

TRANSPORT FINDINGS

Understanding Car Ownership Decisions: Evidence from an Emerging Central Business District in Mumbai, India

Aditya Saxena, Ph.D.¹, Abhijna M, Ph.D.¹, K. V. Krishna Rao, Ph.D.¹¹ Department of Civil Engineering, Indian Institute of Technology Bombay

Keywords: Car ownership, Mixed logit, Perceived access time, Perceived travel cost, Revealed preference

<https://doi.org/10.32866/001c.159386>

Findings

This study examines factors associated with car ownership in an emerging central business district in Mumbai, India, using a revealed preference survey and mixed logit model. The results indicate that higher individual monthly income, parenthood, and higher perceived travel costs of other modes are associated with a higher probability of car ownership, whereas higher perceived car travel cost is associated with a lower probability of car ownership. The model reveals significant heterogeneity in sensitivity to perceived two-wheeler travel cost. Scenario analysis indicates that lower perceived access time to public transport is associated with a lower predicted probability of car ownership.

1. Questions

Examining the determinants of vehicle ownership remains a central focus in transportation research. Past studies have examined a range of factors influencing vehicle ownership, including the built environment characteristics (Laviolette et al. 2022; Shen et al. 2016) as well as socioeconomic and residential attributes (Hankach et al. 2022; Ko et al. 2019). Several studies have focused on the economic implications of vehicle ownership (Baum 2009; Dargay et al. 2007). Researchers have also investigated how public transport service availability (Vasudevan et al. 2021; Blumenberg et al. 2021) and emerging mobility options such as carpooling (Ye et al. 2021) influence vehicle ownership choices. Recent studies have focused on the determinants of young adults' decisions to own vehicles (Jiang et al. 2023). Against this background, the present study seeks to answer the question: What socioeconomic and travel-related factors are associated with the likelihood of car ownership in the context of a dense urban employment center in a lower-middle-income country (LMIC)? Unlike most car ownership studies that focus on citywide scales, this paper investigates the car ownership choice of employees in an emerging central business district (CBD) in Mumbai, the financial center of India. While CBDs in developed economies are characterized by strong public transport provision and parking constraints that suppress car ownership, emerging CBDs in LMICs often operate under structurally constrained transit conditions, with perceived access time to public transport and perceived travel costs playing a more central role in car ownership decisions. This study estimates a mixed logit model of car ownership that incorporates these travel-related attributes.

