EXPLANATORY FACTORS OF DISTORTED PERCEPTIONS OF TRAVEL TIME IN TRAM

ABSTRACT

In this study, the error rate of perceived time by in-vehicle users is put forward as a measure of distorted perceptions of travel time. These distorted perceptions can be explained as a function of actual in-vehicle travel time and a series of novel variables, such as the perception of other travel time components (access, waiting, egress), as well as certain characteristics of the trip and commuter. A sample consisting of students from the University of La Laguna (Spain) that travel by tram to their university center was used. Users were classified into those who overestimated and those who underestimated travel time. The results obtained provide evidence that the explanatory variables and their marginal effects are different for each of these groups. Public transport policy should focus on the overestimating commuters, specifically on those who travel frequently, to improve their perceptions of travel time, facilitate access to stops, and increase frequency of service offered.

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1. Introduction

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 Pocock (1978), Magel and Sadalla (1980), Staplin and Sadalla (1981), Jansen-Osmann and Berendt (2002), Cubukcu and Nasar (2005), Crompton and Brown (2006)). Other authors have focused on socioeconomic characteristics that influence perception of travel time or distance, for instance, Matthews (1981) found that older individuals perceived distance differently than younger ones; Stone and McBeath (2010) found gender differences in perceptions of length. Péruch et al (1989) show 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 recently received more attention in travel behavior literature, see among others Parthasarathi et al. (2011, 2012), Horning et al (2008), Li (2003), Levinson et al. (2004), Chen and Mahmassani (2004), Wu et al. (2009), Arnold 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 person and trip specific variables.

Kenyon and Lyons (2003) and Handy el al. (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.

"Mandatory trips" is a term that refers to individuals who travel to and from work or education center. Mandatory trips represent more than 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 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 private transport mode, while 14.4% use public transport. The reduced use of public transport in 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 2009.

This study uses students' responses on perceived travel times while using the tram to travel to their university centers. This information is taken from an Internet survey on mobility (see González-Marrero and Lorente, 2012), which was given to students at the University of La Laguna, in 2009. A survey had also been carried out in 2007 (see González-Marrero, 2008), two months before the tram was available to the public.[1] Data obtained in both surveys show that almost half of the trips by students took place using their own vehicle.[2] This percentage was 42.6% in 2007 and dropped slightly to 38.7% in

[1] In 2007, a survey was carried out of 2,212 students and in 2009 of 2,831 students. Both surveys were financed by the Tenerife Island Government (Cabildo Insular de Tenerife).

[2] This situation was similar to a previous survey in 2000, to which it was compared, and referred only to the students of Economic and Business School at the University of La Laguna, (see Amador and González, 2005, and Amador, González and Ortúzar, 2005).

2009, once the tram had started running. Transfers between public transport modes were also observed, specifically users changed from bus to tram. In fact, 50% of the students that used the tram in 2009 stated that previously they had travelled to the university by bus, while 7.5% went on foot and only 10% traveled by car. This travel mode behavior highlights the limited success of the tram in reducing the use of private vehicles, as shown by González-Marrero et al, 2012.

Another noteworthy aspect is that students said the most common reason for them to choose their own vehicle to get to their education center was because it was faster, followed by acquiring greater flexibility in their daily schedules. These data confirm the importance of these characteristics related to travel time and with flexible schedules when choosing between using private vehicles and public transport. In addition, when asked why they chose to travel by either bus or tram 77.8% of bus users and 34.6% of tram users stated not having an available car as their main reason. Thus, these data revealed that most public transport users were captives, that is, students who had to choose public transport because no other transport mode was available.

These data convey significant dissatisfaction by the public transport users, which in turn would explain why it is so difficult to lower the number of private vehicle users, even after the tram began running. Clearly, there is a need to deepen our understanding of how commuters perceive the different characteristics of public transport.

