Analysis of Travel Choice Behavior along the Urban Railway Corridor Area in Bangkok, Thailand

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The inventory of housing near train stations is rapidly expanding along the urban railway corridor after the decade of the first rail transit system operation in Bangkok, Thailand. There is still no clear whether residents those live and have destination as well near rail transit stations are regular railway users. Therefore, how much the built environment of transit-based living influence on the transit ridership should be examined. The main objective of this paper is to scrutinize which factors are noted to have potential influence the station-area residents' travel choice behavior at disaggregate level. We conducted a travel survey to examine the travel behavior of residents those both origin and destination point are within the rail transit corridor area. The results reveal that people could develop more 'pro rail' attitudes after experiencing travel by train after moving to live near the rail stop. Also, the results from discrete logit model explain that the transit accessibility or distance to the station have significant influence in persuading people to shift from car user to rail transit user. This finding indicates that the reduction of out-of-vehicle time will give greater effect to attract more rail transit ridership. However, ability to use a car and parking space availability at destination has negative effect to the tendency to use transit among urban railway residents.

Key Words : *travel choice behavior, rail transit ridership, urban railway resident, logit model, Bangkok*

1. RESEARCH BACKGROUND

Accomplishing sustainable transport is a main challenge encountered 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 first rail transit systems known as BTS and MRT Bangkok city were introduced in Bangkok city, operated with route covering the central business district and inner city area in 1999 and 2004 respectively. However, the main problem faced by mass transit authorities in this city is that transit ridership has failed to meet their expected ridership level[1)].

The BTS was built in the middle of some of the city's most congested and highest rent arterial roads. Surprisingly, the previous studies on travel behavior of BTS residents showed that most residents those living near the station and expected to be BTS passenger choose private car as mode choice rather than rail transit[2)]. The limited rail transit network coverage comparing to road network, competition rather than complementarily with other mode of public transportation (e.g. bus service) in same corridor and the lack of accessibility for trips from origin to transit station are claimed to be the main reasons of the failure of transit ridership[1)]. Therefore, to investigate what makes people use or prefer the car or railway is very interesting.

We aim to examine factors influencing on the station-area residents' mode choice decision. Substantive work is questioning the level of significance that built environment context plays in travel behavior and supporting individual characteristics as the main factor in explaining observed behavior. Suppose that people have preferences for travel modes (especially car or rail transit), apart from their personal characteristics. In general, researchers do not include these other preferences in their studies, and literature on these preferences is very scarce. If preferences are either not, or only partly, related to personal and household variables, ignoring these preferences results in an overestimation of the impact of built environment or the distance to railway station on travel behavior[3]. Our objective in this paper is therefore to focus on these preferences, with the aim of answering the questioned whether the preferences for modes have played a role in travel choices decision indirectly through residential choice within the urban railway corridor area.

2. STUDY FOCUS

From literature review, there are two key factors related to transit ridership, internal and external factors[1]. Wibiwo and Chalermong (2010) stated that the internal factors are factors that transit authorities can control and manage such as aspects related to fare system, transit capacity and headway, station amenities, and so on. The external factors, on the other hand, are those that beyond the transit authorities' control such as number of population and employment in station area, land use system, and so on. Socioeconomic characteristics are part of the external factors since the authorities are unable to change or to modify the individual characteristics of the transit users. Several researchers found that external factors have stronger impact on ridership than internal factors[4] or incorporated with demographic parameters, such as age, level of education, income, and car ownership[5].

Considering these various impact factors on the travel choice behavior, this paper focuses on built environment i.e. the accessibility to the nearest station. Pedestrian accessibility to transit has been long recognized as an important factor in determining ridership. Transit ridership declines exponentially with walking distance to the transit stop[1]. Also, 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 transit ridership within transit station area.

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. For Bangkok case study, we set assumption that after moving to a house near a station, people could develop more 'pro rail' attitudes after experiencing travel by train. Another assumption in this paper is that, within station coverage area, each individual has free choice to use at least two access modes, with walking as one of them, to their desired station, as had been stated by Wibowo and Chalermpong (2010). Thus, the locations in remote areas where there is a high dependency of car user, for example, are not considered. Our target group therefore focuses only on the station-area residents.