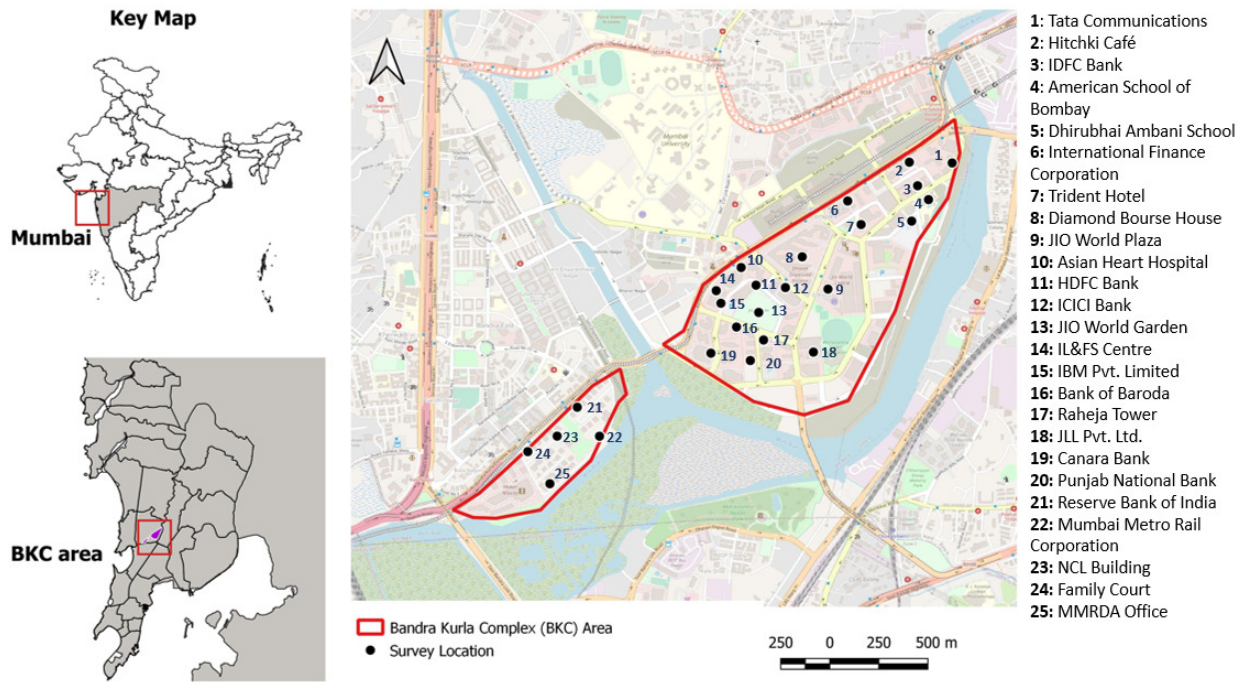


Fig. 1. Study area with survey locations

2. Methods

The study was conducted in Mumbai, which exhibits a polycentric urban structure with employment distributed across multiple high-intensity activity centers, focusing on the Bandra Kurla Complex (BKC) as a representative dense employment hub (Fig. 1). A revealed preference survey was conducted among employees in BKC to collect socio-economic and travel characteristics. Although BKC primarily comprises a formal workforce, responses from the informal workforce, such as daily wage earners, were also collected to ensure comprehensive representation of the working population. Data were collected from various locations, such as offices, food stalls, and shopping malls, across BKC, using a random sampling approach to ensure spatial distribution. In-person surveys were administered by trained enumerators using a web-based questionnaire developed in *123FormBuilder* on smartphones. The questionnaire used for car users is provided as supplementary material.

The travel modes considered were car, two-wheeler, and public transport. In this context, public transport primarily refers to suburban rail, which is the predominant public transport mode used by commuters in BKC, as bus usage was limited and metro was not yet available in the area. Perceived travel cost (self-reported fuel expenditure or fare) was collected for current mode and the two alternative modes. Perceived access time to public transport (self-reported time to reach the boarding point) was collected from all respondents. Respondents were assumed to be familiar with alternative modes; those lacking such knowledge were excluded.

Using Slovin's formula with a 95% confidence level (Susanto et al. 2017) the minimum required sample size was 385. A total of 764 responses were collected, of which 747 valid samples were retained after data cleaning for analysis. A mixed logit model of individual-level car ownership was estimated in R (Apollo), with perceived travel costs and perceived access time to public transport specified as random parameters. Respondents reported the number of cars they owned, which was recoded as a binary variable (1 = at least one car; 0 = none).

3. Findings

[Fig. 2](#) presents the socio-demographic distribution of respondents along with the corresponding car ownership status. Overall, 46.5% of respondents reported owning at least one car. Based on unit-level data from the Household Consumption Expenditure Survey 2022-23, about 15% of urban households in Maharashtra state own at least one car (MoSPI, 2023). Although this reflects household-level ownership, it provides a population-level benchmark for contextualizing car ownership prevalence in this employment centre.

A comparison of the mean perceived travel cost per km (computed as perceived travel cost divided by trip length for each respondent) for all modes and the mean perceived access time to public transport by travel mode used is shown in [Table 1](#). Public transport users report the lowest perceived public transport travel cost, while their perceived costs for car travel are higher than those reported by car users. In contrast, car users report higher perceived public transport cost than public transport users, while reporting lower perceived cost for car travel. Two-wheeler users report higher perceived costs for both car and public transport than the respective mode users. This pattern may reflect that, for modes not currently used, perceived travel cost captures a broader notion of travel burden rather than strictly monetary expenditure. In contrast, perceived access time to public transport shows less variation across mode user groups. Overall, these findings indicate differences in perceived travel attributes across mode user groups, supporting the use of perception-based variables in the modeling framework.