This study contributes further evidence of the importance of increasing the awareness and knowledge of travel time perceptions in public transport (in-vehicle), even when that travel time is certain. Specifically, the aim of this study is to understand the factors that influence distorted perceptions of travel time in a public transport mode that runs along a segregated track. To do this, models have been estimated where the ratio of perception error of travel time in-vehicle to measured travel time in-vehicle is a function of measured time in-vehicle and the perceived times for other stages of the journey (waiting , access and egress time). Other explanatory variables included are commuters' (frequent users) and trip characteristics (trips with transfers and the transport mode used to access the tram stop). To carry out the estimation the previously mentioned 2009 survey was used. [3] As far as we know, no previous studies have explained the perceived error in travel time in vehicles as a function of these variables.

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

2. The Data

This study is based on a survey carried out with students from the University of La Laguna in May 2009, using revealed preferences methodology.[4] A questionnaire was prepared with Internet access, which identified characteristics, such as transport mode choice, trip conditions (travel time, cost, frequency), available transport modes, socio-economic characteristics, etc.[5]

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[3] Perceptions of university students have also been the object of study in other papers. For instance, Lee (1970) used a sample dataset of 171 student from the University of Dundee, Scotland to confirm that perceived distance of urban destinations vary depending on the direction of travel (inwards or outwards) with respect to the city.

[4] For a detailed analysis of the characteristics of the samples of revealed and stated choices, the reader can consult Ortuzar and Willumsen (2011). Likewise, to see cases of application of revealed choices in the estimation of demand models in Spain the reader can see, among others: González and Ortúzar (2002), Amador et al (2005).

[5] Nowadays, Internet surveys are seen as a way of providing quality information in the same way as face-to-face or telephone surveys (see for example, Bronner and Kuijlen, 2007; Heerwegh, 2009; Li et al, 2004)). Furthermore, previous experience in similar contexts to this study show that Internet surveys among young people and university students, accustomed to using the Internet, have similar results, regarding response rate and response quality, to those carried out face-to-face. (See Heerwegh, 2009).

In short, the questionnaire reveals the respondent's behavior. Internet surveys are advantageous because respondents can fill them out at any time of the day, anywhere, just as long as they have a computer with Internet access. Additional advantages include instantaneous follow-up of survey participation and possible respondent communication using email. Complete survey information can also be accessed, for instance tram route, bus lines, trip frequency, fares and free tram transfers to/from the bus, etc.

The purpose of the questionnaire was to characterize the commuting patterns of students, with questions on:

- the socioeconomic characteristics of the respondent (age, gender, studies, residence, etc.).
- the characteristics of the trip.
- The main reasons why students chose a specific transport mode to travel to their education center.
- The breakdown of overall journey time needed to reach their education center.

The sample obtained included 2,831 of the 21,909 total registered students at the University of La Laguna during the 2008-2009 academic year. In other words, the sample in this survey accounts for 12.1% of all registered students. This sample size is much larger than the 1,067 observations needed to fall within a 3% error range at a 95% confidence interval in the case of random sampling.

A subsample of 653 observations was chosen from the initial sample. It only included those students that use the tram to travel to their education center. The sample collects information on the following variables.

- Variables related to the perceptions of all components of travel times (in minutes, quantitative variables): perceived travel time in tram *(pt)*, perceived access time to tram stop *(at)*, perceived waiting time at tram stop *(wt)*, perceived egress time to education center *(et)*.
- Other variables: number of days per week traveling to education center, pre-tram travel mode (walking, bicycle, bus, car driver, car passenger), mode of access to tram (walking, bicycle, bus, car driver, car passenger, and others), reason why tram model was chosen (cheaper, faster, greater chance of arriving on time, schedule flexibility, offered frequency, unavailability of car, other).
- Socioeconomic variables: income level per strata, gender, place of residence, family members and number of drivers in the family.

Using both information provided by the company that runs the tram service and the responses of students about the stop they got on and off at, the variable measured travel time (*mt*) was determined for each observation, which is actual travel time in the tram (in-vehicle).

