European Transport \ Trasporti Europei n. 38 (2008): 107-118

Willingness-to-pay of public transport users for improvement in service quality

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Abstract

In this paper, passenger willingness-to-pay (WTP) for improving the quality levels of a bus service is examined. Specifically, the objective of this research is to provide a tool for evaluating passenger willingness-to-pay by considering some qualitative service aspects, in addition to the traditional quantitative service aspects like travel time and cost. The adopted methodology is built on the calibration of behavioural models based on user choices. The WTP values are obtained as marginal rates of substitution between some service quality attributes and travel cost at constant utility. For this purpose, Multinomial and Mixed Logit models are introduced. The models were calibrated by using the data collected from an SP experiment in which each user makes a choice between an alternative representing the current service and two alternatives representing hypothetical bus services. In order to take into account the randomness of the estimated WTP, the limits of the confidence intervals are calculated.

Keywords: Service quality; Public transport; Willingness-to-pay.

1. Introduction

In the field of public transport, service quality measure is a subject of the greatest interest both for planners and transit operators. Generally, service quality is measured by asking the users their perceptions and expectations about some service quality aspects. By considering the importance and satisfaction levels stated by users, the service quality attributes to be improved can be identified.

A service quality measure can be obtained by discrete choice models based on the Random Utility Theory (RUT), and particularly by Logit models. Over the last few decades, Logit models have been widely used for the calibration of the mode choice models in which the alternatives are different transport modes. However, more recently "within mode" models have been proposed, in which the alternatives relate to a single

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transport mode, usually public transport mode. In the specific case of service quality each alternative is a bus service characterized by some service quality attributes. Some Logit models, like Multinomial, Nested or Mixed Logit, were proposed by Hensher (Prioni and Hensher, 2000; Hensher, 2001; Hensher and Prioni, 2002; Hensher et alii, 2003). By means of the coefficient estimation of these models, the importance of service quality attributes on global service quality is evaluated.

These models can be calibrated by using the combination of Revealed Preferences (RP) and Stated Preferences (SP) data. The SP data applications have assumed a growing importance in the last few decades. The major advantage of SP data compared with RP data is that they exploit a more extensive attributes space (Pearmain et alii, 1991).

From Logit models a subjective value of time can be derived; this value represents the user willingness-to-pay in terms of monetary cost for savings in travel time. The concept of value of time was extended to the widest concept of willingness-to-pay (WTP) in order to evaluate in monetary terms some external effects of transport systems, like accidents, air pollution, noise, and landscape deterioration. The WTP measures represent an important tool in the valuation of transport investments, because they allow the rate which could be debited to the users to be established.

In this paper, the WTP concept was adopted in order to evaluate willingness-to-pay of public transport users for an improvement in quality of service. To this purpose some Logit models in which the choice alternatives are some *bus services* were introduced. The rest of the paper is organized as follows: section 2 presents an overview of some methods for measuring consumers' willingness-to-pay; section 3 introduces a theoretical background of the discrete choice Logit models; in section 4 the experimental context is described and the statistical-descriptive results of the survey realized to support the research are reported, this section also discusses the estimation results; finally, section 5 summarises the main conclusions.

2. Willingness-to-pay measures

On the basis of the assumption that consumer choices reflect their preferences, it is possible to deduce from choice behaviour or from direct questions about preferences, whether transportation improvements or public policy initiatives are socially desirable (McFadden, 1997). A quantitative measure of the social desirability of improvements can be obtained by the WTP valuation. In the literature different WTP valuation methods have been proposed. The most widely used approaches are the Hedonic Pricing Method (HPM) and the Contingent Valuation (CV) method.

The HPM relies on actual behaviour observed in the housing market, while the CV method (known in marketing as Conjoint Analysis, CA) relies on respondents' statements about their willingness to pay for a hypothetical improvement of a transport system. The HPM has been specifically used to estimate the environmental externalities, like traffic noise, air pollution, urban development, transport safety, and so on (see for example, Garrod and Willis, 1999; Freeman, 2003; Jim and Chen, 2007).

