Case Studies on Transport Policy 2 (2014) 142–152

Contents lists available at ScienceDirect

Case Studies on Transport Policy

journal homepage: www.elsevier.com/locate/cstp

Modeling travel choices of students at a private, urban university: Insights and policy implications

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ARTICLE INFO

Article history:
Available online 16 September 2014

Keywords:
Travel mode choice
Discrete choice models
University students
Value of time
Forecasting
Sustainable transportation

ABSTRACT

This study investigates differences between the mode choice patterns of students of the American University of Beirut (AUB) and the general population of the Greater Beirut Area. Discrete choice models are developed to model the choice among car, bus, and shared taxi (or jitney). It is found that travel time, cost, income, auto ownership, gender, and residence location (whether within Municipal Beirut or not) are the main factors affecting mode choice, and that AUB students who come from wealthier families have a significantly higher value of time than the general population. The models are used to forecast students' commute mode shares under alternative scenarios to support the development of policies that would encourage students to switch toward more sustainable modes. It is found that increasing parking fees and decreasing bus travel time through the provision of shuttle services or taxi sharing could be promising strategies for mode switching from car to public transport for AUB students. The study contributes to the emerging literature on students' travel patterns and its findings are particularly relevant in travel contexts characterized by high congestion levels, high auto ownership rates, and low quality public transport system.

1. Introduction

University students have complex and unique travel behavior (Limanond et al., 2011), and they are underrepresented in most travel studies although they comprise a significant proportion of the traveling public (Khattak et al., 2011). Understanding the travel behavior of university students, and particularly their reliance on the private auto for commuting, can help universities and other stakeholders work toward improvements to policies, programs, and infrastructure that encourage students' use of public transport or non-motorized modes of travel (Shannon et al., 2006). This is critical especially in the context of large universities since student travel directly affects the levels of congestion in adjacent streets with impacts on the well-being of students and employees, as well as that of residents and businesses in the university neighborhood.

The study contributes to the emerging literature on understanding student travel behavior. It is motivated by the case of the American University of Beirut (AUB), a private university in a developing country, and whose students mostly come from wealthy families, and are very dependent on private cars. This research analyzes the commute mode choice of AUB students and investigates the extent to which their travel patterns differ from those of the general population in light of their socioeconomic background and the fragmented public transport system in the Greater Beirut Area (GBA). It is hypothesized that students' sensitivities to modal attributes governing their mode choice decisions are different from those of the general population. For example, students may place a higher value on their travel time and therefore would be more likely to choose faster modes. This hypothesis is tested by developing discrete choice models for the travel mode choice of both groups (AUB students and the general GBA population).

If this hypothesis is confirmed, the transportation policies that can be effective for the general population of GBA do not necessarily have to be effective for AUB students. Therefore, AUB students might still rely on their private cars despite future public policies aimed at encouraging public transport in GBA if

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http://dx.doi.org/10.1016/j.cstp.2014.08.006
2213-624X/

those policies were not tailored to the needs and preferences of students. As a result, AUB has to develop a specific set of policies oriented toward its high-income population.

This study considers the possible role of different interventions and policy measures in encouraging shifts by AUB students toward more sustainable transport modes. The findings of this paper are useful in assessing the effectiveness of these policies in the neighborhood of AUB. The mode choice model specific to students is used to forecast the market shares of the considered modes (car, bus, and jitney) in response to changes in different variables such as parking cost, bus and jitney fares, and travel times, and accordingly assess the effectiveness of the possible policy interventions. These policies can help provide a more sustainable environment for students and a higher quality of life in AUB's neighborhood and nearby areas through easing congestion and promoting public transportation. Non-motorized modes are not modeled in this study because the data reveals that most students living within walking distance of AUB commute on foot. In addition, non-motorized travel was not measured in the general population dataset, which is used as a basis for comparison.

This paper is organized as follows. The second section provides a background of Beirut and its current transportation conditions and especially in the AUB neighborhood. The third section presents a literature review discussing the findings of similar student-related transportation studies. The fourth section presents the methodology, the data sets, the assumptions, and the methods used in developing the models. The fifth section shows the estimation results of the models for AUB students and the general population, including the values of time calculated for each group. The sixth section presents an analysis of the possible policy interventions taking into consideration their applicability and effectiveness in the study context. And the last section concludes the paper and discusses the study limitations and recommendations for future research.

2. Study context

This section provides the study context, starting first with a description of socio-demographics and travel patterns in Beirut followed by a description of AUB's location and students' characteristics and modal split.

