Empirical analysis of travellers' routine choice of means of transport in Barcelona, Spain

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ABSTRACT

The present study identifies groups of travellers according to their routine choice of means of transport in the context of the Barcelona Metropolitan Region. Clustering procedures are used to classify travellers according to the self-reported frequency of use of different travel modes. The extracted segments are then profiled with regards to their residence location, socioeconomic traits, access to a car, and other factors that relate to routines becoming habits – (low) use of travel information and disproportionate use of their preferred means of transport. This exercise is of great interest because the incidence of driving habits and other psychological determinants of (un)sustainable travel mode choice are under-researched factors in Barcelona. Data was retrieved from the *Survey of Daily Mobility of Catalonia 2006*. We identified seven relatively homogeneous segments of transport users, of which two groups are routine users of private vehicles for whom their modal choice is apparently disconnected from situational factors, namely *Motorcycle enthusiasts* and *Car drivers*. These groups also share common traits regarding their minimal use of travel information and narrow modal mix (unimodality). The results suggest that it may be valuable to explore the issue of driving habits formation in the context of Barcelona in depth, as it has implications for the design of environmental policy for transport.

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1. Introduction

Transport puts a great deal of pressure on the environment. A special focus on travel mode choice seems inevitable given the disproportional contribution of private vehicles compared with their environmental impact. Travel behaviour is however complex and travel-related decisions involve many underlying factors. Despite the efforts of various policies to cut down private vehicle usage, physical changes advanced by strategic urban planning and transport taxes, people continue to drive, even if they have access to alternatives. This is why, nowadays, it is widely believed that in order to be more effective, environmental transport policies need to better account for bounded rationality (e.g. routines and habits) and the heterogeneity

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of travellers' preferences (Anable, 2005; Garcia-Sierra, van den Bergh, & Miralles-Guasch, 2015; Jensen, 1999; Krizek & El-Geneidy, 2007). Up until today, most of the literature regarding Barcelona's mobility has been focused on the determinants of modal choice urban form and built environment (Marquet & Miralles-Guasch, 2015a; Matas & Raymond, 2008; Muñiz, Galindo, & García, 2003). Gender, age and income differences have been analysed as well by Miralles-Guasch, Martínez Melo, and Marquet (2016), Marquet and Miralles-Guasch (2015b, 2014). The incidence of psychological factors has drawn much less attention (Garcia-Sierra & van den Bergh, 2014) despite being a fundamental part of travel behaviour and modal choice (Garcia-Sierra et al., 2015; Metcalfe and Dolan, 2012), and this has the potential to explain why homogeneous groups behave differently (Van Acker, Van Wee, & Witlox, 2010).

This empirical study aims at filling that gap by offering a first, exploratory approximation to the issue in the context of Barcelona's mobility. It focuses on the routine choice of a means of transport. Routines play a significant role in modal choice, since most daily travel is repetitive in nature (Thøgersen, 2006), especially on weekdays (Gärling & Axhausen, 2003; Schlich & Axhausen, 2003). Moreover, frequency of past behaviour is a proxy of habit (Triandis, 1977, 1980), whilst habits pose a real challenge to environmental transport policy aimed at behavioural change in order to realise more sustainable mobility (see Verplanken & Wood, 2006, for a review). A major concern is that people with strong modal habits tend to neglect relevant and compelling information about their travel choices (Gärling, Fujii, & Boe, 2001; Verplanken, Aarts, & van Knippenberg, 1997), including information about improvements to the accessibility of public transport and the increase in price of private transport. The aim of the article is to identify groups of travellers according to their routine choice of means of transport, and study them as socially-embedded groups. In this way, we can analyse common traits between groups and, more interestingly, the divergences in their daily strategies of modal choice. Cluster procedures are used to achieve this aim by classifying individuals according to their routine travel patterns (e.g. Bayarma, Kitamura, & Susilo, 2007; Hanson & Huff, 1986; Krizek, 2006). Data is retrieved from a general mobility survey, the *Survey of Daily Mobility of Catalonia 2006* (EMQ 2006). This is the last of this series of general mobility surveys and it involved the largest sample of individuals ever compiled for Catalonia and the BMR, and the largest set of variables, including self-reported frequency of use of different transport modes on weekdays. In addition, the groups identified are studied in regards to the determinants of transport mode choice, such as public transport provision at residence location, socioeconomic traits and access to a car.

The remainder of this article is structured as follows. Section 2 reviews the literature on the determinants of transport mode choice and clustering analysis for the study of travel behaviour. Section 3 introduces the methodology. Section 4 presents the empirical analysis resulting in seven behavioural segments or typologies of travellers, as well as the application of the findings for policy design. Section 5 concludes the study.

2. Literature review

2.1. The election of a means of transport

Regarding the choice of a means of transport, factors of different nature have an effect. Situational factors connected to the built environment like urban form are well-recognised antecedents of travel mode choice (e.g. Ewing & Cervero, 2001, 2010; Handy, Boarnet, Ewing, & Killingsworth, 2002), of which compact forms can facilitate a modal shift through the shortening of daily journeys and better access to public transport. Individuals' socioeconomic characteristics also determine modal choices. Income can restrain the frequency of use and the access to private modes of transport, while demographic variables, such as gender and age, shape the different use of transport means. In explaining why homogeneous groups of travellers in terms of situational and socioeconomic characteristics behave differently, psychological factors play a role (Steg & Vlek, 2009; Van Acker et al., 2010). Perceptions of how difficult or easy it is to shift the habitual transport choice, attitudes towards public transport and the car and norms concerning car use, all have been found to influence, to some extent, the preference for a certain means of transport, and the intention to change to another transport option (e.g. Abrahamse et al., 2009; Bamberg & Schmidt, 1999; Carrus, Passafaro, & Bonnes, 2008; Klöckner and Blöbaum, 2010). Meta-analytic results confirm the influence of attitudes, mediated by intention, on modal choice and in which intention explains 27% of the variance in use of sustainable transport alternatives such as public transport (Bamberg & Möser, 2007). The general consideration is that individuals select a form of transport depending on their opportunities and preferences, that is, through a rational scrutiny of the pros and cons of the available alternatives.

Individuals, however, are not always fully conscious of their travel behaviour. For frequently repeated journeys, studies found that only minimal thought is required to select the transport alternative (Aarts, Verplanken, & van Knippenberg, 1998; Verplanken & Aarts, 1999), suggesting that those choices may be non-deliberated, habitual choices (Aarts & Dijksterhuis, 2000; Gärling et al., 2001; Verplanken et al., 1997). Past behaviour may impact future behaviour through two different paths, studies show (Bamberg, Ajzen, & Schmidt, 2003; Davidov, 2007; Gardner, 2009; Ouellette & Wood, 1998; Thøgersen, 2006; Verplanken, Aarts, van Knippenberg, & Knippenberg, 1994). For repetitive behaviours that are enacted in stable contexts (routines), past behaviour can lead to habit formation. In this case, past behaviour directly influences future behaviour, and the resulting course of action is automatic and non-reasoned; i.e. not mediated by intention. For behaviours that are performed in less stable contexts, past behaviour contributes to the process of intention formation. The resulting course of action is thus deliberate and planned. Routines and past behaviour consequently contribute, together with perceived behavioural control, attitudes, norms and other determinants of modal choice, to preference formation.