The definition of station coverage area is defined by the distance between their house and the nearest station within 5 minutes traveling. Generally, there is paratransit, i.e. van pool or golf cart, provided by the condominium located within 1-2 kilometers rings the station to service their resident to commute between their building and the station. Also, motorcycle taxi is the regular choice for the station-area resident to access the station. The 5 minutes travelling by these paratransit modes can be referred to the distance within 1 kilometer. Thus, we define the station-area resident as people those reside within 1 kilometer distance rings of the rail stations. Focusing on those people might have a great potential to increase overall transit ridership[1]. In addition, the elderly and people with disability are not a major concern in this research.

Lastly, to gain more transit ridership, infrequent ridership is considered by persuading this group to use transit more often. Oram and Stark (1996) suggested that the infrequent riders are a critical transit market and perhaps the key to build higher transit ridership[6].

3. METHODOLOGY

We conducted survey to collect the travel choice behavior data on May, 2013. We formulated questionnaire to interview the residents living in condominium/apartment located within 1 km rings of the BTS/MRT stations. The questionnaire was distributed on not only by door to door home interview survey, but also distributed to travelers in public areas such as mall and CBD areas. The questionnaire was designed including housing characteristics, travel behavior and individual characteristics. About travel behavior, respondents were asked to describe their trips from home to their workplace in detail

(itinerary trip data). Every mode, including non-motorized mode, time and cost for the particular mode were asked to be written down. The total 620 respondents of 36 condominiums/apartments from 5 prime residential zones along the railway corridor were selected. 180 respondents can not be used due to incomplete and missing data or the destination beyond the study area.

4. MODEL SPECIFICATION

The multinomial logit model was developed to explain the mode choice of those residing in the transit corridor area. Recent policy interest in transit oriented development (TOD) has focused almost exclusively on rail transit systems. There are too few bus transit trips among those living near rail stops to support a modal model of motorized commute choice. Thus, bus trips are excluded from the final analysis. Our study therefore represents mode choice between rail transit and automobile (drive alone and shared-ride) alternatives.

5. PRELIMINARY ANALYSIS

(1) Respondent characteristics

In the first stage of research we explain the respondents who reside near the rail stop and in turn commute by rail transit. Figure 1 describes the characteristics of respondents. The typical type of the station area-resident is the resident who are living alone, middle income, worker and car owner.

(2) Travel behavior characteristics

Next, we describe the existing situation on whether the residents who move to live near train stations tend to be transit user. Form figure 2, the rail transit has become the most popular mode for the station-area resident. It is overwhelming selected as mode choice to go to work while the car is used less than nearly a half of the transit use.

The simple statistics of travel behavior on Table 1 suggests that living near the rail transit has become the alterative choice for residents who want to minimize their commuting cost and time. After moving, their travel cost and time are explicitly decreased. Although, most of railway residents have a car, their mode choice to go to work has shifted from auto to transit as seen in the decreasing of auto use and the increasing of transit use relatively.

