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Research Paper

What Drives Students to Use Shuttle Services? Exploring Preferences and Behavior

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Abstract

Shuttle services have become an increasingly popular mode of transportation, particularly in areas where direct access to public transit is lacking. This study focuses on the utilization of shuttle services at Abbaspoor University in Tehran, Iran, and aims to identify the key determinants of students' willingness to use these services. A stated preference survey was conducted to gather data on student preferences, with the questionnaire divided into three sections: socio-economic information, travel behavior, and stated preference scenarios. The survey results were analyzed using a binary logit model to assess the impact of various factors on the adoption of shuttle service. Findings indicate that shuttle services are instrumental in reducing reliance on private vehicles and alleviating traffic congestion. The binary logit model results show that students who commute by metro are 33% more likely to use the shuttle, while car ownership decreases the probability of shuttle adoption by 9%. Moreover, increasing shuttle headways significantly reduces the likelihood of use: from –0.11 at 15 minutes to –0.42 at 60 minutes, underscoring the critical role of service frequency. The model achieved a prediction accuracy of 71% with a McFadden's ρ^2 of 0.225, indicating a satisfactory fit. The study provides valuable insights for the design and implementation of shuttle services in university settings, particularly in developing countries with limited public transportation infrastructure. The results underscore the importance of strategically located shuttle stops and highlight the role of shuttle services in enhancing accessibility, equity, and sustainability within the broader transportation ecosystem.

Keywords: Shuttle Services, University Campus, Stated Preference Scenario, Binary Logit

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1. Introduction

Shuttle services have emerged as an expanding mode of transportation, particularly where direct access to public transit is unavailable or insufficient. Often classified as feeder services, they serve diverse roles across multiple sectors. Corporate offices and healthcare facilities, for instance, rely on shuttles to support employee and patient mobility, while educational institutions and residential areas employ them as first-mile/last-mile (FMLM) solutions that connect travelers to the nearest public transit stations. This role is especially valuable in suburban areas or large campuses where residential neighborhoods or university facilities are distant from subway stations or bus stops (Baghestani et al., 2023; Kanafani & Wang, 2010a; Li & Hensher, 2013a; Losada Rojas et al., 2018a; Mahpour et al., 2023).

Shuttle services improve network connectivity, reduce reliance on private vehicles, and support sustainable travel by offering reliable and cost-effective access to major transit nodes. Their potential benefits include alleviating congestion, lowering emissions, and enhancing accessibility. However, these outcomes are context-dependent and influenced by substitution patterns and service design. For example, evidence from a Chinese case study indicates that community shuttles replaced about 30% of private trips and reduced emissions by nearly 28%, yet other studies caution that benefits may be limited when shuttles substitute for short walking trips or when access distances are under one kilometer (Rich, 2024; Z. Zhao et al., 2022).

Within universities, shuttle services fulfill a variety of functions. They support intra-campus travel across large areas and connect campuses in multi-campus systems (Azzali & Sabour, 2018a). In developing countries, where public transportation is often insufficient, university shuttle services can act as essential feeders linking campuses to broader networks, thereby improving accessibility and mobility for students (Kazemeini & Kermanshah, 2023). These services also contribute to inclusivity by improving access to educational and recreational facilities, which supports equity on campus (Balsas, 2003a; Limanond et al., 2011a).

Beyond practical convenience, shuttle services are important for their role in reducing private vehicle dependency and mitigating congestion and environmental impact. Recent studies highlight that ridership strongly depends on service attributes such as headway and reliability, with more frequent and reliable services attracting higher demand, though with diminishing marginal returns (Berrebi et al., 2021; Currie & Loader, 2010). To interpret these behavioral responses, the present study is guided by theoretical frameworks. Discrete-choice theory conceptualizes shuttle adoption as a utility-maximizing decision, supporting the use of stated-preference surveys and logit modeling to analyze willingness to use such services (Louviere et al., 2000a; Train, 2009). In parallel, the Theory of Planned Behavior (TPB) explains how individual attitudes, subjective norms, and perceived behavioral control shape adoption of sustainable travel modes (Ajzen, 1991; Heath & Gifford, 2002). Together, these frameworks not only inform the survey design but also provide insight into how service quality and behavioral factors jointly influence students' willingness to adopt shuttle services.

