P-ISSN 2664-0422	Pakistan Social Sciences Review	April-June 2024, Vol. 8, No. 2
O-ISSN 2664-0430	https://doi.org/10.35484/pssr.2024(8-II)20	[233-242]

Pakistan Social Sciences Review
www.pssr.org.pk

RESEARCH PAPER

Multan's Domestic Travel Landscape: Unraveling Influential Factors in Transportation Choices

[1]Dr. Hina Ali *, [2]Syeda Neha Fatima and [3]Rabia Mohsin

1. Associate Professor, Department of Economics, The Women University Multan, Punjab, Pakistan
2. PhD Scholar, Department of Economics, The Women University Multan, Punjab, Pakistan
3. Lecturer, Department of Sociology, Ghazi University Dera Ghazi Khan, Punjab, Pakistan

***Corresponding Author:** hinaali@wum.edu.pk

ABSTRACT

The study endeavors to discern the determinants influencing individual travel mode preferences within the urban landscape of Multan City, located in the province of Punjab, Pakistan. Methodologically anchored in primary data acquired through an online questionnaire, a judicious application of convenient sampling facilitated the assimilation of pertinent information. Employing the binary regression Logit model, the discernments proffer that variables such as income, total distance, gender, and fuel expenditure exert a significant influence on the selection of travel mode. Conversely, the variables of age and possession of a driving license were found to be non-contributory to the individuals' choices in travel mode.

KEYWORDS Age, Driving License, Fuel Expenditure, Gender, Income Level, Total Distance

Introduction

The selection of a travel mode constitutes the intricate process of decision-making wherein an individual opts for a specific transportation mode for a given journey. This decision hinges on a myriad of factors, encompassing the purpose of travel, travel distance, duration, cost implications, comfort, safety considerations, environmental impact, and individual preferences.

The spectrum of travel mode options encompasses walking, public transit, private transit, and solitary driving, each accompanied by its own set of advantages and disadvantages. The optimal choice is contingent upon the unique circumstances surrounding the trip. Public transit emerges as an economically viable and sustainable alternative, particularly for extended distances, particularly in urban locales endowed with robust transit infrastructure. In navigating the complex landscape of travel mode decisions, individuals weigh the nuanced trade-offs associated with each mode to arrive at the most judicious choice.

Ultimately, the selection of a travel mode is a deeply personal decision, contingent upon individual preferences and specific circumstances. Deliberating the trade-offs inherent in various modes becomes imperative, intending to identify the option that not only aligns with one's needs but also minimizes adverse impacts on the environment and society at large. A comprehensive exploration of different facets within the realm of transportation is undertaken, encompassing transportation modes, infrastructure, planning, technology, environmental considerations, and economic ramifications. Transportation, defined as the movement of people, goods, and services from one location to another, constitutes a cornerstone of contemporary society. Its pivotal role extends beyond mere logistical functions, contributing significantly to social engagement, economic development, and fostering cross-cultural interchange. Diverse

modes of transportation, such as water, air, train, and roadways, collectively form the spectrum of alternative means for mobility. The intricate web of transportation infrastructure comprises vital elements like roads, bridges, airports, seaports, and railways. Integral to this framework is transportation planning, a dynamic process involving the formulation of policies and strategies aimed at enhancing and achieving a sustainable and efficient transport system. Recognizing transportation as not just a utilitarian necessity but a multifaceted enabler of societal progress underscores its far-reaching impact on our interconnected world.

The impact of transportation on the environment is unmistakable, with emissions from vehicles standing out as a significant contributor to air pollution and the aggravation of climate change. The discernible consequences of these emissions underscore the pressing imperative for the adoption of sustainable and eco-friendly solutions to alleviate environmental degradation. Addressing the environmental challenges posed by transportation necessitates a paradigm shift towards cleaner and more sustainable modes of mobility. Embracing innovations such as electric vehicles, promoting public transportation, and investing in alternative fuels are integral components of a comprehensive strategy aimed at mitigating the adverse effects of transportation on our environment. This proactive approach not only aligns with global efforts to combat climate change but also fosters a more resilient and harmonious coexistence between transportation systems and the delicate ecosystems they traverse.

