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Commuter Preferences for Shared Micromobility Integration with Mass Transit Systems

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Abstract *— Shared bicycle and e-scooter services are increasingly positioned as first-and-last-mile connectors to mass transit systems, yet commuter willingness to integrate micromobility into routine transit journeys depends on factors extending beyond simple availability. This study examines commuter preferences regarding shared micromobility integration with rail-based transit, using a stated preference survey administered to regular transit commuters across several transit-served districts. We model preference trade-offs among transfer time savings, micromobility fare structure, parking predictability at transit stations, and weather exposure, applying discrete choice modeling to estimate the relative importance commuters assign to each factor when deciding whether to substitute micromobility for walking or connecting bus service. Findings indicate that parking predictability at transit stations, rather than fare level, most strongly influences willingness to adopt micromobility for transit connections, suggesting that operational reliability concerns outweigh cost sensitivity for this travel segment. Weather exposure sensitivity varied considerably by commuter age group, with implications for infrastructure investments such as covered parking and sheltered pickup zones. These findings inform transit agency partnerships with micromobility operators seeking to design integration policies that address the specific barriers commuters report rather than assumed cost barriers alone.*

Index Terms *— micromobility, urban mobility, mass transit integration, commuter behavior, first-last mile*

I. INTRODUCTION

Transit agencies increasingly view shared bicycles and e-scooters as first-and-last-mile connectors capable of extending effective catchment areas around rail stations [1]. Yet observed integration uptake often lags stated policy ambitions, suggesting that commuter willingness depends on factors beyond simple service availability [2].

Existing evaluations of micromobility-transit integration frequently emphasize fare structure and pricing incentives, drawing on general technology adoption frameworks [3]. Less attention has been paid to operational reliability factors, such as parking predictability at stations, that may matter more to habitual commuters than one-time users [4].

This study models commuter trade-offs among transfer time savings, fare structure, parking predictability, and weather exposure using a stated preference survey and discrete choice estimation, to identify which factors most strongly influence willingness to substitute micromobility for walking or bus connections.

II. RELATED WORK

Prior first-and-last-mile research has documented micromobility's potential to extend transit catchment areas but has relied largely on revealed preference data from early adopters, limiting insight into barriers among the broader commuter population. Discrete choice studies of mode integration in other contexts have found parking and reliability factors salient, but comparable evidence for rail-transit micromobility connections remains limited. Complementary evidence from adjacent literature further situates these dynamics within the broader field [5]. Related methodological precedents also inform the analytical choices adopted here [6].

III. METHODOLOGY

A stated preference survey was administered to regular rail transit commuters across several transit-served districts, presenting respondents with hypothetical connection scenarios varying transfer time savings, fare level, parking predictability, and weather exposure.

A. Discrete Choice Model Specification

Responses were analyzed using a multinomial logit discrete choice model in which utility for each connection mode is expressed as a linear function of attribute levels, allowing estimation of relative attribute importance through marginal utility coefficients and implied willingness-to-pay measures for each factor.

$$U_{ij} = \beta_1 T_{ij} + \beta_2 F_{ij} + \beta_3 P_{ij} + \beta_4 W_{ij} + \varepsilon_{ij} \qquad (1)$$

IV. RESULTS

Table 1 reports estimated relative importance weights for each attribute across the full sample and by age group. Parking predictability received the highest relative importance weight overall, exceeding fare level.

Weather exposure sensitivity was notably higher among older respondents, consistent with reported reluctance to rely on micromobility without sheltered pickup infrastructure.

V. DISCUSSION

The dominance of parking predictability over fare level suggests that commuters weigh operational reliability more heavily than cost once a connection option is viable at all, chal-

Table 1. Relative attribute importance in mode choice

Attribute	Overall Weight	Younger Group	Older Group
Parking predictability	0.34	0.31	0.39
Transfer time savings	0.27	0.29	0.24
Fare structure	0.21	0.24	0.16
Weather exposure	0.18	0.16	0.21

lenging pricing-centric integration strategies. The age-group divergence in weather sensitivity indicates that infrastructure investments, such as covered parking and sheltered pickup zones, may yield differentiated adoption gains across commuter segments. Stated preference data carry the usual caveat of imperfect correspondence with revealed behavior, warranting complementary field trials.

VI. CONCLUSION

Transit agency partnerships with micromobility operators should prioritize parking reliability and weather-protective infrastructure alongside fare integration to meaningfully expand first-and-last-mile adoption. Future research should validate these preference estimates against revealed usage data following infrastructure interventions.

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