Previous studies have examined the factors that affect the utility of shuttle services and identified the user groups for whom these services are an attractive alternative (Cao & Wang, 2016; Chen, 2019). However, a research gap persists regarding the factors influencing demand for university shuttle services, especially in developing-country contexts. To address this gap, this study focuses on Abbaspoor University in Tehran, Iran, where a stated-preference survey was designed to assess student attitudes, concerns, and preferences. The collected data are analyzed through a

binary logit model to identify key determinants of willingness to adopt shuttle services.

The structure of this paper is as follows. The second section presents a comprehensive literature review on shuttle services and mode choice in transportation. The third section details the research methodology, including data collection processes and modeling approaches. The fourth section presents the results of the analysis, followed by a discussion of the findings in the fifth section. Finally, the sixth section concludes the study with a summary of findings and recommendations for future research and policy implications.

2. Literature Review

The global rise in shuttle services has prompted numerous studies to investigate their role in transportation (Shu et al., 2021; Van der Hurk et al., 2016; J. Zhao & Dessouky, 2008;). For example, (Yim & Ceder, 2006) Conducted a telephone survey of households in Custer Valley to assess the shuttle system. Their results showed that three-fifths of respondents were inclined to use the shuttle to reach the Bay Area Rapid Transit (BART) station, with gender, vehicle ownership, ethnicity, and employment status as significant determinants. However, the study was limited by its small regional scope and the absence of behavioral variables such as attitudes or perceived convenience, reducing its external validity. Similarly, (Shiftan et al., 2006) Applied a vehicle choice logit model in a national park context, concluding that fare costs, travel time, and route design influence behavior. While methodologically rigorous, the hypothetical setting of leisure trips may not translate directly to daily commuting. These examples illustrate both the potential of shuttle services and the importance of critically examining methodological boundaries when generalizing findings.

In the university context, several studies have investigated shuttle systems as cost-effective alternatives to private transport (Arif Khan et al., 2023; Nadimi et al., 2023; Zhou, 2014). For instance, (Gbadamosi, 2023a) analyzed shuttle operations at Lagos State University, highlighting financial constraints, maintenance challenges, and fluctuating demand. The study underscored the importance of sustainable funding models but was based primarily on descriptive analysis without modeling adoption behavior, which limits causal inference. (Kutty et al., 2021) studied shuttle services at Qatar University, using optimization techniques to enhance route efficiency. Their results demonstrated reduced waiting times and improved satisfaction; however, the study emphasized operations rather than demand-side behavioral factors. Together, these studies reveal that while operational improvements are feasible, the determinants of actual adoption remain underexplored in university contexts.

Student perceptions also play an essential role (Javid & Al-Kasbi, 2021). Assessed preferences for university bus services versus private cars, showing that attributes such as smooth travel, safety, and time savings influence modal intentions. Attitudes and social factors shaped adoption more strongly than cost alone, aligning with behavioral theories. Yet, the study's reliance on self-reported perceptions suggests the possibility of hypothetical bias. Similarly, (Charbatzadeh et al., 2016) and (Etminani-Ghasrodashti et al., 2018) Identified reliability and frequency as critical factors in student satisfaction, though both studies were based on single-campus samples and lacked external validation across diverse contexts. These limitations highlight the need for broader and comparative evidence.