Figure 1 represents the cloud of points of perceived travel times in the tram (*pt*) and shows how it varies with respect to measured travel time (*mt*) using a 45 degree line.

Note that there are points located above, below and over the 45 degree line, indicating commuters overestimate, underestimate the travel time in tram and commuters that do not err in their perceptions. Given that the aim of this study is to analyze the explanatory factors for the distorted perception of travel time, a descriptive analysis has been chosen for each subsample that made a mistake in their perceptions. The aim is to find out if there are different characteristics for each of them.

Figure 1: Relationship between perceived and actual travel times

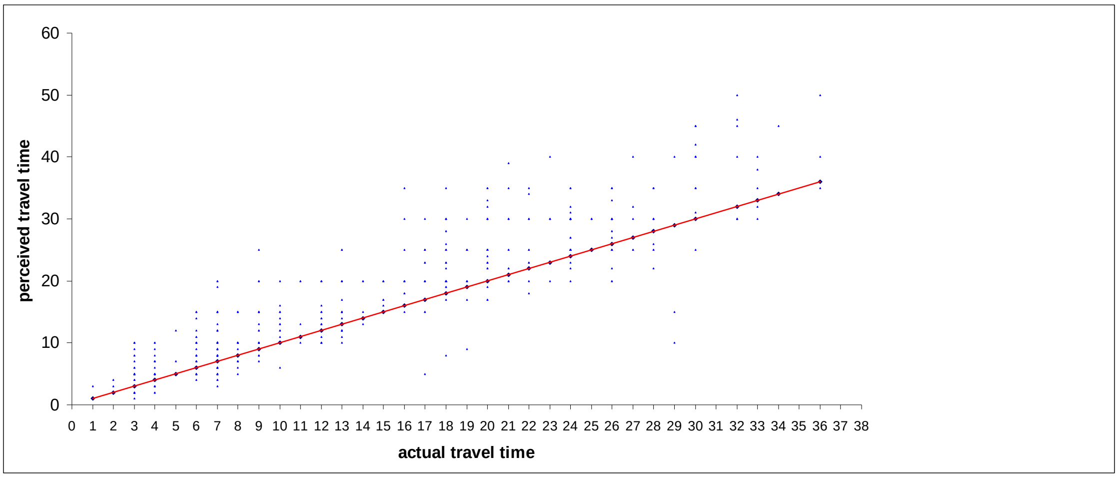

Table 1 presents the descriptive statistics of the quantitative variables and table 2 shows the number of observations and the frequencies of the qualitative variables. The information shows the total sample, the subsample that overestimate and that underestimate travel time in the tram. First and foremost, it is worth noting that the majority of users make mistakes in their perceptions of travel time by tram: 86% of the total sample make mistakes and of these 79% overestimate tram travel time.

Table 1 Quantitative variables: descriptive statistics

	Total Sample N=653		***pt>mt* (N=442)**		***pt<mt* (N=119)**	
	Mean	Standard deviation	Mean	Standard deviation	Media	Standard deviation
(pt-mt)/mt	0.25	0.41	0.42	0.39	-0.19	0.15
Pt	16.64	10.34	18.88	10.35	12.04	8.85
Mt	13.89	8.61	14.22	8.39	14.27	9.37
At	6.83	5.52	7.35	5.40	5.86	6.55
Wt	4.24	1.73	4.35	1.72	3.94	1.96
Et	4.71	3.72	5.14	3.95	3.65	2.45
Age	22.31	4.15	22.19	4.13	22.79	3.82

Source: compiled by authors, pt: perceived time in-vehicle, mt: measured time in-vehicle

Table 1 shows some of the different features between the overestimating and underestimating subsamples. As can be seen, those that perceive more time travelling have a much higher error rate; 42% more than the actual time compared with an underestimation of 19% by the other subsample. This is quite significant given the fact that average travel time is practically the same for both subsamples. Furthermore, the underestimating sample shows lower perceived times in all the components of travel time.