[Table 2](#) shows the mixed logit model results. The negative and significant alternative-specific constant indicates a low baseline propensity for car ownership. Being female or aged 30 to 45 years is associated with a lower car ownership likelihood, whereas being a parent or a postgraduate is associated with a higher likelihood. The lower ownership likelihood among 30 to 45-year-olds, relative to 18 to 30-year-olds, may reflect generational trends. Easy access to car loans may enable younger professionals to purchase vehicles early, whereas mid-career individuals, often settled with family, may reside closer to work and avoid relying on cars. Higher income exhibits a strong positive association with car ownership probability, with individuals with more than 50,000 INR monthly income more likely to own cars.

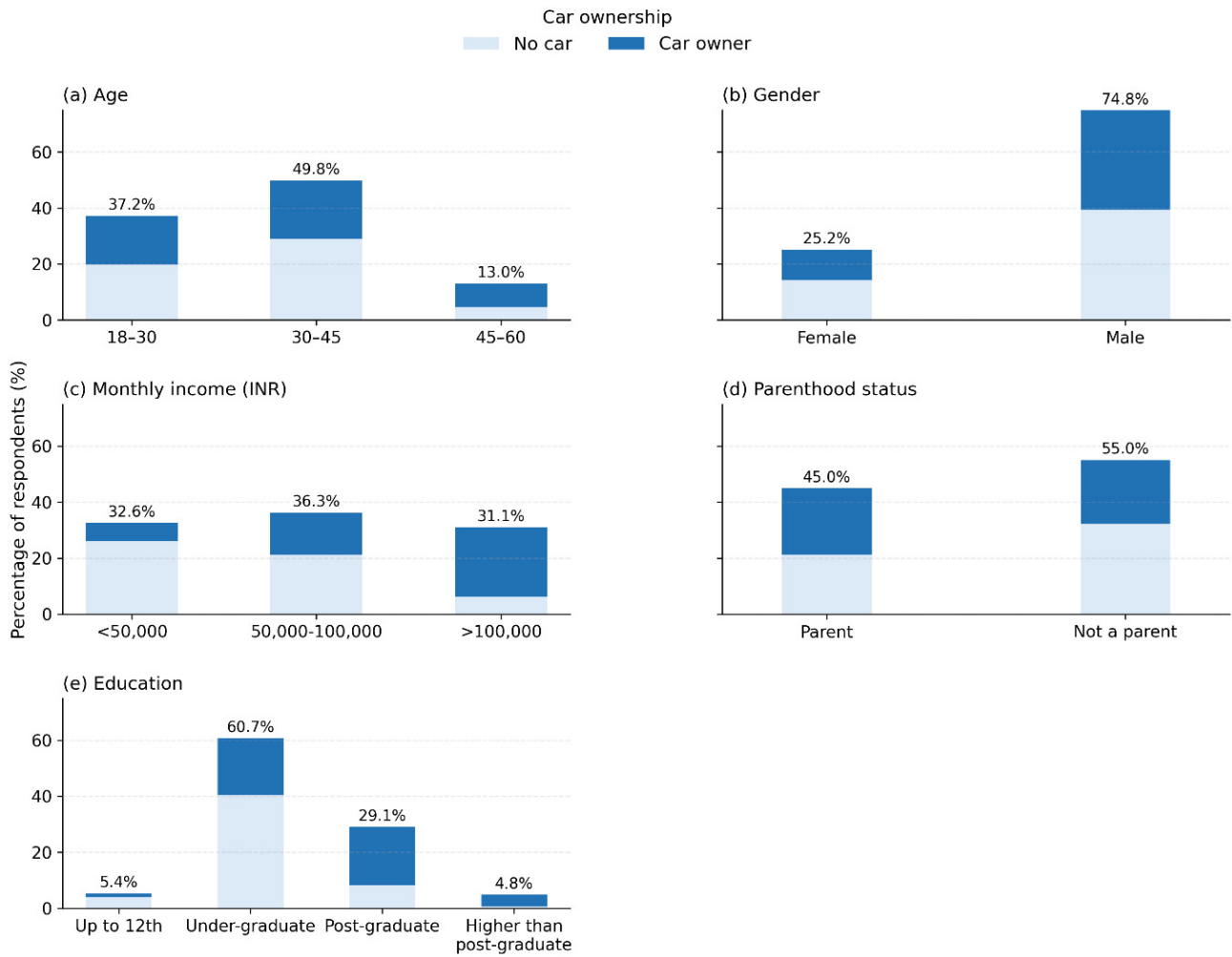


Fig. 2. Distribution of car ownership status across socio-economic groups: (a) Age, (b) Gender, (c) Monthly income (INR), (d) Parenthood status, and (e) Education

Table 1. Mean perceived travel cost per km for each mode and mean perceived access time to public transport, by travel mode used

Travel mode used	Mean perceived travel cost per km (INR)			Mean perceived access time to public transport (Minutes)
	Car	Two-wheeler	Public transport	
Car	16.40	11.19	12.80	10.56
Two-wheeler	27.56	11.24	12.40	15.26
Public transport	22.05	8.10	3.59	13.65

Higher perceived car travel cost is associated with a lower car ownership likelihood, whereas higher perceived travel costs of two-wheeler and public transport are associated with a higher likelihood. Longer perceived access times to public transport are significantly associated with an increased car ownership likelihood. Normal distributions were assigned to the random parameters representing perceived travel costs and perceived access time to public transport. The model reveals significant heterogeneity in sensitivity to perceived two-wheeler travel cost, while heterogeneity in perceived car travel cost sensitivity is marginally significant at the 10% level.

Table 2. Mixed Logit Model for car ownership

Variable	Coefficient	Robust Std. Error	Robust t-statistic
ASC (Car ownership)	-2.485	0.668	-3.721
Female	-0.817	0.457	-1.788
Parent	0.948	0.551	1.720
30 - 45 years	-0.644	0.394	-1.634
Postgraduate	0.755	0.454	1.662