A wider body of literature has explored students' mobility behavior in academic settings (Baghestani et al., 2024, 2025a; Farzin et al., 2024). (Whalen et al., 2013), in a Canadian case study, found that cost, travel time, and urban design characteristics such as street and sidewalk density shaped modal choices, though the developed-country setting may reduce applicability to developing contexts. (Cattaneo et al., 2018) Reported that

exposure to environmental information increased students' willingness to use sustainable transport, reducing private car trips by 5–9% depending on location. These studies demonstrate the importance of attitudinal and contextual factors, but most originate from developed countries, limiting their relevance to settings like Iran. More recent work in Iran, such as (Nadimi et al., 2023) on bus services and (Maljaee & Sameni, 2022) On metro use, it shows how limited infrastructure, affordability concerns, and cultural factors (including gender norms) critically shape student choices, factors not adequately captured in developed-country studies.

To integrate findings, prior research can be grouped into five categories of determinants: (1) Service attributes (headway, reliability, stop proximity, fare), (2) Trip attributes (total travel time, transfers, access distance), (3) Sociodemographic factors (gender, vehicle ownership, income, employment), (4) Behavioral and attitudinal factors (perceptions of safety, comfort, and environmental attitudes), and (5) Contextual factors (university location, transport infrastructure, and policy environment). While most studies have examined subsets of these categories, few synthesize them into a comprehensive framework. Moreover, many adopt descriptive or small-sample approaches without robust modeling. This gap motivates the application of Discrete Choice Theory, which formalizes mode adoption as a utility-maximizing decision (Louviere et al., 2000a; Train, 2009), and the Theory of Planned Behavior, which incorporates psychological constructs such as attitudes, subjective norms, and perceived control (Ajzen, 1991; Heath & Gifford, 2002). These theoretical frameworks provide coherence across diverse findings and guide our empirical approach.

In summary, while the literature identifies multiple determinants of shuttle service use, it remains fragmented across contexts and methodologies. Evidence from developed countries dominates, with relatively few studies in developing nations despite distinct structural and behavioral conditions. Methodological limitations, such as small samples, reliance on self-reported data, or narrow case studies, also reduce generalizability. Addressing these gaps, this study contributes by applying a stated-preference survey and discrete-choice modeling in the Iranian university context, thereby extending the literature to a developing-country setting while linking operational attributes and behavioral constructs within a unified theoretical framework.

3. Methodology

3.1. Study Area

Located in Tehran's Hakimiyeh neighborhood, Shahid Abbaspoor Technical and Engineering Campus has four faculties, fourteen specialized departments, five centers and institutes, and approximately sixty specialized units. The campus currently has 2,100 students, including 1,800 undergraduates, 300 master's degree candidates, and 80 doctoral students, supervised by 120 faculty members.

Given the location of this campus in the suburbs of Tehran, most students use private cars, ride-hailing, or the metro to commute. Also, campus students face transportation challenges due to the distance to the nearest subway station (Farhangsara). Students rely on buses, taxis, and ride-hailing services to bridge this gap, yet buses often entail extended waiting times, up to 35 minutes, while the cost of taxis and ride-hailing services may present financial constraints for students. The available routes for taxi and ride-hailing from Farhangsara Metro Station to the university are shown in figure 1.

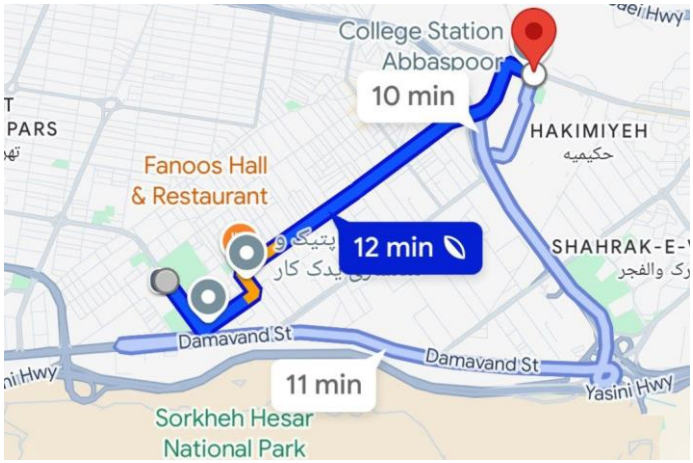

Figure 1. Available routes for taxi and ride-hailing from Farhangsara Metro Station to the university