Table 2 highlights several important aspects. Not having a car available is the reason given by most users followed by the certainty of travel time and punctuality, except for the subsample that underestimates travel time, who affirm that their primary reason is the certainty of travel time and timetable (36.1%) and as their second reason the unavailability of a car (21.9%). This seems to indicate that users who perceive a longer travel time by tram than in reality are mainly commuters who would have preferred to travel by car yet did not have one available and were obliged to choose the tram. Thus, this represents a suboptimal choice, captive demand, so the overestimation of travel time partly reflects the dissatisfaction from this fact. However, for the subsample that underestimates tram travel time, it appears that their perceptions reflect a choice to travel by tram because of the convenience of aspects of travel time, which are the certainty and punctuality of the journey.

From the data in table 2, it can be observed that the vast majority of students use the tram three or more times a week and gain access to the tram stop on foot. Almost half the students used the bus before the tram was running, and a great majority state that their monthly family income is under 2400 Euros. These features are valid for the total sample and both subsamples.

Table 2 Qualitative variables and frequencies

	Total Sample N=653		*pt>mt* N=442		*pt<mt* N=119	
	observations	%	observations	%	observations	%
Reason to choose tram						
Faster	51	7.8	26	5.9	14	11.8
Car unavailable	226	34.6	163	36.9	26	21.9
Cheap	34	5,2	23	5.2	7	5.9
Flexible times	49	7.5	39	8.8	6	5.0
Frequency	75	11.5	47	10.6	18	15.1
Travel time certainly, punctuality…	187	28.6	119	26.9	43	36.1
Other	31	4.7	25	5.7	5	4.2
Journeys/week						
Less than 3	22	3.4	11	2.5	4	3.4
3 or more	631	96.6	431	97.5	115	96.6
Access mode to tram stop						
Walking	556	85.1	378	85.6	98	82.4
By bicycle	26	4.0	17	3.9	6	5.0
By bus	52	8.0	33	7.5	10	8.4
By car	17	2.6	12	2.7	5	4.2
Other	2	0.3	2	0.5	0	0.0
Pre tram travel mode						
Walking	49	7.5	28	6.3	8	6.7
Bus	325	49.8	230	52.0	54	45.4
Car	66	10.1	43	9.7	16	13.4
Bicycle	2	0.3	1	0.2	1	0.8
Not attending university center	202	30.9	134	30.3	38	31.9
Other	9	1.4	6	1.4	2	1.7
Gender						
Female	396	60.6	266	60,2	76	63,9
Male	257	39.4	176	39,8	43	36,1
Family income (€)						
<450	77	11.8	53	12.0	12	10.1
450-900	116	17.8	76	17.2	24	20.2
900-1500	177	27.1	136	30.8	25	21.0
1500-2400	161	24.7	102	23.1	30	25.2
>2400	87	13.3	58	13.1	19	16.0
No response	35	5.4	17	3.8	9	7.6

Source: compiled by authors

3. Model results

3.1. The model

Based on the data obtained in the survey four linear model were estimated, one for all commuters, one for users that perceive their travel time to be different from the measured travel time, one for commuters that overestimate travel time and one for those that underestimate travel time. The endogenous variable is named perception error ratio *(per=(pt-mt)/mt).* This variable allows us to measure the importance of the error made in perceptions of tram travel time compared to the actual time (mt) [6]

The explanatory variables, mentioned above, have been introduced into the model in different ways: the quantitative variables are put in directly, whereas the majority of the qualitative variables are used as dummies (1,0). Interactions between quantitative and dummy variables have also been introduced.

The estimated model is

$$per = \sum_i \alpha_i x_i + \sum_j \beta_j D_j + \sum_i \sum_j \gamma_{ij} x_i D_j + \varepsilon$$

Where : *per=(pt-mt)/mt);* x_i*:(mt, at, wt, et);*D_i*,* are the previously mentioned dummy variables related to qualitative variables; α_i, β_j, γ_{ij} are coefficients to be estimated and ε is a random variable with mean 0.