The determination of WTP by means of SP data has traditionally been associated with the CV method. The CV method consists in asking people how much they are willing to pay in monetary cost for a benefit; analogously, the Willingness-to-Accept (WTA) in compensation for deterioration can be calculated. A number of studies have been proposed in order to valuate WTP for reducing traffic air pollution and noise (Feitelson et alii, 1996; Saelensminde, 1999; Ortùzar and Rodrìguez, 2002; Bjorner, 2004; Fosgerau and Bjorner, 2006), for reducing road accidents (Rizzi and Ortùzar, 2003; Iraguen and Ortùzar, 2004), for saving travel time (Brownstone et alii, 2003; Hensher and Goodwin, 2004; Hensher, 2006a; Hensher, 2006b), for improving transport information services (Mehndiratta et alii, 2000; Denant-Boèmont and Petiot, 2003; Khattak et alii, 2003; Molin and Timmermanns, 2006), for improving the paved road surface (Walton et alii, 2004), and for not losing one's driving licence (Jorgensen and Wentzel-Larsen, 2002; Jorgensen and Dargay, 2007). In the specific case of public transport service quality, Ramanayya et alii (2007) measured the willingness-to-pay for better services across different categories of commuters by asking them their willingness to pay higher fares for an assured seat, for a comfortable journey, for fast service, and to accommodate luggage. On the other hand, Espino et alii (2006a) proposed a discrete choice model between the private and public transport mode in order to estimate willingness-to-pay for better bus services in terms of frequency increases, reduction in walking time, and improvements in the level of comfort.

Traditionally, WTP for savings in travel time (in the classic transport microeconomic literature normally referred to as the subjective value of time) has been estimated by using mode choice models based on RUT, by considering travel time and cost attributes in the utility function of the modal alternatives. Travel time can be expressed in terms of total travel time, or by considering separately some parts of the total time, like in-vehicle time, waiting time, access/egress time, parking time, and so on; travel cost represents the monetary cost linked to the transport mode.

According to this approach, a useful way to calculate the value of time is to find the marginal rate of substitution (i.e. the trade-off) between perceived travel times and costs at constant utility. For the linear-in-parameters specification of the utility function, the value of time corresponds to the ratio between the estimated parameters of time and cost attributes. The subjective values of time are heavily dependent on the model specification and data (Gaudry et alii 1989).

As is well-known, the maximum likelihood estimation method used for the calibration of Logit models provides asymptotically distributed multivariate normal parameters (Ben-Akiva and Lerman, 1985). The probability distribution for the ratio between two normally distributed variables is unknown *a priori*, and therefore the value of time is a random variable with an unknown probability distribution function. This circumstance does not allow an easy definition of confidence intervals for the estimated value of time. To this purpose, in the last few years, a number of works have focused on this subject and several methods for constructing confidence intervals of the value of time were proposed. Ettema et alii (1997) discussed a general method based on multivariate normal simulation, while Yadlin, as reported in Armstrong et alii (2001), constructed confidence intervals assuming that a continuous function of normal variates follows a normal probability distribution function. Re-sampling methods were also adopted; in this case, numerous sub-samples are generated by an original sample or artificially created, and models are estimated for each one of them by using the same model specification. In this way, a large number of average values of time are obtained allowing an approximation of its probability distribution. Thus, the limits of the confidence interval are computed by determining the values that correspond to pre-specified percentiles (Armstrong et alii, 2001). The Jackknife and Bootstrap techniques

(Shao and Tu, 1995) are widely used in practice. More recently, Ortùzar introduced other two methods (Armstrong et alii, 2001). The first one, founded on the likelihood ratio test, is based on imposing a linear restriction to the maximum likelihood estimation process and comparing the statistical efficiency of the estimation with respect to the unrestricted case. The procedure consists in searching for values of time for which the linear restriction is valid, given a certain significance level. The second one is based on the asymptotic t-test, generally used in order to prove whether a normally distributed parameter is significantly different from zero. Ben-Akiva and Lerman (1985) proposed an extension of this test for a linear combination of the parameters. As the parameters are asymptotically distributed normal, the following null hypothesis can be postulated:

$$H_0 : \beta_t - VT \cdot \beta_c = 0 \tag{1}$$

where, β_t is the *time coefficient*, β_c is the *cost coefficient*, and VT represents the *value of time estimate*. The confidence interval is given by the set of VT values for which it is not possible to reject H_0 at a given level of significance. The corresponding test statistics is (Garrido and Ortùzar, 1993):

$$t = \frac{\beta_t - VT \cdot \beta_c}{\sqrt{\mathrm{var}(\beta_t - VT \cdot \beta_c)}} \tag{2}$$

This expression distributes normal for linear models and asymptotically normal for non-linear models, like Logit models.