3.2. Questionnaire Design

A questionnaire was employed to examine individuals' behavior concerning the shuttle system. The questionnaire comprised three sections: the first section gathered respondents' socio-economic information, the second section focused on individuals' travel behavior, and the third section presented a stated preference scenario. In the first section, respondents were asked questions regarding their age, gender, educational level, car ownership, and independent income, and respondents answered the questions in the form of multiple-choice answers. The second section focused on questions related to individuals' travel modes from their origin to the university. For example, respondents were asked about their travel modes using multiple-choice questions (e.g., "Which mode of transport do you usually use to commute to the university? Metro/Taxi/Ride-hailing/Private car/Other"). The third section presented scenarios pertaining to their willingness to use the shuttle service. The stated preference scenarios were designed to reflect realistic commuting conditions between the Farhangsara metro station and the campus. Key attributes included shuttle frequency (15, 30, and 60 minutes), which were selected based on current bus headways observed in the area and discussions with campus transportation officials. These intervals represent typical waiting times students currently face and thus provide meaningful alternatives for choice modeling.

3.3. Data Collection

Data collection began with a pilot survey conducted through interviews with several individuals to identify any confusing or inadequately expressed sections of the questionnaire. Necessary revisions were made based on the identified issues. The questionnaires were distributed using a face-to-face interview approach, targeting students across different faculties and academic levels to ensure diversity in responses. The questionnaires were distributed among 330 students over a period of 1 month. During the cleaning and refining process, responses with incomplete socio-economic or travel behavior information were excluded. Specifically, questionnaires with more than 20% missing data, inconsistent answers, or outliers were removed. After this process, 294 valid responses remained for analysis.

3.4. Discrete Choice Model

The logit model is a discrete choice model that assumes the random error term follows a Gumbel distribution. A special case of the logit model is the binary logit model, which deals with only two alternatives for the decision maker (Puan et al., 2019). This study applies the binary logit model to examine the choice behavior of travelers regarding the use of the shuttle system. The authors assume that

travelers will opt for the shuttle system if they derive a higher utility from it, and will reject it otherwise. The utility function for the shuttle system alternative is specified as follows:

$$V = \alpha + \beta_k X_k \quad (1)$$

where V: measurable utility of using the shuttle system

α: constant coefficient,

β_k: coefficient of the independent variable k,

X_k: the independent variable k.

The model parameters are estimated using the Maximum Likelihood Method (MLE). The MLE method assumes that there is a population that is most likely to generate the observed sample, and finds the parameters that maximize the probability of observing the sample from that population (Rossi, 2018). To assess the model fit, the ρ^2 index is used, which is analogous to R^2 in linear regression models. The ρ_c^2 index is also used to compare models with different market shares. Furthermore, one of the performance measures for binary logit models is the Percent Correct (PC), which indicates how well the model can accurately predict the observed choices (Baghestani et al., 2025b; Cramer, 1999; Mahpour et al., 2023).

The marginal effect of a predictor in a categorical response model quantifies how the probability of a certain response level varies as the predictor varies. For a continuous predictor, the marginal effect is the slope of the event probability curve with respect to the predictor of interest. For a binary categorical predictor, it is the difference in event probability when the predictor switches from one level to another (Bland & Cook, 2019).

4. Results

This section commences with a detailed descriptive analysis of the respondent demographics. Following this, the results derived from the modeling process are elucidated.