Monthly income: 50,000 to 100,000 INR	2.065	0.515	4.008
Monthly income: More than 100,000 INR	4.911	0.909	5.405
Perceived travel cost: PT (mean)	0.027	0.008	3.163
Perceived travel cost: PT (sd)	0.001	0.006	0.129
Perceived access time to public transport (mean)	0.099	0.029	3.354
Perceived access time to public transport (sd)	0.003	0.012	0.294
Perceived travel cost: car (mean)	-0.023	0.006	-4.047
Perceived travel cost: car (sd)	0.007	0.004	1.726
Perceived travel cost: two-wheeler (mean)	0.033	0.011	3.118
Perceived travel cost: two-wheeler (sd)	0.031	0.012	2.479
Log likelihood at constant	-510.35		
Log likelihood at convergence	-340.26		
Rho-squared	0.333		
Adjusted rho-squared	0.304		

Note: Female = 1 if female, 0 otherwise; Parent = 1 if has children, 0 otherwise; Base categories for age: 18 - 30 years, education: graduate, monthly income: less than 50,000 INR; PT: Public Transport; sd: standard deviation

Table 3. Predicted car ownership probabilities based on perceived access time to public transport scenarios

Scenario	Predicted probability of car ownership
Baseline (current perceived access time to PT)	0.474
90% of baseline	0.463
80% of baseline	0.451
70% of baseline	0.440
60% of baseline	0.429
50% of baseline	0.418

Scenario-based analysis ([Table 3](#)) shows that as perceived access time to public transport shifts to 50% of its current level, the predicted probability of car ownership decreased from 0.474 to 0.418, indicating an absolute reduction of 0.056 (5.6%). This corresponds to an 11.8% decrease in ownership likelihood relative to the baseline scenario. This scenario is based on a shift in perceived access time to public transport rather than a change in actual network conditions. The results indicate that, within the estimated model, car ownership probability is sensitive to changes in perceived access time to public transport.

Overall, the results indicate that reductions in perceived access time to public transport and the perceived travel costs of alternative modes are associated with a lower likelihood of car ownership in this context. These findings

are consistent with the view that enhancing first-mile connectivity and maintaining affordable public transport fares could help moderate car ownership probability, particularly in dense urban regions like Mumbai.

