,96 – 1,98
Student Characteristics	Type of school (private)	0,874	0,201	18,9	0	2,4	1,61 – 3,57
	Student age group (11–14 years old)	0,553	0,243	5,17	0,023	1,74	1,08 – 2,81
Trip Characteristics	Travel distance (km)	0,621	0,203	9,37	0,002	1,86	1,26 – 2,78
	Travel time (minutes)	0,504	0,201	6,19	0,013	1,65	1,11 – 2,46
	Cost of school commute	-0,162	0,13	1,54	0,215	0,85	0,65 – 1,12
Perceptions & Attitudes	Perceived safety	0,793	0,172	21,29	0	2,21	1,60 – 3,05
	Perceived convenience	0,642	0,225	7,96	0,005	1,9	1,21 – 2,99
	Trust in service quality	0,509	0,199	6,46	0,011	1,66	1,13 – 2,45
	Perceived cost	-0,145	0,114	1,65	0,198	0,86	0,67 – 1,10

-2 Log likelihood = 321,5; Cox & Snell R Square = 0,396; Nagelkerke R Square = 0,527

Within the perception and attitude domain, perceived safety (Exp(B) = 2,21), perceived convenience (Exp(B) = 1,90), and trust in service quality (Exp(B) = 1,66) all have positive and statistically significant effects ($p < 0,05$). In contrast, current escorting costs and cost-related perceptions do not show significant effects on school bus use ($p > 0,05$).

Overall, the results indicate that socio-demographic characteristics, trip attributes, and perception–attitude factors jointly shape parents' school travel mode choice. Among these, factors related to safety, convenience, and school type emerge as the most influential determinants of school bus adoption.

5. DISCUSSION OF RESULTS AND POLICY IMPLICATIONS

The regression results indicate that perceived safety exerts the strongest and most statistically significant influence on parents' mode choice regarding school bus use. In the context of Hanoi, where traffic congestion is persistent and traffic accidents involving school-age children remain a pressing concern, this finding reflects parents' tendency to prioritize safety as the foremost criterion in daily travel decisions for their children. This result is consistent with previous findings by McDonald [23] and Nikitas et al. [24]. However, a novel contribution of this study lies in demonstrating that the magnitude of the safety effect is stronger than that reported in studies conducted in developed cities. This reflects the specific characteristics of Hanoi's highly mixed traffic environment, where motorcycles dominate traffic flows and dedicated pedestrian or school travel infrastructure remains limited.

Convenience also emerges as a significant determinant of school bus mode choice. This suggests that parents value the service's ability to ensure punctual pick-up and drop-off, reduce daily escorting burdens, and enhance time flexibility for commuting to work. In Hanoi, where office-based employment is concentrated and working hours largely overlap with school schedules, convenience assumes particular practical importance. This finding extends the conclusions of Ewing and Cervero [2] by illustrating that convenience is not merely an individual preference but also a reflection of broader urban pressures under constrained transport infrastructure conditions.

Trust in service providers likewise has a positive and statistically significant effect on parents' decisions. Parents are more willing to adopt school bus services only when they have confidence in supervision procedures, driver competence, and the presence and quality of onboard attendants. This is especially salient in Hanoi, where school bus services have expanded rapidly only over the past five years and uniform operational standards remain underdeveloped. This result provides empirical support for Gefen's [25] argument that trust acts as a mediating factor between perceived risk and the adoption of new services—an aspect that has received limited empirical attention in the context of school travel and urban mobility in Vietnam.

Parents with higher household income and educational attainment exhibit a greater likelihood of choosing school bus services. While this finding aligns with Yarlagadda and Srinivasan [26], an important distinction emerges: in Hanoi, the highest adoption rate is observed among middle–upper income households (VND 15–30 million per month), rather than the highest income group. This suggests a non-linear relationship between income and public service adoption in a transitional economic context, where middle-income households tend to prioritize safety and convenience over private vehicle ownership.

Additionally, home-to-school distance and travel time are found to have positive and significant effects on school bus choice, indicating that the service is particularly attractive for longer trips (3–7 km) and in areas experiencing severe congestion. Although distance and travel time are positively correlated, the absence of multicollinearity in the model indicates that these variables capture distinct dimensions of the travel experience. Distance relates primarily to spatial service coverage and the acceptability of boarding locations, while travel time reflects schedule reliability, on-time school arrival, and perceived safety during longer commutes. Parents may tolerate greater distance if travel time remains reasonable, but are less willing to accept excessive travel time even for shorter distances.

Based on the empirical findings, several policy implications can be drawn:

First, enhancing safety and service quality should be prioritized as the central strategy for influencing parents' travel behavior. Policy interventions should focus on standardizing operational procedures, strengthening quality control, and building public trust, rather than competing primarily on price.

Second, improving service convenience through the optimization of travel time and distance is critical. Flexible routing and service designs aligned with users' spatial and temporal constraints can significantly increase the likelihood of adoption.

Third, communication and outreach strategies should emphasize safety, convenience, and service quality rather than focusing excessively on cost. Enhancing users' awareness of service value plays a crucial role in shaping and sustaining mode choice behavior.

Fourth, targeted policies based on income level and educational background should be developed to design differentiated service packages and access strategies, thereby improving implementation effectiveness.

Finally, the findings suggest that in the long term, investments in enhancing users' awareness and trust are likely to yield more sustainable outcomes than short-term interventions centered primarily on cost reduction.

6. CONCLUSION

This study examines parents' mode choice behavior for school commuting in Hanoi, with a particular focus on school bus services. The findings indicate that perceived safety is the most influential determinant of parents' decisions, outweighing cost-related considerations. Perceived convenience and trust in service providers and service quality also exert statistically significant effects on school bus choice. These results underscore the importance of psychological and perception-based factors in students' daily travel behavior, beyond traditional economic and trip-based attributes.

By integrating socioeconomic characteristics, trip features, and perceptual variables within a discrete choice framework, the study contributes empirical evidence to the literature on travel behavior and urban mobility in rapidly urbanizing contexts. The findings offer policy-relevant insights for developing safe, reliable, and sustainable school bus systems to mitigate peak-hour congestion in Hanoi.

The study is limited by its focus on high-quality public and private schools, where school bus services are more prevalent. Future research should extend the analysis to general public schools to enhance representativeness and support broader policy design.

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