4.1. Descriptive Analysis

As mentioned in data collection, a total of 294 valid responses were recorded. Based on this, 146 of the respondents are females, whereas 148 are males (Table 1). About 11.56% of students are married, and 88.44% are single. In comparison, only 25 students don't have a certificate, whereas 91.50 % of the general population does. According to the data, about 65.30% of students have access to a private car. Furthermore, the ownership of vehicles among students' families is depicted, indicating that households without any car comprise only 1.79% of the population. The relatively high car ownership rate suggests that many students have the option of private car use, which can reduce their likelihood of adopting shuttle services unless the shuttle offers clear advantages in terms of cost, convenience, or travel time. The table below illustrates the distribution of students across various academic levels: 69.05% are pursuing undergraduate studies, 22.79% are enrolled in postgraduate programs, and 8.16% are engaged in doctoral research. Given the overall student population at this university, this sample is representative of the broader statistical population.

Table 1. Descriptive analysis of socioeconomic variables

Socioeconomic factor		Number	Percentage
Gender	Female	146	49.65
	Male	148	50.35
Marital Status	Married	34	11.56
	Single	260	88.44
Driving-Licence	Yes	269	91.50
	No	25	8.50
Independent Income	Yes	139	47.28
	No	155	52.72

Socioeconomic factor		Number	Percentage
Available Car	Yes	192	65.30
	No	102	34.70
Car Ownership	No car	5	1.71
	1	132	44.89
	2 or More	157	53.40
Education Level	Bachelor	203	69.05
	Master of Science	67	22.79
	PHD	24	8.16
Sum		294	100

Table indicates the mode choice of respondents to reach the university. As indicated, the Farhangsara Metro has captured a 54% share of students' transportation choices compared to other modes. This underscores the significance of this metro station for students. On the other hand, the share of private cars is approximately 30% in total, while other modes of transportation have a smaller share compared to these two modes. The dominance of metro usage (54%) highlights the critical role of the Farhangsara station as the primary gateway for student commutes. This reliance on metro services reinforces the need for efficient solutions, such as a dedicated shuttle system, to connect the metro station to the campus.

Table 2. Mode choice of respondents to reach the university

Transportation Mode	Number	Percentage
Metro (Farhangsara) & Ride-Hailing	67	22.79
Metro (Farhangsara) & Taxi	62	21.09
Metro (Farhangsara) & Bus	30	10.20
Other Metro Stations	2	0.68
Ride-Hailing	19	6.46
Taxi	3	1.02
Bus	9	3.06
Private Car	87	29.60
Other (walking, motorcycle & etc)	15	5.10
Sum	294	100

Table Shows the number of student trips on weekdays by gender. It's evident that a considerable number of students commute to the university on Saturdays, Sundays, Mondays, and Tuesdays. The results indicate that approximately 81.78% of students commute to the university on Saturdays, 88.09% on Sundays, 92.85% on Mondays, 81.63% on Tuesdays, and 63.94% on Wednesdays. The weekday travel distribution also reveals heavy commuting on Sundays through Tuesdays, with over 80% of students on campus during these days. This pattern implies that shuttle demand is likely to peak at the beginning of the week, which should be considered in service scheduling and capacity planning. These findings provide a contextual foundation for the binary logit analysis and demonstrate the potential impact of integrating shuttle services into the students' commuting system.

Table 3. Number of Student Trips on Weekdays by Gender (294 responses)

Frequency of Trip	Male	Female	Total	Percentage
Saturday	128	110	238	81.78
Sunday	145	114	259	88.09
Monday	154	119	273	92.85
Tuesday	129	111	240	81.63

Frequency of Trip	Male	Female	Total	Percentage
Wednesday	93	95	188	63.94

4.2. Binary Logit Model

Table 4 Illustrates the results of the binary model analysis regarding shuttle use within a stated preferences scenario. Since in the stated scenario one of the stations is located near the subway station, students who use the subway to come to the university tend to use the shuttle system to reach the university. Additionally, the number of days each student spends at the university has a positive effect on whether they use the shuttle system. In contrast, students with an available car and a certificate are less likely to use this system. Additionally, the frequency of the round-trip shuttle system has a negative effect on its use, which means that the higher the frequency between the two shuttle systems, the lower its utility. The selection of variables in the final binary logit model was based on both theoretical relevance and statistical significance. Variables such as metro use, shuttle frequency, number of days on campus, and car ownership were retained because they directly capture factors influencing the practicality and necessity of shuttle services. Other variables, including gender, education level, and independent income, were initially tested in the model but were found to be statistically insignificant (p-values > 0.1) and were therefore excluded to improve model parsimony.