Literature Review

Horjus et al. (2022) studied the impact of virtual skills on the intent to use public transport and shared modes in a multi-modal network. Younger, more educated individuals with previous exposure to shared mobility showed higher intent. Using various transport means during a journey also positively influenced shared mobility intent (Reiffer et al., 2023). Ehtehshamrad et al. (2022) delved into the intricate dynamics of how guardians and their children navigate the realm of public transportation. Within this familial context, guardians emerged as pivotal decision-makers, holding the reins in determining their children's mode of transportation when commuting to school. Remarkably, the study discerned a reciprocal influence, wherein the guardians' own choice of travel mode was intricately intertwined with the specific needs of their children's journeys. The research endeavors to proffer a model that encapsulates and predicts the behavioral patterns of both guardians and children in the context of opting for public transportation for school and work-related trips. Drawing insights from a sizable sample of 4000 families, with 1876 participants engaged through paper surveys, the study focused specifically on respondents with at least one child at the elementary school level.

Jaszberenyi et al. (2022) conducted a study delving into the transformative potential of self-driving cars in shaping mobility and the tourism industry. The research focused on key variables, including the willingness to adopt autonomous vehicles for tourism, the influence of unfamiliar environments, and the role of habitual vehicle usage in the context of self-driving cars. Notably, the researchers extended the technology acceptance model to comprehensively elucidate the factors contributing to the adoption of autonomous vehicles specifically for tourism purposes. Employing a robust covariance-based structural equation model (CB-SEM), the study yielded insightful findings. It revealed a positive impact of autonomous vehicles on tourism intentions, signifying a favorable disposition toward incorporating this technology into the travel experience. However, a counterintuitive revelation emerged wherein a strong adherence

to conventional vehicle use exhibited an adverse effect on the inclination to embrace self-driving cars for tourism purposes (Al Mansoori, Al-Emran & Shaalan, 2023).

Fessler et al. (2022) conducted a comprehensive exploration into user preferences concerning a crowd shipping concept integrated with public transportation, wherein users actively contribute to the transportation of parcels during their commute. Employing a stated choice experiment, participants were presented with varying scenarios that altered factors such as parcel quantity, size, weight, compensation, and the additional time required. The researchers leveraged data obtained from 524 transit users in the Greater Copenhagen Area, employing a mixed logit model for estimation. The study unveiled compelling findings, with all main effects proving statistically significant. Bai et al. (2022) explored students' attitudes during university closures in China. Positive link found between street greenery and active travel. Suggested urban planning focuses on green spaces for green transportation goals.

Abdullah et al. (2022) conducted a comprehensive exploration into mode choice behavior in Pakistan, examining shifts that occurred before and during the COVID-19 pandemic. The researchers employed an online questionnaire survey to gather pertinent information, covering socioeconomic factors, determinants influencing mode choice, and the preferred modes for both shorter and longer journeys in the context of circumstances before and after the onset of the pandemic. To model the intricate mode choice behavior, discrete choice models were utilized. The research findings underscored notable shifts during the pandemic period. Joseph et al. (2022) conducted a comprehensive exploration into the impact of Bus Rapid Transit (BRT) systems on addressing mobility challenges. The BRT, designed to enhance public transportation through scheduled services and dedicated lanes, aimed to improve accessibility to central districts. The study delved into changes in people's travel behavior before and after the implementation of BRT, leveraging a GPS application to analyze alterations in spatial mobility demands, including newly visited locations, travel frequency, trip distances, and departure times. Additionally, short surveys were employed to document geographical characteristics. The findings highlighted the association between informal public transport, such as mini-buses and motorcycles, and various mobility challenges. Zhang et al. (2022) explored gender differences in nighttime travel behavior. Fear of violence and urban space influenced mobility. Analyzed using various indexes including the Tucker-Lewis Index (Pani, 2023).

