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Who are bike sharing schemes members and do they travel differently? The case of Lyon's "Velo'v" scheme



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ABSTRACT

This paper analyzes the socio-demographic profile and travel behavior of the "Velo'v" bike-sharing scheme annual members in Lyon (France). This scheme started in 2005 and has now around 350 stations and 4500 bikes in operation, with more than 50,000 annual members. By the means of an Internet-based survey more than 3000 respondents were described by their detailed socio-demographic profile, their travel means and habits, a one-day activity-travel diary and additionally a seven days activity-travel diary filled by around 700 volunteers. By this way the survey covers all travel modes and day-to-day variations in travel behavior beyond the sole use of shared bike. We analyze with a discrete choice model the socio-demographic and spatial factors affecting the probability of being an annual member of the Velo'v scheme. Then we compare with descriptive statistics their daily travel behavior involving as well bike sharing as other traditional modes to the travel behavior of the general population as given with the latest Household Travel Survey available in the Lyon area (2015). The majority of Velo'v annual members are male, younger and hold higher social positions when compared with the Lyon's general population. An individual higher social position and the residential proximity to stations have both separate and positive effects on the probability of being an annual member of the service. Velo'v members are not captive from public transport, a majority of them have access to a car and they are fully multimodal in their day-to-day travel behavior. Velo'v bikes are used by them for any activity, not necessarily every day, like any other travel mode. The multimodal behavior of Velo'v members shows that Velo'v supply fits especially a demand not satisfied when the public transport station is too distant from home.

1. Introduction

Bike sharing schemes (BSS) in urban areas have sprawled around the world at an accelerated pace over the last years, and could announce unprecedented transformations in contemporary mobility and urban lives. The rapid emergence and policy adoption of these schemes has already been documented in several papers (DeMaio, 2009; Parkes et al., 2013). The success of these schemes and numerous studies already published have provided significant knowledge gains regarding planning, operational management, public policy assessment, modal shift and users attitudes or perceptions (Shaheen et al., 2010; Fishman et al., 2013; Fishman, 2016) but only few regarding analysis of social transformations induced by this new kind of travel mode (apart from Ricci, 2015).

Most of the previous studies performed detailed analysis of anonymous bike flow data, yielding original insights on spatio-temporal patterns and dynamic performance of the systems (Caulfield et al., 2017). This is sometimes combined with some basic socio-demographic data recorded at the time of enrollment for annual subscribers but even these are limited (e.g. gender, age, home

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postcode, see e.g. Morency et al., 2011; Vogel et al., 2014). Some specific additional surveys targeting scheme members cover perceptions of their own modal shift by respondents (Shaheen et al., 2013; Bachand-Marleau et al., 2012; Nikitas et al., 2016) or exceptionally compare BSS members with traditional cyclists (Buck et al., 2013) or with the general population (Fishman et al., 2015).

Moreover very few published studies address the issue of inequality of access to bike sharing scheme, whether because of the social profile of the users or the spatial location of stations. One notable exception stands in the papers on the London Bikesharing Scheme by Ogilvie and Goodman (2012) and Goodman and Cheshire (2014) which give evidence of an overrepresentation of males and individuals coming from affluent neighborhoods.

Furthermore knowledge is still to be elaborated on the way this new travel mode takes part in the daily travel behavior of the individual user, how this mobility behavior is modified and more generally how urban practices are modified. One reason of this lack of knowledge may be that registration data and automatic data recording of bikes movements provide only limited information on the socio-demographic profile of the users and their overall daily mobility.

Since the 1980s the research efforts for better understanding day-to-day variation of travel behavior, i.e. intrapersonal variation, has gathered substantial results showing that there is a significant day-to-day variability in travel/activity behavior (Pas and Koppelman, 1986; Hanson and Huff, 1982, 1986, 1988; Huff and Hanson, 1986; Jones and Clarke, 1988; Pas, 1988; Pas and Sundar, 1995; Buliung et al., 2008; Schönfelder and Axhausen, 2010; Neutens et al., 2012). Schlich and Axhausen (2003) used the Mobidrive six-week travel diary dataset (Axhausen et al., 2002) to study the variability of day-to-day travel behavior. They found that travel behavior is more stable on weekdays than weekend. This accumulated knowledge motivated us to carry on a multiday survey on travel behavior of Velo'v annual members.