Table 4. Results of the Binary logit model

Variable	Description	Coefficient	Standard error	t-test	p-value
CONS	Constant	-0.042	0.400	-0.10	0.917
Metro	Students who use the subway to commute	1.862	0.176	10.59	0.000
Fre	Shuttle system round-trip frequency (minutes)	-0.395	0.005	-8.75	0.000
Nday	The number of days students are in the university	0.239	0.083	2.90	0.004
Acar	Students who have an available car and a driving license	-0.555	0.172	-3.22	0.001
LL(C) = -606.958 LL(β) = -470.270 ρ2C = 0.225 Percent Correct = 71%					

The model fit statistics indicate a McFadden's ρ^2 value of 0.225 and a prediction accuracy of 71%. According to Louviere et al. (Louviere et al., 2000b) And Hensher et al. (Hensher et al., 2015), values of ρ^2 between 0.2 and 0.4 are generally considered indicative of a good model fit in discrete choice studies. Similarly, previous transportation studies applying binary logit models in comparable contexts have reported prediction accuracies in the 65–75% range (e.g., (Baghestani et al., 2024; Cramer, 1999; Puan et al., 2019; Baghestani, Heshami, Mahpour, et al., 2025). Thus, the reported fit statistics are consistent with the literature. An analysis of the marginal effects of the binary logit model on the choice of the shuttle system is shown in table 5. The marginal effect was estimated for each of the announced frequencies, which were 15 minutes, 30 minutes, and 1 hour. The results show that the likelihood of using the shuttle system decreases as the frequency between the shuttles increases. Also, the number of days students are in the university is from 1 to 5 days; the more they are in the university, the more likely they are to use this system. In addition, students who commute by subway add a value of 0.33 to the probability of using the shuttle system, and having an available car and having

a license reduces the probability of choosing this option by 0.09.

Table 5. Marginal effect of the binary logit model for the shuttle service choice

Variable	Description	Value	Coefficient
Metro	Students who use the subway to commute	Yes	0.33
		No	0
Fre	Shuttle system round-trip frequency (minutes)	15	-0.11
		30	-0.21
		60	-0.42
Nday	The number of days students are in the university	1	0.04
		2	0.09
		3	0.13
		4	0.17
		5	0.21
Acar	Students who have an available car and a driving license	Yes	-0.09
		No	0

5. Discussion

The analysis of the model's marginal effects indicates that students who commute to the university via subway are most likely to utilize the university's shuttle system. This finding aligns with the objectives of this study. It is recommended that university transportation policymakers implement the shuttle system on the specified route from Farhangsara metro station to the Shahid Abbaspoor Technical and Engineering Campus. Additionally, given the proximity of two other university campuses near the Shahid Abbaspoor Technical and Engineering Campus, it is advisable for the university presidents to consider an integrated shuttle system.

While the recommendation for an integrated shuttle system is promising, its feasibility depends on several practical considerations. Implementing such a system would require coordination among multiple campuses, allocation of funding for fleet acquisition and operation, and assessment of infrastructure needs, such as designated shuttle stops and layover areas. Potential challenges include ensuring financial sustainability, especially if fares remain low, and scheduling integration with metro services to minimize waiting times. For the proposed Farhangsara route, cost estimates and funding sources (e.g., university budget allocation, partnerships with municipal authorities, or student transportation fees) must be considered. Infrastructure upgrades, including signage, shelters, and safety measures along the shuttle corridor, would also be necessary to enhance usability and reliability. By acknowledging these logistical and financial aspects, the recommendations become more actionable for policymakers and university administrators.