Liu et al. (2022) delved into the concept of empowering departure time shifts as a potential strategy to alleviate congestion during peak hours. The study employed Inverse Reinforcement Learning (IRL) as a method to capture travelers' preferences regarding departure times. Numerous reward functions were utilized to articulate the decision-making behavior associated with the selection of departure times based on observed data. The findings underscored the efficacy of the Inverse Reinforcement Learning model in replicating individual decision behavior regarding departure times. Through the implementation of pricing and incentive schemes, the study demonstrated that travelers exhibited significant shifts in their departure times. This suggests that strategic interventions, informed by a nuanced understanding of individual preferences, can be instrumental in influencing and optimizing travel behavior. Yang et al. (2022) explored competition and coordination in public transportation choices. Negative externalities, such as traffic congestion, impacted mode choice behavior. Lab experiments with 100 participants showed significant effects.

Magdolen et al. (2022) conducted a study exploring the impact of long travel on climate and the travel behavior of individuals residing in metropolitan areas. The

research revealed that while urban dwellers tend to cover short distances in their daily lives using eco-friendly modes of transportation, a different pattern emerges when it comes to extremely long journeys, particularly in the context of recreational travel. The study focused on investigating the travel behavior of urban individuals, with a specific emphasis on recreational travel. The methodology employed an integrated approach, considering factors such as regular travel patterns, norms, attitudes, and socio-demographic characteristics. The research identified a specific category of leisure travelers labeled as 'young travel-dependent urbanites,' characterized by individuals from metropolitan areas who do not own a vehicle (von Behren et al., 2024). Irawan et al. (2022) explored factors influencing bike use among students in Yogyakarta, Indonesia. Low-income, male undergraduates and those in multi-bike families were more motivated to be future motorcyclists.

Dütschke et al. (2022) delved into the significance of leisure travel, particularly its role in everyday mobility. The study aimed to present a comprehensive understanding of the socio-psychological and economic factors influencing individual choices of transportation modes for both routine daily mobility and longer-distance leisure travel. To gather information, the authors employed an online questionnaire targeting individuals with driving licenses, with a focus on age and gender demographics. The research was motivated by a perceived gap in the existing literature, with a specific aim to bridge the understanding of the drivers behind the utilization of sustainable transportation modes in various contexts—ranging from daily life to extended leisure travel (de Pater et al., 2022). Measures to reduce the transport-related carbon footprint of the Erasmus+ program. Qunfeng et al. (2022) explored energy consumption in urban areas, finding buildings produced more CO2 emissions than transport. Travel patterns and participants' perceptions played crucial roles in mode choices.

Material and Methods

Data and Methods

The current study relies on primary data obtained through a meticulous research methodology. A random sampling technique was employed to ensure a representative sample of the population under study. To gather information from the respondents, a questionnaire survey was conducted. The survey was administered online, reaching a total of 324 participants residing in Multan city, located in the Punjab region of Pakistan. The survey specifically targeted individuals who engage in travel for various purposes, encompassing both work/study commitments and leisure or family gatherings. Notably, a significant portion of the respondents in this survey did not possess personal means of transportation, opting instead for public transport due to a variety of reasons. The participants in this research were primarily students or employed individuals, reflecting the diversity of the working and learning population in Multan. The inclusion of both male and female respondents spanning different age groups adds depth to the study, allowing for a comprehensive exploration of travel behavior and preferences within the given demographic context.

Model Specification

The econometric form of a model is given below:

Metro bus=f (age, income, total distance, gender, driving license, fuel expenditure)

Careem, Uber, In-drive= f (age, income, total distance, gender, driving license, fuel expenditure)

The functional form of a model can be written as:
RS= β0+β1AG+ β2GN+β3MI+β4DL+β5FE+ β6TD+μ. (Equation No. 1)
MB= β0+β1AG+ β2GN+β3MI+β4DL+β5FE+ β6TD+μ. (Equation No. 2)
The description of the variables is presented below:

Table 1
Definition of Variables

Variable	Description	Unit of measurement	Expected Relationship
Dependent Variables	-----	-----	-----
Metro bus/Veda	MB	Dummy Variable Metro-users: 1 Non-users: 0	Positive
Careem, Uber, In-drive	RS	Dummy Variable Users: 1 Non-users: 0	Positive
Independent Variables	-----	-----	-----
Age	AG	In completed years	Negative
Income	MI	PKR Rupees	Positive
Total Distance	TD	Km/h	Positive
Driving License	DL	Dummy Variable License holder: 1 Not having: 0	Negative
Gender	GN	Dummy Variable Female: 1 Male: 0	Positive
Fuel Expenditure	FE	Rupees/liter	Positive