On the basis of these assumptions, Garrido and Ortùzar (1993) derived the upper and lower bounds for the confidence interval as follows:

$$V_{L,U} = \left(\frac{\beta_t}{\beta_c} \frac{t_c}{t_t} \right) \cdot \frac{(t_t t_c - \rho \cdot t_{cr}{}^2)}{(t_c^2 - t_t{}^2)} \pm \left(\frac{\beta_t}{\beta_c} \frac{t_c}{t_t} \right) \cdot \frac{\sqrt{(\rho \cdot t_{cr}{}^2 - t_t t_c)^2 - (t_t^2 - t_{cr}{}^2) \cdot (t_c^2 - t_{cr}{}^2)}}{(t_c^2 - t_{cr}{}^2)} \tag{3}$$

where t_t and t_c correspond to the t-statistics for β_t and β_c respectively; t_{cr} is the critical value of t statistics given the degree of confidence required and the sample size, and ρ is the coefficient of correlation between both parameter estimates.

These approaches were also extended in order to construct confidence intervals for the largest WTP concept. As an example, some authors have recently proposed willingness-to-pay measures derived by discrete mode choice models and have calculated confidence intervals for WTP estimated values (see Greene et alii, 2006; Espino et alii, 2006b).

The construction of the confidence intervals provides the range of possible benefits derived from a given project (Espino et alii, 2006b). Specifically, WTP confidence intervals allow planners to consider the lower and upper limits of the benefits obtained, for example, from travel time savings or service quality improvements in terms of frequency, reliability, comfort, and so on.

3. Discrete choice logit models

Logit models are the better-known discrete choice models. These models are based on the Random Utility Theory (RUT), and on the hypothesis that the errors in the utility function are distributed according to the type I extreme-value (EV1) distribution.

Multinomial Logit (MNL) is the model with the simplest structure inside the Logit family. There are three fundamental hypotheses that underlie the MNL formulation. The first one is that the random components of the utilities of the alternatives are independent and identically distributed (IID). The second one is that the MNL model maintains homogeneity in responsiveness to the attributes of the alternatives across individuals. Finally, the third hypothesis is that the error variance-covariance structure of the alternatives is identical across individuals (Bhat, 2003).

In the last few years, by relaxing the hypotheses of the MNL model, more complex model formulations have been derived, like Heteroskedastic Extreme Value (HEV) models, Generalized Extreme Value (GEV) class of models, and Mixed Logit (ML). Specifically, the ML models have more recently been used in order to consider the heterogeneity among users and permit the differences in user perceptions and responses to be considered. Traditionally, these differences were taken into account by introducing some socioeconomic characteristics of the users among the model attributes. Mixed Logit models spread at the end of the nineties (McFadden and Train, 1997; Bhat, 1998; Train, 1998) as a consequence of the development of specific software for their calibration. ML models can be formulated according to two different structures: "error component structure" and "random coefficients structure" (reported in the literature also as Random Parameter Logit, RPL). In the first structure some hypotheses of correlation between alternatives are made; in the second one some hypotheses of unobserved heterogeneity among users as regards observed variables are made (Bhat, 2003). RPL has the standard form of an MNL model except that one or more parameters can be considered as random parameters, with the standard deviation estimated together with the mean.

For a more exhaustive discussion about Logit models one could refer to Domencich and McFadden (1975), Ben-Akiva and Lerman (1985), Ortuzar and Willumsen (1994), Cascetta (2001), Train (2003).

In this research some Logit models were specified and calibrated in order to calculate users willingness-to-pay for improving service quality. In addition to an MNL, an RPL model was introduced in order to allow the heterogeneity of customers with respect to the service quality responsiveness to be investigated.

4. Empirical application

4.1. Experimental context

A sample survey of the University of Calabria students was conducted. The University is like an Anglo-Saxon campus and is situated in the urban area of Cosenza (in the South of Italy); it is attended by approximately 32,000 students and 2,000 members of staff (March 2006). At the present time, the University is served by bus services connecting the urban area with the campus; extra-urban bus services connect the campus with the other towns of Calabria. The urban bus service is available from 7.30 to 00.30; service frequency is 1 run every 60 minutes. The cost of one-way ticket is 0.77 Euros, while one-day travel card costs 1.55 Euros; in addition, weekly and monthly travel cards are available with a special price for students; the cost of a weekly travel card is about 7 Euros, while a monthly travel card costs about 18 Euros. On a working day, about 8,000 students travel by urban bus.

