Travel Choice Behavior Analysis of Urban Railway Residents and Non-residents in Bangkok, Thailand

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The sustained and pervasive popularity of the private vehicle is the major transport-related environmental problems faced by most major cities particulary in developing countries. The main objective of this paper is to scrutinize which factors are noted to have potential influence on travel choice behavior. Our paper focuses not only on transport related attributes but non-transport related attributes as well. In this study, therefore, we aim to make an extensive analysis for assessing the extent to which transport and other factors impact on the choice of mode choosing Bangkok, Thailand, where there is urban railway system available but car ownership and use is still high, as a case study.

This paper examines household travel behavior using a sample of households divided into two groups regarding to the proximity to the first introduced railway corridor, BTS line, in Bangkok namely BTS residents and non-residents. The necessary data was obtained from household activity survey. To analyse the transport choice behavior of car and railway user, the discrete choice models in the context of binary logit model is then applied to explore the extent to which major factors impact the mode choice chosen in order to find out what factors are more significantly effective in quantify the impacts of transport and other factors on people's mode choice selection. For the case of Bangkok, there are various factors especially socio-demographic attributes and transport related attributes influencing households on making decision. Among these typical factors, rather than transport utility characteristics, the trip maker characteristics particularly income and auto ownership are found to play a significant role in explaining the travel choice behavior of people.

Key Words : *travel choice behavior, home-based work trip, urban railway residents and non-resident, Bangkok*

1. BACKGROUND AND MOTIVATION

Accomplishing sustainable transport is a main challenge encounterd by countries around the world, in particular, Asian countries which have to cope with transport-related environmental problems associated with the increasing trend in car ownership and use. The urban transport management in many cities, including Bangkok, Thailand, has been receiving an increasing attention for its prospective to shift passengers from existing private motor vehicle to mass rapid transit. The Thai government was determined to provide a better and effective urban transport system in Bangkok city. One way to try and control road traffic growth in this city was through the introducing the 47 km of first rail transit system known as BTS and MRT, operated with route covering the central business district and inner city area in 1999 and 2004

respectively. The former is elevated rail system comprising two main lines with the total of 23.5 kilometers, 24 stations and the latter is the subway line on the 20 kilometer-service length with 20 stations. Moreover, network extension plans are in the process of being implemented.

Over the past decade of the first railway operation, BTS line, it has revealed that it recorded 176 million passengers in 2011, an increase of 21% from the year earlier. Approximately, BTS carries over 400,000 passengers per day in 2005. In 2011, the railway promoted 21 percent more passenger journeys than the previous year, estimated at 480,000 trips per day1).
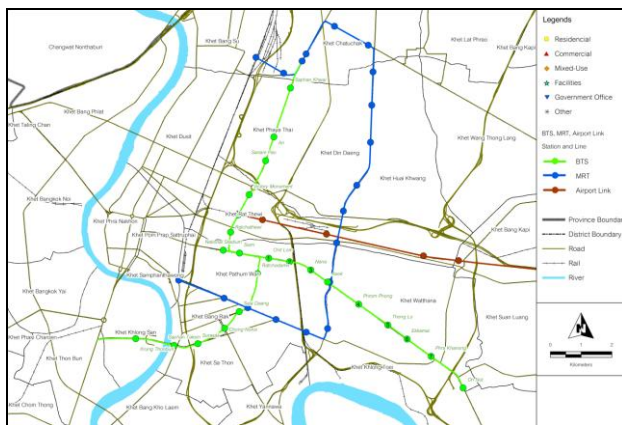

Fig.2 The urban railway network in Bangkok.

However, major of travels in Bangkok are made on road. In 2005, the share of private mode was 53% while that of public mode accounted for only 44% of all trips made by Bangkok residents on an average weekday. Although roads are becoming more congested, people still prefer traveling by private cars. Share of public transport reduces from 45% in 2002 to 40% in 2009, and 38% in 2022 by transportation demand forecast2). Road and expressway network have plays important roles in accommodating the travel demand, meanwhile, the public transport service is inadequate. It does not comprehensively cover the whole urban area. People living in suburban areas then prefer traveling by private car than using public transportation modes.

The BTS was built in the middle of some of the city's most congested and highest rent arterial roads. Surprisingly, the previous research on travel bahavior of BTS residents[3] showed that most of the residents that are expected to be BTS passenger choose private car as mode choice, while the BTS shares about 33% of all trips. Therefore, to investigate what makes people use or prefer the car or railway is very interesting. we aim to examine factors influencing on their mode choice decision. Substantive work is questioning

the level of significance that transport context plays in travel behaviour and supporting individual characteristics as the main factor in explaining observed behavior.