This study employs the binary regression model due to the dichotomous nature of the dependent variable. Binary regression, also known as logistic regression, is particularly suited for situations where the dependent variable is binary or dichotomous. In this case, the dependent variable takes on two possible outcomes, often coded as '0' or '1'. In the context of this research, the dependent variable is binary, reflecting the choice between public transport (coded as '1') and private transport (coded as '0'). The objective of the study is to concentrate on individuals who opt for public transport and to discern the factors influencing their mode choices under various circumstances. Binary regression models are well-suited for such scenarios as they allow for the analysis of the probability of an event occurring, making them particularly effective for understanding the determinants of binary choices, such as the selection between public and private transport in this research. The coding of the dependent variable as '1' for public transport and '0' for private transport facilitates the application of the binary regression model to uncover the underlying factors shaping individuals' mode choices in different situations.

Logit Model Results

Table 2
Metro Model

Variables in the Equation							
		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1[a]	@1.Age	-.007	.019	.143	1	.706	.993
	Income	.000	.000	10.000	1	.002	1.000
	Total distance	.062	.023	7.178	1	.007	1.064
	@2.Gender	1.046	.267	15.344	1	.000	2.845
	Driving license	-.640	.355	3.259	1	.071	.527
	Fuel exp	.000	.000	13.949	1	.000	1.000
	Constant	-.761	.548	1.928	1	.165	.467

a. Variable(s) entered on step 1: @1.Age, Income, Total distance, @2.Gender, Driving license, fuelexp

The Metro Bus system has emerged as a pivotal mode of transportation in several Pakistani cities, notably Lahore, Islamabad, and Multan. It offers a reliable and efficient public transportation option, particularly beneficial in congested urban settings. The system aims to alleviate traffic congestion, providing a convenient alternative to private vehicles. Metro buses are strategically designed to enhance travel efficiency, offering faster transit times compared to traditional buses. This not only saves commuters' time but also contributes to reduced fuel consumption, leading to cost savings for passengers. The implementation of Metro Bus projects involves significant infrastructure development, including dedicated bus lanes, well-equipped stations, and terminals. Beyond improving transportation, these projects create employment opportunities and stimulate economic growth within the construction and transportation sectors. Analyzing the factors influencing the choice of transportation mode, the study found that age is statistically insignificant and negatively associated with the use of Metro buses. This implies that age does not significantly impact the preference for Metro buses, suggesting a universal appeal across age groups. Monthly income emerges as a crucial determinant in travel mode choice, with a highly significant positive association. This underscores the influence of income levels on the decision to opt for Metro buses, indicating that higher or lower incomes play a substantial role in shaping transportation preferences. Total distance proves to be statistically highly significant, and positively associated with the choice of public transit. The equal fare structure of the Metro Bus system is highlighted as an economic and beneficial feature, particularly amidst inflationary conditions.

Gender emerges as a significant factor, with a positive association with the use of Metro buses, indicating differing preferences between males and females in terms of transportation choices. Fuel expenditure is found to be positively associated with Metro bus usage, signifying a significant impact on the decision to use public transport. The study suggests that individuals opt for Metro buses to mitigate fuel costs, contributing to a more sustainable and cost-effective mode of transportation. The use of public transport, particularly the Metro Bus, is seen as an effective strategy to limit travel costs for respondents. Moreover, possessing a driving license is found to be negatively associated with Metro bus usage, indicating that the availability of a driving license has no significant impact on the choice of Metro buses. Overall, these findings provide valuable insights into the factors influencing transportation choices and highlight the significance of public transport systems like the Metro Bus in addressing urban mobility challenges.