2.1. Beirut: socio-demographics and travel patterns

The Greater Beirut Area (GBA) extends over an area of close to 200 km^2 and its population (approximately 1.5 million) is estimated to be one third of the total Lebanese population. Different economic activities taking place in Beirut at different times of the day (businesses, schools, universities, retail, etc.) cause traffic to be spread throughout the whole day, without any significant AM or PM peaks, except for the hour between 7:00 and 8:00 AM, which accounts for approximately 6.71% of the daily traffic (IBI Group and TEAM, 2009).

Despite the city's favorable atmosphere and topography (which is mostly plain), travelers rarely rely on active transport modes (walking and biking) due to the unavailability of the required infrastructure for these modes (bicycle paths, proper sidewalks, crossing facilities, etc.).

Public transport services are currently provided by many operators running different services (e.g. public buses, private buses, minibuses, etc.). However, these services are inefficient due to their unreliability and the lack of appropriate waiting facilities (IBI Group and TEAM, 2009). Public and private buses and minibuses account for only 10% of the trips in Greater Beirut (Kaysi et al., 2010). A small number of these buses operate at predefined schedules. The inefficiency and limited coverage of bus lines encouraged jitneys (locally known as "service", which are a form of shared taxis) to compensate for the shortage of public transportation in Beirut. Jitneys are mostly privately owned cars operated by single owners seeking random demand for transport (Kaysi et al., 2010). These jitneys do not follow defined routes or paths, and they may or may not serve potential customers on the road depending on their destination and other passengers' destinations. Therefore, travel time by jitney can be highly variable. However, these provide a better level of service and comfort than buses, even though they operate at higher fares (2000 Lebanese Liras ($1.3) currently compared to 1000 L.L. ($0.7) charged by buses). Jitneys serve 19% of the overall transport demand in Greater Beirut (Kaysi et al., 2010). The rest of the transport demand is covered by private cars.

Safety and security are considered as major challenges in the public transportation sector for both buses and jitneys (Choueiri et al., 2013; Kaysi et al., 2010). The lack of proper maintenance depots for publicly operated buses (IBI Group and TEAM, 2009) causes these buses to not meet the required safety standards. Due to the fierce competition, private operators also disregard maintenance measures in order to cut on their costs (Kaysi et al., 2010). This competition also leads to dangerous and inappropriate driving behavior exhibited by the private operators characterized by sudden and random stops (Kaysi et al., 2010). Other factors also exacerbate the safety conditions such as the poor infrastructure of public transport (Choueiri et al., 2013), and the possible harassment and discrimination in these modes. Recent studies have suggested qualitative rather than quantitative improvements to the public transport sector. For instance, Kaysi et al. (2010) suggested reducing the jitney fleet size in order to provide a better level of service and better safety standards. Choueiri et al. (2013) also suggested improving public transport from a safety point of view, and not only from a network coverage point of view.

Private cars are heavily relied on not only due to the inefficiency of public transport but also due to inexpensive parking, generally ranging from $2 to $4 daily in Beirut central area. The average vehicle occupancy for private cars in Beirut was estimated to be 1.7, compared to 1.9 for all modes in Beirut (IBI Group and TEAM, 2009).

2.2. AUB: location and characteristics

The American University of Beirut is a private university located in Ras Beirut (one of the most luxurious areas in the city) and having a total area of 250,000 m^2 (refer to Fig. 1). AUB overlooks

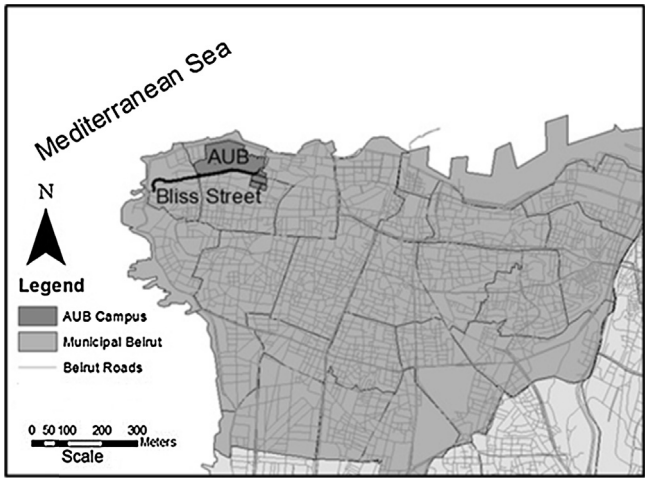

Fig. 1. Municipal Beirut and location of AUB.