According to the results, a 60-minute interval for each shuttle system decreases the likelihood of usage to 0.42, whereas a 15-minute interval reduces this likelihood to 0.11. Consequently, it can be inferred that a 15-minute frequency is more effective in attracting students compared to a 60-minute frequency. These results are consistent with previous research (Gbadamosi, 2023b). Policymakers can utilize these insights to make informed decisions regarding the optimal frequency of shuttle systems at the Shahid Abbaspoor Technical and Engineering Campus.

Beyond the significant role of metro commuters and shuttle frequency, other model results provide important insights. The negative effect of car ownership (Acar: -0.555) suggests that students who have access to a private car are

less likely to adopt shuttle services, highlighting the challenge of reducing private vehicle dependency in suburban university settings. This underscores the importance of designing shuttle systems that can compete with private cars in terms of cost, convenience, and travel time.

Conversely, the positive effect of the number of days spent on campus (Nday: 0.239) indicates that students with higher weekly commuting frequency are more inclined to use shuttle services. This reflects the potential of the shuttle system to serve regular commuters who are sensitive to accumulated transportation costs and travel fatigue. These findings reinforce the value of integrating shuttle planning into broader campus transportation strategies and support targeted policies to encourage sustainable commuting choices.

Beyond the immediate context of Abbaspoor University, the findings have broader implications for transportation policy and sustainability. By reducing dependence on private cars, shuttle services can contribute to lowering traffic congestion and vehicle emissions, thereby supporting national goals of environmental sustainability. Moreover, shuttle systems enhance equity in mobility, as they provide affordable and reliable transportation options for students who may lack access to private vehicles. In developing country contexts where public transit coverage is often limited, university shuttles can bridge gaps in the transit network and improve accessibility for disadvantaged groups.

6. Conclusion

This study aimed to investigate the factors influencing the utilization of the shuttle system at Abbaspoor University, particularly for student travel to the Farhangsara metro station. Data were collected through a questionnaire, yielding 294 responses. Following a descriptive analysis, a binary logit model was employed to identify the key variables affecting shuttle system usage. The findings indicate that students who commute to the university by subway and those who spend more days on campus positively influence shuttle system usage. Conversely, the frequency of shuttle trips and the availability of a personal car and driver's license negatively impact the desirability of the shuttle system. Additionally, a marginal effect analysis revealed that commuting by metro has the most significant positive effect on the likelihood of using the shuttle system, while a 60-minute shuttle frequency has the most substantial negative effect.

The research underscores the importance of strategic planning in the deployment of shuttle services, particularly in large campuses or suburban areas where public transit access is limited. By optimizing shuttle frequencies and ensuring proximity to key locations such as student residences and academic buildings, universities can improve overall network connectivity and student satisfaction. These insights are valuable for policymakers aiming to enhance campus transportation systems and promote environmentally friendly travel behaviors.

Overall, the study provides actionable recommendations for university transportation planners. Implementing more frequent shuttle services—for instance, 15-minute headways offered free of charge for students, with vehicles providing enhanced service quality and a minimum capacity of 15 passengers—could significantly increase ridership, reduce traffic congestion, and mitigate environmental impacts. Future research should continue to explore the specific factors influencing shuttle service effectiveness and student preferences, ensuring that transportation solutions are tailored to the unique needs of university communities.

It is important to note several limitations of this study. First, the binary logit model relies on the Independence of Irrelevant Alternatives (IIA) assumption, which may not hold if additional commuting alternatives are considered in future studies. Second, the use of a convenience

sample of Abbaspoor University students introduces the possibility of sampling bias and limits the representativeness of the results. Third, the findings are context-specific, reflecting the travel behavior of students at a suburban university in Tehran, which may reduce generalizability to other campuses or urban settings. Recognizing these limitations, future research should apply more diverse sampling methods, consider advanced discrete choice models such as multinomial or mixed logit, and conduct comparative studies across different universities to strengthen external validity.

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