The survey, realized in the winter of 2006, involved a sample of 470 students who live in the urban area and habitually use the bus to reach the campus. Therefore, the sampling rate is approximately equal to 5.8%. Respondents were asked to provide information about their trip habits regarding getting to the university and, in addition, about public transport service quality.

The interview is divided into three sections: in the first and second section some information about socioeconomic characteristics (gender, age, income and car availability) and travel habits was elicited; the last section of the interview includes an SP experiment proposed to the users, in which they made a choice between the current bus service and two hypothetical bus services. The current service is defined by the user taking into account the bus service used at the time of the interview according to the attribute levels reported in table 1. The alternatives are defined by nine attributes varying on two levels. Each SP alternative is a combination of the attribute levels and represents a bus service. Some levels used in the SP alternatives are not available for the current service. Table 1 reports the attribute levels. The full factorial design includes all the possible combinations among the attribute levels. In this case, it consists of 2^9 combinations producing 512 alternatives. We restricted the number of alternatives to 50 by adopting the usual partialization techniques of the full factorial design.

Only three alternatives were proposed to the users because they may have some difficulties in making a choice between more than three alternatives when several attributes define the alternatives (see for example Prioni and Hensher, 2000; Hensher and Prioni, 2002); in this cases the matter of interviewee's fatigue and burden occurs.

Table 1: Service quality attributes and levels.

Service quality attributes	*Levels*
Walking distance to the bus stop	same as now (1); 10 minutes more (0)
Frequency	every 15 minutes (1); same as now (0)
Reliability	on time (1); late (0)
Bus stop facilities	bus shelter, seats and lighting (1) no shelter, no seats, no lighting (0)
Bus crowding	no overcrowded (1); overcrowded (0)
Cleanliness	clean enough (1); not clean enough (0)
Fare	25% more than the current fare (1); same as now (0)
Information	timetable, map, announcement of delays (1) no timetable, no map, no announcement of delays (0)
Transit personnel attitude	very friendly (1); very unfriendly (0)

The hypothetical alternatives were coupled producing several types of experiments, each of which was proposed to a group of users. The alternatives were coupled by using an empirical simulation procedure. An example of experiment is shown in table 2. To some users two SP experiments were proposed generating 640 observations. In these cases only an SP alternative was replaced in the second experiment in order to reduce the fatigue effect in the respondent.

The sample is spread over 46% male and 54% female respondents. 89% of the student sample was between 18 and 24 years old. The sample was divided, also, in "in course", and "out course" students; in Italy, the "out course" condition relates to a university student who has not finished his studies in the prescribed time. The "in course" students represent a percentage of 78% of the total. About 50% of students belong to a middle class of family income and about 35% to a lower-middle class. Almost all the students do not have the possibility of using a car to reach the campus (92%).

Table 2 - Example of an SP experiment proposed to the interviewed

Attributes	*Current service*	*Service bus A*	*Service bus B*
Walking distance to the bus stop	same as now	10 minutes more	same as now
Frequency	same as now	same as now	every 15 minutes
Reliability	on time	late	late
Bus stop facilities	no shelter, no seats, no lighting	Bus shelter, seats and lighting	no shelter, no seats, no lighting
Bus crowding	overcrowded	overcrowded	no overcrowded
Cleanliness	clean enough	clean enough	not clean enough
Fare	same as now	same as now	25% more than the current fare
Information	no timetable, no map, no announcement of delays	timetable, map, announcement of delays	no timetable, no map, no announcement of delays
Transit personnel attitude	very friendly	very friendly	very unfriendly

4.2. Experimental results

An MNL and an ML model were calibrated by using AMLET package. The package is based on a procedure which uses Monte Carlo sampling to produce the approximate likelihood function and dynamically adapts the number of draws on the basis of statistical estimators of the simulation error and simulation bias (Bastin et alii, 2006).