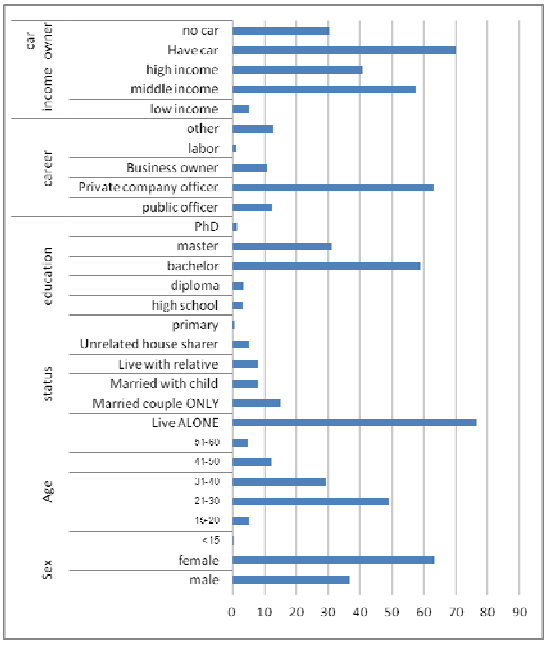

Fig.1 Summary of respondents' characteristic

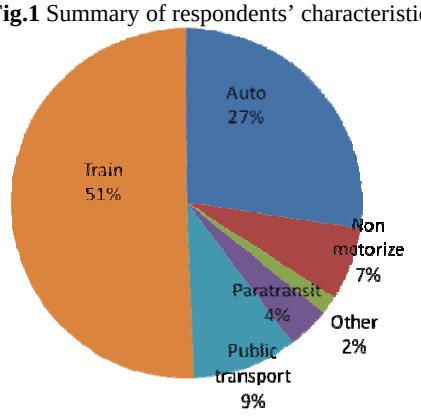

Fig.2 Mode share of respondents

Table 1 Relationship between preferences for modes and the travel-related behavior

Travel behavior	**The changing after living near rail station**	
Daily travel time from home to workplace	decrease	64.1 %
	same	18.5%
	increase	17.5%
Daily travel cost from home to workplace	decrease	43.7%
	same	32%
	increase	24.3%
Frequency of transit use	decrease	15.5%
	same	33%
	increase	51.5%
Frequency of auto use	decrease	39.6%
	same	29.7%
	increase	30.7%
The number of car availability	decrease	39.61%
	same	47.52%
	increase	12.87%

(3) The transit accessibility characteristics

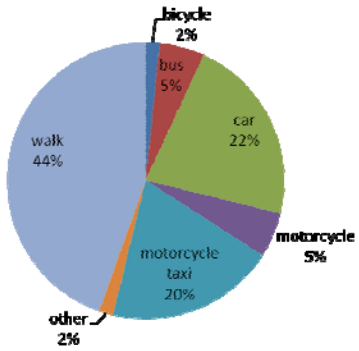

Fig.3 Access mode share to station

In Bangkok, most residents access to station by walk. The proportion of walking will decrease as the distance to station increases and, on the other hand, the proportion of non-walking access modes increase. Motorcycle taxi is preferable among others access modes. The proportion of using car is relatively high although there are limited car parks provided in station areas. This finding might indicate high proportion of car sharing or drop off by car.

(4) Preferences for modes

Table 4 Personal and household characteristics related to preferences for modes

Variable	Preferences for modes
Household size	Single-person households more often have a preference for rail transit
Age	People under 35 relatively often have a preference for rail transit
Sex	Women less often have a preference for cars and more often for rail transit.
Income	People with higher incomes more often have a preference for cars and less often for rail transit
Car ownership	People owning a car much more often have a preference for cars (70%) compared to those not owning a car (9%)

Residents those not owning a car and living alone have a more than average preference for rail transit. Also, women and people younger than 35 years old have a strong preference for rail transit.

(5) Factors influencing transit ridership

The model results reveal people could develop more 'pro rail' attitudes after experiencing travel by train after living near the rail stop. However, mass transit system is less attractive for those who are car lover. Among the all predictor variables fitted in the logit model, accessibility distance has role to induce people to use mass transit. The socio-demographic variables particularly income and car ownership are expected to have a high potential impact on the mode choice decision. When income increases, the tendency of using railway decreases. 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 their mode choices. It stated that car availability has negative effect to the tendency of transit use.

6. CONCLUSION

The outcomes of the research are able to present some observable facts that might be useful in giving more understanding how to make mass transit work effectively. For Bangkok case study, mass transit improvements have beneficiary for the existing public transportation users rather than to private car users. Thus, the improvement strategies to persuade transit captive users shifting to mass transit or using mass transit more often should give significant effect on ridership rather than spending too much resource to convince private car users to shift to mass transit. Therefore, the policy on the improvement of transit accessibility by increasing the walkable environment and adding more feeder mode to access station in order to reduce out-of-vehicle time for the residents who live and have destination as well near rail transit stations, particularly infrequent user, could be an important strategy to increase more transit users. Also, parking policy along the transit corridor should be revised.

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