Submitted: November 16, 2025 AEDT. Accepted: March 23, 2026 AEDT. Published: March 28, 2026 AEDT.



This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CCBY-SA-4.0). View this license's legal deed at <https://creativecommons.org/licenses/by-sa/4.0> and legal code at <https://creativecommons.org/licenses/by-sa/4.0/legalcode> for more information.

REFERENCES

- Baum, C. L. 2009. "The Effects of Vehicle Ownership on Employment." *Journal of Urban Economics* 66 (3): 151–63. <https://doi.org/10.1016/j.jue.2009.06.003>.
- Blumenberg, E., J. Paul, and G. Pierce. 2021. "Travel in the Digital Age: Vehicle Ownership and Technology-Facilitated Accessibility." *Transport Policy* 103 (January): 86–94. <https://doi.org/10.1016/j.tranpol.2021.01.014>.
- Dargay, J., D. Gately, and M. Sommer. 2007. "Vehicle Ownership and Income Growth, Worldwide: 1960-2030." *The Energy Journal* 28 (4): 143–70. <https://doi.org/10.5547/ISSN0195-6574-EJ-Vol28-No4-7>.
- Hankach, P., P. Gastineau, and P. O. Vandanjon. 2022. "Multi-Scale Spatial Analysis of Household Car Ownership Using Distance-Based Moran's Eigenvector Maps: Case Study in Loire-Atlantique (France)." *Journal of Transport Geography* 98 (November 2021): 103223. <https://doi.org/10.1016/j.jtrangeo.2021.103223>.
- Jiang, Y., Z. Guo, R. Zhang, W. Zong, and J. Zhang. 2023. "How Do Expected Changes in Life Affect Young People's Stated Ownership of Privately-Owned Autonomous Vehicles: A Comparative Study." *Transport Policy* 135 (January 2022): 71–81. <https://doi.org/10.1016/j.tranpol.2023.03.008>.
- Ko, J., H. Ki, and S. Lee. 2019. "Factors Affecting Carsharing Program Participants' Car Ownership Changes." *Transportation Letters* 11 (4): 208–18. <https://doi.org/10.1080/19427867.2017.1329891>.
- Lavolette, J., C. Morency, O. D. Waygood, and K. G. Goulias. 2022. "Car Ownership and the Built Environment: A Spatial Modeling Approach." *Transportation Research Record* 2676 (3): 125–41. <https://doi.org/10.1177/03611981211049409>.
- Shen, Q., P. Chen, and H. Pan. 2016. "Factors Affecting Car Ownership and Mode Choice in Rail Transit-Supported Suburbs of a Large Chinese City." *Transportation Research Part A: Policy and Practice* 94: 31–44. <https://doi.org/10.1016/j.tra.2016.08.027>.
- Susanto, T. D., M. M. Diani, and I. Hafidz. 2017. "User Acceptance of E-Government Citizen Report System (a Case Study of City113 App)." *Procedia Comput. Sci.* 124: 560–68. <https://doi.org/10.1016/j.procs.2017.12.190>.
- Vasudevan, V., R. Agarwala, and S. Dash. 2021. "Is Vehicle Ownership in Urban India Influenced by the Availability of High Quality Dedicated Public Transit Systems?" *IATSS Research* 45 (3): 286–92. <https://doi.org/10.1016/j.iatssr.2020.12.005>.
- Ye, J., D. Wang, X. Li, K. W. Axhausen, and Y. Jin. 2021. "Assessing One-Way Carsharing's Impacts on Vehicle Ownership: Evidence from Shanghai with an International Comparison." *Transportation Research Part A: Policy and Practice* 150 (February 2020): 16–32. <https://doi.org/10.1016/j.tra.2021.05.012>.

SUPPLEMENTARY MATERIALS

Supplemental

Download: <https://findingspress.org/article/159386-understanding-car-ownership-decisions-evidence-from-an-emerging-central-business-district-in-mumbai-india/attachment/336377.pdf>