All the service quality attributes are defined as dichotomous variables, except "Walking distance to the bus stop" and "Ticket cost" that are continuous, measured in minutes and in Euros respectively. Specifically, when people use daily, weekly or monthly cards, the cost was divided by 2, 6, and 24, respectively. The values of the dichotomous variables are defined like the attribute levels reported in table 1. Two socioeconomic characteristics are included in the utility function of the alternative representing the current service: gender (a dummy variable equal to 1 if the student is female and 0 otherwise) and car availability (a dummy variable equal to 1 if the student does not have the possibility of using a car to reach the campus and 0 otherwise); other socio-economic variables were introduced in the model but were not statistically significant.

Specifically, in the ML model, 4 random parameters distributed with a normal distribution and the remaining as fixed parameters were considered. The random parameters are "Reliability of buses that come on schedule", "Bus overcrowding", "Information at bus stops" and "Helpfulness of personnel". Some ML models were specified and calibrated in which the other attributes were considered random. In this paper the model characterised by the best results is described. In table 3 the results of the ML compared to the MNL model results are shown.

Some measures of overall model fit were effected. The Rho squared corrected statistic of the ML model has a value superior (0.334) to the MNL model (0.326). The final values of Log-Likelihood of both models are comparable. An LR statistic for verifying the hypothesis that all the parameters are significantly different from zero was effected; for both models it is notably higher than the critical value. Another LR statistic was effected to compare the ML with the MNL model; the value of this statistic (14.81) confirmed that the ML is statistically better than the MNL model.

All parameters have a correct sign. Both the mean and the standard deviation of the random parameters assume a value statistically different from zero, at a 95% level of significance; also the fixed parameters are significant, except for the “Gender” variable, which have a t-statistic equal to 1.8.

Socio-economic variables assume a positive sign; this result indicates that the utility of the current service has a higher value, ceteris paribus, for the students of female gender and for the students who do not have car availability. These categories of students are more satisfied with the current bus service.

In table 4 the WTP values and their confidence intervals are reported. The confidence interval limits (lower and upper) were calculated by using the method proposed by Garrido and Ortùzar (1993). All the WTP values have a negative sign, except for the walking distance to the bus stop; in this last case, in fact, WTP represents the willingness to pay for reducing the time spent to reach the bus stop, while all the other WTPs represent the willingness to pay for an improvement in the various service aspects from a lower level to an upper one.

The maximum value of WTP concerns service frequency, the minimum one information at bus stops. WTP for an improvement in service frequency is 2 times higher than WTP for improving service reliability, 3 times higher than WTP for improving cleanliness on board, and 5 times higher than the other WTP values.

In the following, only the WTP values obtained from the ML model are discussed; analogous considerations can be effected for the MNL basic model. Currently, the service is available for 17 hours in a day, therefore there are 17 runs/day. Instead, a service frequency of 1 bus every 15 minutes corresponds to 68 runs/day. The obtained WTP value suggests that users would pay 22.8 Euros in order to have 68 runs/day, that is 0.34 Euros per run. This means that users would pay an increase of the ticket equal to 44%, and therefore a ticket cost of 1.1 Euros/run. Analogously, users would pay more expensive weekly and monthly cards (about 10 Euros/week and 26 Euros/month) for an increase in service frequency. The travel expenses in one year would be equal to 312 Euros against the current annual cost of 216 Euros, with an additional travel cost of 96 Euros/year.

Table 3 - ML and MNL model results (in bracket the t-statistics are reported)

variable		*estimation*	
name	*parameter*	*MNL*	*ML*
Walking distance to the bus stop	mean	-0.101 (-4.3)	-0.207 (-7.6)
Service frequency	mean	2.678 (11.5)	4.424 (7.1)
Reliability of buses that come on schedule	mean	1.202 (7.6)	2.370 (7.1)
	st. deviation	-	1.090 (3.1)
Availability of furniture at bus stops	mean	0.583 (3.8)	0.952 (3.6)
Bus overcrowding	mean	0.643 (3.4)	1.138 (3.6)
	st. deviation	-	1.980 (2.9)
Cleanliness of interior, seats and windows	mean	0.741 (5.0)	1.390 (4.9)
Ticket cost	mean	-5.451 (-4.2)	-11.617 (-7.2)
Information at bus stops	mean	0.561 (3.6)	0.936 (3.6)
	st. deviation	-	1.533 (2.2)
Helpfulness of personnel	mean	0.451 (3.1)	0.981 (3.9)
	st. deviation	-	2.496 (4.5)
Gender	mean	0.328 (1.8)	-
Car availability	mean	0.422 (2.0)	-
Final value of Log-Likelihood		-462.860	-455.453
Log-Likelihood with Zero coefficients		-703.112	-703.112
Rho squared		0.342	0.352
Rho squared corrected		0.326	0.334
Likelihood Ratio		480.504 (χ^2=19.675)	495.318 (χ^2=22.362)