3.2. Results and discussions

Table 3 shows the results of four linear regression models, estimated using ordinary least square. The first model includes all commuters; the second model considers those

[6] This variable attempts to account for, for example, the fact that a minute's error in 5 minutes of real time is not the same as a minute's error in 25 minutes of travel time. This effect could not have been included if the endogenous variable had only been the error made (*pt-mt*).

that perceive their travel time different to the measured (actual) travel time in tram. The third model includes only commuters that overestimate travel time, and finally, the fourth model considers those that underestimate the travel time.[7] Estimated coefficients, standardized coefficients and the t-student statistics for each significant explanatory variable are shown. The method used to select the variable is the denominated backward method.[8] The variables that were found to be significant are the ones that are related to the various components of trip time stated by the individuals and the qualitative ones that are mentioned next. These variables include one that accounts for trips with transfers through a dummy equal to one for commuters that make transfers between transport modes (*Dtr*). Another variable is used for frequent users, with a dummy value of one for those students who travel to their education center three or more times a week (*Df*).

The variable access time (*at*) interacts with a dummy, with value of one, for users who gain access to the tram stop on foot (*at-walking*). This variable has been built to account for the access time for these students on foot. The variable that refers to commuters who access the tram stop by car as a passenger (*Da-car*), which is equal to one for them and zero for the others who do not. The dummy variable Da-walking has a value of one for those commuters who access the stop on foot.

[7] In this last model, the absolute value endogenous variable has been introduced to facilitate the interpretation of the signs of the estimated parameters.

[8] That is, initially all the variables are introduced in the models, and subsequently, step by step, one after another is excluded. Those variables that have the least partial correlation with the dependent variable and that surpass the exclusion criterion are the first to be excluded. Subsequently, the same procedure is carried out with the next variable with the smallest partial correlation. This procedure ends when there are no variables left in the equation that satisfy the exclusion criterion.

Table 3: Results of the estimate

Variables	Model 1			Model 2			Model 3			Model 4		
	All commuters			Under and overestimating samples			Overestimating sample			Underestimating sample		
	Coefficient		T	Coefficient		t	Coefficient		t	Coefficient		t
	estimat.	standard		estimat.	standard		estimat	standard		estima t.	standard	
Mt	-0.01	-0.36	-6.14	-0.01	-0.41	-6.69	-0.02	-0.52	-9.22	-0.01	-0.47	-4.92
Wt	0.02	0.22	2.69	0.03	0.25	3.01	0.04	0.32	4.25	0.01	0.25	2.10
Et	0.01	0.19	3.67	0.02	0.18	3.28						
Df	0.16	0.33	3.66	0.2	0.40	4.20	0.45	0.78	8.94			
at-walking	0.02	0.21	4.21	0.01	0.20	3.85	0.01	0.12	2.60			
Da-car							0.18	0.05	1.9			
Dtr										0.25	0.43	5.20
Da-walking										0.23	0.86	7.29
N	653			561			442			119		
R^2	0.356			0.408			0.632			0.703		
F test	71.786			76.503			150.038			68.015		

The results of the four models show that the joint significance of the exogenous variables is clear, as observed by the F test values. Each variable is shown to be significant at the 95% confidence interval. The results of all models satisfy the standard statistical hypotheses: linearity of the measured phenomena, independence of random disturbances, normality of the distribution of random disturbances, and the homoscedasticity of random disturbances, thus, the obtained estimator is linearly unbiased and optimal. The study of the correlation between sample regressors shows that in no cases are there problems of high multicollinearity, a result that is confirmed by the values of the factor of incremental variance. This allows us to conclude that the parameters have been estimated with a high level of accuracy, which is reflected in the magnitude and in the signs calculated for the parameters. Thus, the validity of the estimated models, both all together and for each parameter, can be affirmed.

When a model is estimated using the whole sample (model 1), R^2 is the lowest and the explanatory variables are different to those that appear when the population is segmented (models 3 and 4). When commuters who do not make any errors are eliminated (model 2), the results are similar to those obtained for the total sample.