2. STUDY FOCUS

The majority of the papers provides some debate on the role of a variety of factors that influence the travel choice behavior. From literature review, there are two key factors included in these previous studies, the first factor is transport facility. Travel time and travel cost were considered as the main variables to develop utility functions[4),5),6),7]. The other key factor concerns socio-demographic factors. Various authors cite gender, household composition and income, habit and car ownership amongst others as significant factors in influencing travel behaviour[8),9].

Considering these various impact factors on the travel choice behavior, this paper focuses on not only the transport related attributes comprising the travel cost and travel time but also non-transport related attributes concerning socio-demographic attributes. we aim to make an extensive analysis for assessing the extent to which these factors affect people's choice decision.

The empirical results of past studies on travel choice behavior have varied from place to place. However, our study is somewhat complicated because such study in Bangkok is still rare, in particular given the lack of experience of urban railway mode in this city. Not only focusing on travel behavior of railway user, non-user is also selected as target group. As the previous papers mostly deals with the use of either the car or public transport as the primary mode of transport[10]. Therefore, we analyze the travel choice behavior using private car and railway as the two main choices as well as focusing exclusively on home-based work trip. Likewise, this paper originally attempts to examine not only the railway residents, people who live along the BTS corridor, but also non-residents selected as target. These residents are devided by the proximity to the railway corridor of the BTS line.

3. METHODOLOGY

In this paper, we analyse the household travel survey data to assess the factors affecting the selection of mode choice. Data on travel choice behavior was obtained from the household travel survey of Bangkok undertaken in December 2008 by Team Logistic

and Transportation consultant company. The survey questionnaire addressed socioeconomic variables and individual travel patterns. This paper intentionally selects two target groups based on the proximity to the BTS line (railway residents and non-resident). Railway residents are those living within 1 kilometers along the railway corridor while railway non-residents are those living outside the resident interval. Each target group is chosen for 100 respondents so there are totally 200 respondents used in this study.

The modes considered for modelling are only railway and car. Hence, a binary choice model is adopted to assess how much the travel choice behavior can be explained by the socioeconomic characteristics and trip variables.

4. MODEL SPECIFICATION

Given the standard form of a travel forecasting model, logit model, the calibration of this paper fundamentally involves estimating the various constants and parameters for the model. The coefficients are estimated by fitting the data to the model. The Maximum Likelihood Estimation method is the fitting technique commonly used in practice.

The logistic regression estimates the probability of a certain event occurring based on the independent variables. The independent variables keep heterogeneity by comprising the socioeconomic attributes and the attributes related to the mode, such as travel time and travel cost. As stated earlier, the dependent variable for the binary logit model is the mode of railway chosen by the respondents. As a binomial logit model has the best output, the data is organized in such a way that the probability of railway choice over private car is made.

5. MODELLING RESULTS

(1) Model estimation

Among the all predictor variables fitted in the logistic regression model, rather than trip variables, the socio-demographic variables particularly income and auto ownership are expected to have a high potential impact on the mode choice decision. When income increases, the tendency of using railway decreases. When residents' incomes increase, they look for a more convenient, although more costly, the private car as the level of affordability has grown for them. In addition, the ability to use or travel by private vehicle determined by resident who own car or motorcycle is

supposed to be the main category to distinguish captive rider from mode choice rider. This ability could be one of the main variables influencing people to choose car or railway as mode choice.

(2) Descriptive results

The model results can also explain the railway ridership in Bangkok. The question who is the main passenger of the BTS railway will be far more clearly understood. There are two target groups of respondent we have to consider their travel choice behavior thoroughly. The first group is the BTS residents who do not use the BTS for their work trip. The second one is the BTS non-residents who select the BTS as their mode choice. An understanding of the factors affecting the choice decision of such target groups is essential to the promotion of more sustainable behaviour and the achievement of the city's transport targets. This research expects in contributing greater extra details on mode choice behavior to better understand the likely measures that would have to be taken to encourage greater public transport use. In addition, the current traffic problems in Bangkok should be alleviated by encouraging the community to use public transport.

6. CONCLUSION

The outcomes of the research can assist the policy makers in solving the strategic issues of transit planning, including the future development of the railway corridor. The research findings can also be utilized in evaluating the feasibility of developing mass transit in the city, along with appraising the relative influence of railway choice users and car captive users on the travel behavior forecasts for the study area.

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