Analogous calculations can be effected by considering the other WTP values. The only exception is for the WTP for reducing the walking time to the bus stop because this value is expressed in Euros/h and it refers to a single run. By considering the average walking distance (in terms of time) occurred in the sample (3 minutes and 43 seconds), a WTP value of 0.07 Euros/run was obtained; therefore, users would pay a ticket cost of 0.84 Euros/run, a weekly card of about 7.50 Euros and a monthly card of about 20 Euros. The travel expenses in one year would be equal to 240 Euros, with an additional travel cost of 24 Euros/year.

By referring to the global service, the users are willing to pay an increase of about 1 Euro/run for an improvement in all the service aspects considered in the SP experiment. This means that a ticket could cost 1.8 Euros/run, a weekly card about 16 Euros and a monthly card about 40 Euros. Obviously, these values were obtained by considering the WTP values referred to 68 runs/day. By considering the estimated WTP confidence intervals the ticket cost varies from a lower value of 1.5 Euros/run to an upper of 2 Euros/run, the weekly card from 13 to 19 Euros, and the monthly card from 34 to 50 Euros.

Table 4 - WTP calculation

variable	*MNL*		*ML*	
	WTP	Confidence interval	WTP	Confidence interval
Walking distance to the bus stop	1.112	0.773 to 1.620	1.069	0.914 to 1.260
Service frequency	-29.477	-53.152 to -20.292	-22.849	-28.067 to -18.559
Reliability of buses that come on schedule	-13.231	-24.349 to -8.579	-12.241	-15.812 to -9.455
Availability of furniture at bus stops	-6.417	-12.655 to -3.053	-4.917	-7.266 to -2.528
Bus overcrowding	-7.078	-14.094 to -3.034	-5.878	-9.291 to -2.825
Cleanliness of interior, seats and windows	-8.156	-15.895 to -4.528	-7.179	-10.329 to -4.527
Information at bus stops	-6.175	-13.183 to -2.602	-4.834	-7.327 to -2.424
Helpfulness of personnel	-4.964	-10.642 to -1.777	-5.067	-8.115 to -2.554

The travel expenses in one year could be equal to 480 Euros, with an additional travel cost of 264 Euros/year. By considering the estimated WTP confidence intervals the potential annual travel expense varies from a lower value of 408 to an upper value of 600 Euros.

These amounts are quite considerable if compared to the total travelling passengers. As an example, by considering a number of 8,000 habitual bus passengers, transit operators could have an additional amount of about 2 million Euros to invest for improving the current bus service.

5. Conclusions

The main purpose of this research is to provide a tool for calculating user willingness-to-pay for improving service quality in public transport. To this purpose some MNL and ML models were calibrated on the basis of the user choices made in SP experimental contexts. Specifically, the ML model allowed investigation on the heterogeneity across individuals about some service quality attributes. The heterogeneity about the perceptions of “Reliability”, “Bus overcrowding”, “Information at bus stops”, and “Helpfulness of personnel” attributes was investigated. The standard deviation values obtained from the model calibration suggest that there is a notable difference in user perception of these attributes.

The willingness-to-pay in terms of service quality attributes represents a quantitative measure of the monetary cost that the user would pay for improving some qualitative service aspects, such as comfort and safety during the journey. These service aspects are generally neglected because of the difficulty of their evaluation and quantification in monetary terms. WTP values may be used for calculating the project revenues in transport service investments. As an example, in the analysed experimental context, an increase of 22% of the amounts derived from the monthly cards was calculated from the estimated WTP values.

In order to take into account the randomness of the estimated WTP, the limits (lower and upper) of the confidence intervals were calculated by using the method proposed by Garrido and Ortùzar (1993). The confidence interval calculation provides a sensitivity analysis of the possible investments that a transit operator can make starting from the amounts the users are willing to spend for improving service quality.

A limitation of the adopted methodology is linked to the estimation both of WTP values and their confidence intervals. In fact, the obtained values vary strongly with the model specification because of the strong dependence of the WTP values on the functional form assumed for the utility function of the alternatives, and on the model structure.

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