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ScienceDirect

Procedia - Social and Behavioral Sciences 160 (2014) 499 – 508

Procedia Social and Behavioral Sciences

XI Congreso de Ingenieria del Transporte (CIT 2014)

Methodology for a study of the perceived quality of public transport in Santander

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Abstract

This article will primarily deal with improving the quality of a public transport system through the study of the main variables that influence the perceived quality by users, in other words a methodology for modeling the quality of bus services in the Spanish city of Santander, supported by user perception data.
The models calibrated to study the quality of public transport perceived by users are firstly obtained by estimating all the different service attributes, considering mean users' perceptions through an Ordered Probit model, and then studying random variations in users' tastes, applying an Ordered Probit model with random parameters. The models represent the process of quality evaluation based on a limited group of predefined variables. The choice of these variables is important because they are used to explain the selection process to be modeled. The collected data are analyzed and modeled to check the validity of the different variables. Main results suggest consumers would be willing to pay a higher price for improved transport connection networks including the supply of clearer information and the attention to consumer's complaints. Ticket price is also an important attribute mainly for frequent bus users.

Peer-review under responsibility of CIT 2014.

Keywords: Consumer behaviour, Choice models, Ordered Probit Model, Ordered Probit with Random Parameters Model, Public transport system.

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Peer-review under responsibility of CIT 2014.
doi:10.1016/j.sbspro.2014.12.163

1. Introduction

Nowadays, ever greater efforts are made by municipalities to improve public transport systems, in order to achieve sustainable mobility and ensure more healthful environments in our cities.

In order to understand how public transport must be to meet users' needs, it is necessary to define the most important variables determining system quality, from among the many that contribute to the user's perceptions.

It is important when planning market strategies, focused on the development of public transport in urban areas, to understand what users' satisfaction levels depend upon, as well as their expectations for an efficient public system (Bordagaray et al., 2012, 201_, dell'Olio et al. 2011b, Rojo et al. 2012, 2013). An adequate planning strategy should consider the spatial location of bus stops, the re-organization of bus lines, their timing and frequencies across the urban circuit.

Hence the great importance of determining quality in its two different forms in this context: users' *desired* and *perceived quality*. The latter is defined by users' degree of satisfaction with variables that define how public transport works. *Desired quality* (dell'Olio et al., 2011a) differs from *perceived quality* because it does not represent what users feel about daily transport but what they want or would like to find when they travel. In short, it embodies what they envisage as an efficient system (dell'Olio et al., 2010). This article is devoted to an analysis of perceived quality.

In addition, potential users' characteristics have to be considered when planning development policies. The results of assessment of different variables that define public transport quality may depend on these characteristics. The problem is that customers' preferences are uncertain and variable, so the most appropriate model, that estimates users' behavior in regard to perceived quality, needs to be found. It is essential, therefore, to collect information about the characteristics that define the journey and also about how users estimate them.

The paper is structured as follows: Section 2 describes the theoretical approach used in our study; Section 3 discusses into details the case study applied to the public transport (buses) of Santander (Spain) and illustrates the obtained results; and finally, Section 4 summarizes and concludes.

2. Methodology

This section describes the methodology employed in our case study. We illustrate straightforward the features of the sample and finally present the theoretical analysis explaining the choice models used to run our inferential statistic analysis.

Sample. The definition of the sample size is a necessary step before implementing an econometric model. Because of time and cost constraints, it is clearly impossible to cover the entire population, and reach them with a direct survey (Fortini, 2000). For this reason, in statistical methods a random sample of the population is selected, and taken to reflect the entire population. However, in such cases both sampling error, due to working with a sample rather than the entire population, and selection error, due to possible bias even in the case of a random sample, have to be taken into account. Both can generate changes in the results of an investigation. The most commonly used method is the probabilistic one, extracting units from the population in such a way that each element has a known probability of becoming a part of the sample (Marcucci, 2011). Data collection for the survey is carried out by studying users' actual behavior (revealed preference methods), rather than conducting sample surveys, experiments or simulating markets where preferences are collected in a hypothetical choice context (stated preference methods).

Discrete choice models. After concluding the previous steps, the discrete choice models need to be applied, to determine the demand for assets and services, as well as make predictions about users' behavior. They play a very important role in the process of transport modelling and, if properly calibrated, they allow you to make predictions about future states of the studied system, and to intervene in the process of possible development in order to