Table 3
Careem, Uber, In-Drive

Variables in the Equation

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1[a]	@1.Age	-.019	.019	1.049	1	.306	.981
	Income	.000	.000	7.674	1	.006	1.000
	Totaldistance	.082	.023	12.523	1	.000	1.085
	@2.Gender	.954	.270	12.474	1	.000	2.596
	Driving license	-.564	.359	2.470	1	.116	.569
	fuelexp	.000	.000	12.076	1	.001	1.000
	Constant	-1.046	.558	3.506	1	.061	.351

a. Variable(s) entered on step 1: @1.Age, Income, Total distance, @2.Gender, Driving license, fuel exp.

Ride-sharing, a prominent transportation system facilitated through mobile applications or online platforms, involves drivers offering rides in their vehicles. Notable services in this mode include Careem, Uber, and In-drive, known for their budget-friendly alternatives to private transport. Examining the factors influencing ride-sharing choices, the study reveals that the age of respondents is negatively associated with ride-sharing, indicating that age has no significant impact on this travel mode. Changes in age, whether an increase or decrease, are unlikely to affect the preference for ride-sharing. Income emerges as a significant determinant, with a positive association indicating that higher income correlates with increased use of ride-sharing services. This underscores the role of income levels in shaping preferences for ride-sharing.

Total distance to travel proves to be a crucial factor influencing travel mode choices, with a highly significant positive impact. Longer distances prompt a preference for more comfortable transportation options, highlighting the importance of distance in mode choice. Gender plays a pivotal role, revealing distinct travel mode preferences between men and women. Men tend to favor bikes in ride-sharing, while women with families often prefer cars. The results depict a divergence in choices, emphasizing that gender is highly significant and positively associated with ride-sharing, with women utilizing ride-sharing more than male respondents. Fuel expenditure emerges as a key factor in choosing public transport, particularly given the significant rise in petrol prices in Pakistan. The study shows a positive association, indicating that higher fuel expenditure prompts a shift towards public transport as a cost-effective alternative. Interestingly, the possession of a driving license is not statistically significant, with a negative association suggesting no impact on the choice of ride-sharing. Individuals without driving licenses are more likely to utilize this mode of transportation, underscoring that the availability of a driving license has no significant influence on ride-sharing choices. In summary, this study provides valuable insights into the factors shaping ride-sharing choices, highlighting the significance of income, total distance, gender, and fuel expenditure in influencing individuals' preferences for this mode of transportation. The findings contribute to a better understanding of the dynamics surrounding ride-sharing in the context of urban mobility in Pakistan.

Conclusion

The primary aim is to identify key factors influencing travel mode choice in Multan, building on research in various international cities. Multan's emerging transportation system is crucial for the country's economic development. Results highlight age, income, driving license, fuel expenditure, and gender as significant factors influencing travel mode choice. Age and possessing a driving license negatively impact the choice, while monthly income, fuel expenditure, and gender positively influence it. The Logit model was employed and binary regression analysis revealed outcomes, contributing valuable insights into the dynamics of travel mode preferences in Multan.

Policy Implication

Policy implications for factors influencing travel mode choice include:

Improve Public Transport

Enhance the quality of buses and trains to make public transport more convenient and reliable, promoting its attractiveness to travelers.

Develop Cycling Infrastructure

Invest in cycle lanes and secure bicycle parking facilities to encourage cycling for short-distance trips, reducing environmental impact and improving public health.

Create Pedestrian-Friendly Environments

Improve sidewalks, crosswalks, and pedestrian safety measures, fostering workability and promoting healthier urban environments.

Coordinate Transportation Planning with Urban Development

Ensure transportation options are easily accessible and well-connected to residential, commercial, and recreational areas, promoting sustainable travel patterns. Implementing these policies can facilitate a shift towards sustainable travel, alleviate traffic congestion, enhance air quality, and improve overall transportation efficiency.

References

Abdullah, M., Ali, N., Aslam, A. B., Javid, M. A., & Hussain, S. A. (2022). Factors affecting the mode choice behavior before and during the COVID-19 pandemic in Pakistan. *International Journal of transportation science and technology*, *11*(1), 174-186.