In order to gain more information on users and uses of BSS we conducted in 2014 a survey on users of the BSS scheme named Velo'v in Lyon (France). The use of bike for daily mobility is very low in France in general. In Lyon agglomeration after decades of decrease the share of bicycling in daily trips had stabilized under 2% of total trips (including walk, car and public transport). The reversal of tendency occurred recently, probably due to a voluntarist policy including the Velo'v bike sharing scheme which started in 2005 and an effort to develop the cycling network and facilities.

The aim of this paper is twofold. First it is to show whether membership to the bike sharing service is explained by a specific socio-demographic profile or by home spatial proximity to stations. Second it is to analyze whether Velo'v annual members have a different travel behavior when compared with the general population. As such it complements the study by Vogel et al. (2014) which by the means of a detailed analysis of Velo'v movements provides a typology of users based on their intensity and spatial and temporal aspects of use, despite limited socio-demographic data.

We analyze with a discrete choice model the socio-demographic and spatial factors affecting the probability of being an annual member of the Velo'v scheme. Then we explore with descriptive statistics their daily travel behavior involving as well Velo'v as other (traditional) modes. When possible this behavior is compared with the latest Household Travel Survey of Lyon (2015).

The remainder of the paper is structured as follows. Section 2 describes the Velo'v scheme and Section 3 the methodology of data collection and statistical analysis. Section 4 presents the results and Section 5 the discussion while Section 6 concludes.

2. The Velo'v scheme

The Velo'v scheme has now around 350 stations and 4500 bikes in operation, with approximately 50,000 annual registered members at the time of the survey. It is an open scheme operating with fixed 24/7 docking stations where customers (over 15 years of age) can use a variety of smart cards to retrieve a bike (wearing a helmet is not mandatory). Casual users can register with a credit card on the fly at the dock station for one day or 7 days with a fixed fee of respectively 1.5€ and 5€. The membership fee for an annual season-ticket amounts to 25€ per year with a reduced fee of 15€ for those between 15 and 25 years of age. All users then have a free duration use of 30 min for each Velo'v renting. An additional fee applies for a greater duration of use within the same renting period, rising from 0.75€ to 2€ per additional half-hour. By way of comparison with public transport the unit fare amounts to 1.8€ (for one hour, any distance), the season-ticket to 60.4€ per month in general (but half is refunded by the employer) and 30.2€ per month for students.

More than 95% of the 350 Velo'v stations are settled in the center of the Greater Lyon area, a center that we mark with the two adjacent cities of Lyon (divided into nine districts) and Villeurbanne having a total population of 642,625 in 2012 on 62.42 km² (see Fig. 1). The Greater Lyon area adds 57 towns surrounding Lyon and Villeurbanne and covers an area of 534 km² with a population of 1,324,637 inhabitants (see Table 1). The settlement of Velo'v stations is the result of an interactive process between the local authority (Greater Lyon) and the service provider (JCDecaux-Cyclocity) involving experience and ad hoc analysis of potential implementations in the various districts.

The current contract is scheduled to end in November 2017. A competitive tender process, which is still ongoing, will designate a new service provider. Specifications for tender include a scheme expansion to surrounding municipalities and the introduction of e-bikes.

In all what follows we designate with the expression “Velo'v annual members” those who subscribe to the service with a one year period season-ticket. The majority of bike rentals are made by annual members (Vogel et al., 2014): 67% on average on an everyday basis (Monday to Sunday) and more when considering only the weekdays (Monday to Friday). This is why the remainder of the paper focuses on the annual members.

Table 1 shows some basic statistics on the area, including the Velo'v supply.

The correlations between these indicators (see Table 2) show that: population and area are positively correlated – as expected, but

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