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Explanatory factors of distorted perceptions of travel time in tram

Rosa Marina González [a,*], Eduardo Martínez-Budría [a], Juan José Díaz-Hernández [a], Arnaldo Esquivel [b]

[a] Instituto Universitario de Desarrollo Regional, Universidad de La Laguna, Facultad de CC Económicas y Empresariales, Campus de Guajara, 38071 San Cristóbal de La Laguna, Santa Cruz de Tenerife, Spain
[b] Campus de Excelencia, Universidad de La Laguna, Santa Cruz de Tenerife, Spain

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ABSTRACT

This study has two aims. The first is to research the factors that influence deviations in perceptions of travel time with respect to actual travel time by analyzing distorted perceptions of travel time in tram. The second aim is to find out whether these explanatory factors are different for the two segments of users according to the sign of errors in their travel time perceptions, i.e. those who overperceive and those who underperceive travel time.

This work is based on an internet survey carried out on students from the University of La Laguna, Spain, in May 2009, using revealed preference data. Several linear regression models were estimated using the backward elimination method of selecting variables. The variable called "perception error rate" is proposed as a measure of distorted perceptions of in-vehicle travel time and is explained as a function of actual in-vehicle travel time and a series of other novel variables, such as the perception of other travel time components (access, waiting, egress), as well as certain characteristics of the trip and traveler. The results obtained provide evidence that some of the variables that explain the distorted perceptions of travelers are different between the overperceiving and underperceiving samples. This finding shows that estimating just one model with a total sample could lead to erroneous conclusions. Since travelers make decisions based on their perceived travel times, transport policy should focus on overperceiving travelers, and specifically on those who travel frequently. According to our results, policies should be aimed at facilitating access to stops, increasing frequency of service to reduce waiting time and decreasing the relative advantages associated with the use of private vehicles. This last point is because travelers overperceive travel time by tram more when accessing tram stops by car.
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1. Introduction

The literature context for this study is related to the area of time perception, specifically travelers' perception of travel time. The perception of distance and travel time has been thoroughly analyzed in behavioral psychology and spatial geography. Geographers have focused on understanding how spatial patterns influence distance or travel time cognition, (see Crompton & Brown, 2006; Cubukcu & Nasar, 2005; Jansen-Osmann & Berendt, 2002; Magel & Sadalla, 1980; Pocock,

* Corresponding author. Tel.: +34 922 317113.
E-mail address: rmglzmar@ull.es (R.M. González).

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1978; Staplin & Sadalla, 1981; Walmsley & Jenkins, 1992). Other authors have focused on socioeconomic characteristics that influence perceptions of travel time or distance, for instance, Matthews (1981) found that older travelers perceived distance differently than younger ones; Stone and McBeath (2010) found gender differences in perceptions of length. Péruch, Giraudo, and Garling (1989) showed that the general public consistently overestimated travel distances when compared to taxi drivers.

Initial works primarily centered on the cognition of physical distance. However, the realization that time distance is much more important for a traveler than actual physical distance changed the focus to time perception (see MacEachren, 1980). Time perception has received a lot of attention in psychology research literature – for an interesting review considering different theoretical perspectives, see Grondin (2010) – and recently received more attention in travel behavior literature, see among others Wu, Lu, and Ge (2013), Parthasarathi (2011), Parthasarathi, Levinson, and Hochmair (2012), Horning, El-Geneidy, and Krizek (2008), Li (2003), Levinson, Harder, Bloomfield, and Winiarczyk (2004), Chen and Mahmassani (2004), Wu, Levinson, and Liu (2009), van Exel and Rietveld (2010) and Quentin and Hong (2005). Specifically, Quentin and Hong (2005) state that model estimations of transport mode choices may be significantly limited because they place too much emphasis on the use of observed characteristic values and not enough on perceived travel time values. In this sense, Klöckner and Friedrichsmeier (2011) estimate a travel mode choice and explore the interactions between a person and trip specific variables.

Kenyon and Lyons (2003) and Handy, Weston, and Mokhtarian (2005) consider that one of the main barriers to the use of public transport is car drivers' distorted perceptions of its quality. However, public transport passengers' perceptions are also often incorrect, which can influence their levels of satisfaction, and, of course, dissatisfied passengers are more likely to change their travel mode.

The problem stems from a distorted perception of travel time and is particularly acute in the case of commuters that travel several times a week with the same origin and destination, as may be the case for workers or students. "Mandatory trips" is a term that refers to individuals who travel to and from their work or education center. Mandatory trips represent over half of weekday urban travel in Spain. In addition, according to the MOVILIA survey in 2006–2007 by the Spanish Department of Business Development (Ministerio de Fomento), most trips to either work or education centers are carried out in private motorized modes, approximately 63.3%, as compared to 16.39% who use public transport. This imbalance is even more evident in Santa Cruz de Tenerife, Canary Islands, Spain, where 72.8% of mandatory trips take place in motorized private transport modes, while 14.4% use public transport. The reduced use of public transport for mandatory trips in Tenerife required new, more efficient public transport policy initiatives. One such initiative was to establish a tramline to cover the Santa Cruz-La Laguna metropolitan corridor, with the aim of correcting the transport mode imbalance. This tramline began running in 2007.

This study is based in an Internet survey on mobility carried out in 2009, with students from the University of La Laguna, Spain (see González & Lorente, 2012). The responses by these students indicated the limited success of the tram in reducing the use of passenger cars and that most public transport users were captives, that is, students who had to choose public transport because no car was available (González, Martínez-Budría, & Esquivel, 2012). This information conveys significant dissatisfaction among public transport users. Clearly, there is a need to deepen our understanding of how travelers perceive the different characteristics of public transport. This work contributes further evidence to the importance of increasing awareness and knowledge of travel time perceptions in public transport (in-vehicle), even when that travel time is certain. The perceived travel times are interpreted as reported travel times by the students in the survey, this approach is the one followed in the most of early studies in perceptions of travel time (e.g. Henley, Levin, Louviere, & Meyer, 1981; Rietveld, Zwart, Van Wee, & Van den Hoorn, 1999; Van Exel & Rietveld, 2009). Specifically, the objective of this paper is to answer the two following questions: (i) What are the factors that influence distorted perceptions of travel time in tram? And (ii) Are these factors the same for different segments of users according to the sign of the error they make in their perceptions of travel time, i.e. those who overperceive or underperceive travel time?

To achieve these objectives, several linear regressions were estimated where the variable *per* (perception error rate), defined as the ratio of perception error of in-vehicle travel time to actual (measured) in-vehicle travel time, is proposed to measure the error in travel time perceptions and is considered as the criterion (endogenous) variable. Explanatory factors considered are the actual in-vehicle time, the perceived times for other stages of the journey (waiting, access and egress time) and characteristics of travelers (frequent users) and trips (trips with transfers and the transport mode used to access the tram stop). To carry out the estimation a sample of 653 participants that chose the tram to travel to their study centers was used. The perceptions of university students have also been the object of study in other papers (see Lee, 1970). However, as far as we know, no previous studies have explained the perceived error in-vehicle travel time as a function of the variables considered in this work.

The rest of the paper is organized as follows: the next section presents the data and the model used in the study, while the third section discusses the results of the estimation. The paper ends with conclusions.

2. The data and the model

The information used in this study is taken from an internet survey on mobility carried out among students from the University of La Laguna in 2009 (see González & Lorente, 2012). It uses revealed preference data based on observations of

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