Al Mansoori, S., Al-Emran, M., & Shaalan, K. (2023). Factors Affecting Autonomous Vehicles Adoption: A Systematic Review, Proposed Framework, and Future Roadmap. *International Journal of Human–Computer Interaction*, 1-22. 10.1080/10447318.2023.2286089

Bai, Y., Cao, M., Wang, R., Liu, Y., & Wang, S. (2022). How street greenery facilitates active travel for university students. *Journal of Transport & Health*, *26*, 101393.

de Pater, M., Gabrielczak, P., Kokko, S., Omar, M., & Saarela, H. (2022). *Measures to reduce the transport-related carbon footprint of the Erasmus+ program.* European University Foundation

Dütschke, E., Engel, L., Theis, A., & Hanss, D. (2022). Car driving, air travel, or more sustainable transport? Socio-psychological factors in everyday mobility and long-distance leisure travel. *Travel Behaviour and Society*, *28*, 115-127.

Ehteshamrad, S., Saffarzadeh, M., Mamdoohi, A., & Nordfjærn, T. (2022). Behavior of parents and children in the way they use public transport. A case study of Iranian households. *Case studies on transport policy*, *10*(1), 454-462.

Fessler, A., Thorhauge, M., Mabit, S., & Haustein, S. (2022). A public transport-based crowd shipping concept as a sustainable last-mile solution: Assessing user preferences with a stated choice experiment. *Transportation Research Part A: Policy and Practice*, *158*, 210-223.

Horjus, J. S., Gkiotsalitis, K., Nijënstein, S., & Geurs, K. T. (2022). Integration of shared transport at a public transport stop: mode choice intentions of different user segments at a mobility hub. *Journal of Urban Mobility*, *2*, 100026.

Irawan, M. Z., Belgiawan, P. F., & Joewono, T. B. (2022). Investigating the effects of individual attitudes and social norms on students' intention to use motorcycles–An integrated choice and latent variable model. *Travel behavior and society*, *28*, 50-58.

Jászberényi, M., Miskolczi, M., Munkácsy, A., & Földes, D. (2022). What drives tourists to adopt self-driving cars? *Transportation research part F: traffic psychology and behavior*, *89*, 407-422.

Ji, Q., Li, C., Makvandi, M., & Zhou, X. (2022). Impacts of urban form on integrated energy demands of buildings and transport at the community level: A comparison and analysis from an empirical study. *Sustainable Cities and Society*, *79*, 103680.

Joseph, L., Neven, A., Martens, K., Kweka, O., Wets, G., & Janssens, D. (2020). Activity participation and perceptions on informal public transport and bus rapid transit in Dar Es Salaam. *Transportation Research Record*, *2674*(11), 573-583.

Liu, Y., Li, Y., Qin, G., Tian, Y., & Sun, J. (2022). Understanding the behavioral effect of incentives on departure time choice using inverse reinforcement learning. *Travel Behaviour and Society*, *29*, 113-124.

Magdolen, M., von Behren, S., Chlond, B., & Vortisch, P. (2022). Long-distance travel in tension with everyday mobility of urbanites–A classification of leisure travelers. *Travel Behaviour and Society*, *26*, 290-300.

Malichová, E., Cornet, Y., & Hudák, M. (2022). Travelers' use and perception of travel time in long-distance trips in Europe. *Travel Behaviour and Society*, *27*, 95-106.

Pani, A., Sahu, P., & Mishra, S. (2023). Gender disparities in multimodal travel attitudes, behavior, and satisfaction. *Transportation research part D: transport and environment*, *123*, 103917.

Reiffer, A., Magdolen, M., Ecke, L., & Vortisch, P. (2023). Effects of COVID-19 on Telework and commuting behavior: Evidence from 3 years of Panel Data. *Transportation Research Record*, *2677*(4), 478-493.

von Behren, S., Puhe, M., & Magdolen, M. (2024). Social aspects of long-distance travel-a study of two survey designs. *Transportation Research Procedia*, *76*, 361-372.

Yang, Y., Han, X., Jiang, R., Jia, B., & Gao, Z. Y. (2022). Competition and coordination in public transport: A mode choice experiment. *Transportation Research Part C: Emerging Technologies*, *143*, 103858.

Zhang, M., Zhao, P., & Tong, X. (2022). Constructing women's immobility: Fear of violence and Women's constricted nocturnal travel behavior. *Travel behavior and society*, *26*, 178-192.