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A Traffic Mode Choice Model for the Bus User Groups Based on SP and RP Data

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Abstract

Enhancing the bus share rate is a major measure to relieve the traffic congestion. To analyze the effect of public transit policy, this paper establishes MNL models based on both SP data and combining SP and RP data, which was collected in Jinan city. Then the paper analyzes how the influencing factors affect the choice proportion of bus travel mode for the bus user groups. In the end, the paper obtains some significant conclusions and proposes measures which would enhance the bus attraction.

Keywords:SP and RP Survey; MNL model; Combining data; Sensitivity analysis;

1.Introduction

With the rapid development of economy, the total number of motor vehicles ownership in large and medium-sized cities in China grows rapidly. Traffic demand grows continuously, while the supply of urban land resources strains increasingly. The contradiction between traffic supply and demand is obvious. It is unable to meet the growing travel demand by relying solely on expanding and increasing the road construction. Bus priority policy can improve the utilization rate of road resources, which is the effective way of solving road congestion problems in city. It is the focus of study for many scholars to increase the public transit share rate.

Several studies have been conducted to increase the public transit share rate. Li studied the bus priority policy affected the development of urban traffic. Wang studied the method of making the subway ticket price. Litman studied how to predict the travel impacts of specific price reforms and management strategies. Paulley et al

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studied bus travel demand was affected by the fare, service level, individual income and the number of car ownership.

It is essential to discuss the bus travel demand under different service level and technology before studying the bus share rate. RP data(revealed preference data, RP data for short) can't describe the nonexistent traffic mode, on the contrary, SP data(stated preference data, SP data for short) can design future traffic scene and analysis the traffic demand under different conditions. However, revealed preference choice may be in contradiction with stated preference choice, in others ways, the SP data has the biases. Many scholars made studies to solve problem of SP data biases. Guan et al established the combining model by combining the traffic experiment data and SP data and solved the SP data deviation. Ben.A et al combining RP data and SP data which is revised by RP data established model to solve the SP data biases.

This paper uses above method and establishes MNL models using the SP and RP data of the bus user groups in Jinan city. Then the paper makes the sensitivity analysis of some main factors in order to analyze their effects on enhancing the bus attraction. In the end, some significant recommendations are concluded.

2. Travel Behavior Survey of the Bus User Groups

The method of Revealed Preference (RP) survey and Stated Preference (SP) survey was used to analyze the user behavior in this paper. The survey items include three parts.

- Personal information including gender, age, occupation, car purchase plan, and monthly household income
- Bus travel behavior including weekly trip times of used traffic mode, payment mode, bus travel time and bus satisfaction degree
- Stated Preference survey

Bus ticket price, bus travel time, parking fee and fuel cost are four important influencing factors and used to design the questionnaire survey.

Air-conditioned bus and non air-conditioned bus price are set three levels. Bus travel time is set two levels. Parking fee and fuel cost are set two levels. Orthogonal design method is used to obtain the most suitable factor combination as shown in table 1.

Table 1. Factors Combination of SP

Air-conditioned and non air-conditioned bus ticket price	Travel time	Parking fee and fuel cost unchanged	Parking fee and fuel cost increased	
1yuan /0.5yuan	unchanged	–	–	Available traffic modes including Car, bus, motorcycle, bike, walking others
1yuan /0.5yuan	decreased by *20* %	–	–	
1.5yuan /0.8yuan	unchanged	–	–	
5yuan/0.8yuan	decreased by *20* %	–	–	
3yuan /2yuan	unchanged	–	–	
3yuan /2yuan	decreased by *20* %	–	–	

Household survey method was used in this paper. The interviewees of the bus user groups choose one travel mode under different travel conditions. The survey was conducted from June 16 to June 24 in 2012. 1359 questionnaires are retrieved and the effective sample is 1223.