In models 1 and 2, waiting time, egress time and access time walking are found to be significant variables that are positively related to the ratio between perception error and measured travel time. Furthermore, observing the values of the standardized coefficients, the most important explanatory variable, for both models, is measured time, though this is not the case in models 3 and 4.

The results obtained from models 3 and 4 demonstrate that the explanatory variables are different for commuters that overestimate travel time to those that underestimate travel time. This shows that estimating just one model with the total sample could have led to erroneous conclusions, as well as showing the need to segment users according to the sign of the error they make in their perceptions of travel time. Let us now focus further on the results obtained from models 3 and 4.

Note that the goodness of fit of regression models 3 and 4 have adjusted R^2 values of 0.632 and 0.703 higher than those obtained in models 1 and 2 (see Table 3). This indicates that the fit of the model improves significantly when we segment the sample depending on the sign of error committed by the individual.

The results for users that overestimate (model 3) show that the variable *per* is negatively related to measured travel time and positively with waiting time and access time walking. This indicates that as measured travel time increases, the error perception rate decreases. This could be interpreted as a non-linear relationship between perception error (pt-mt) and real travel time. In addition, an increase in waiting time at the tram stop (wt) increases the rate of perceived travel time error in tram, the same happens with access time walking to tram stop (at-walking). Although the standardized parameter of both these variables shows that the effect of the variable wt is more important.

Commuting frequency also provides an interesting result. It was found that the students who travel most frequently to their education center, three or more times per week, are those with higher error rates. Thus, these commuters overestimate travel time even more than others do, even though their condition as frequent users should offer them greater familiarity with the travel conditions. However, it is possible that this overestimation is attributable to fatigue acquired during their trips, which could lead them to exaggerate commuting conditions. It is worth noting that this is the explanatory variable with greatest weight in this model, according to the standardized coefficient

Another result from model 3 is that the users who access the stop by car as a passenger show a greater error rate in their perceived times than the rest. This reflects that the transfer between a private vehicle and the tram negatively biases perceptions of tram travel time, which could be interpreted as a loss of convenience leading them to perceive worse conditions in the tram trip, and thus overestimate travel time. In this case, policies be aimed at reducing the functional, psychological and cultural values of private cars and, at the same time, increasing the performance of public transport (see Steg et al, 2001)

The results from model 4 confirm that some of the variables that explain the error rate in travel time perceptions for the underestimating sample are distinct from those in model 3. In this case, as observed in model 3, the error rate in the underestimating sample decreases with real travel time and increases with waiting time. However, the marginal effect of both variables is greater in model 3. The following differences should also be noted for model 4. First, students that have to transfer between transport modes tend to underestimate tram travel time to a greater extent. This result could reflect that the combination of different transport modes (primarily bus-tram) makes the journey more inconvenient and thus makes the travel conditions in the tram seem better. Second, commuters who access the tram on foot have a greater error rate of the perceived time in tram, that is, they tend to underestimate tram travel times even more. This reflects the fact that for these commuters the tram is the most convenient means of transport as students who access stops on foot, in this subsample, take on average 3.5 minutes, which clearly shows that the stops are very close to their homes. This makes them perceive this transport mode as more convenient; therefore, they tend to perceive a shorter travel time than the real one. Moreover, based on the standardized parameter, this is the variable with greatest weight in model 4.

4. Conclusions

In this work, we have analyzed explanatory variables found in a phenomenon in behavioral psychology, namely perceived travel times. Specifically, the error rate of perceived times in tram are explained as a function of the perceptions of other time components (access, waiting and egress),. This work was based on a survey of revealed preferences of students at the University of La Laguna that traveled by tram to their education center.

The analysis reveals that 86% of users make errors in their perceptions of travel time in tram, and of these 79% overestimate tram travel time with an average overestimation of 42%. This is despite being a segregated transport mode and, therefore, one in which travel time is certain. The commuters were classified into two groups based on the sign of the perception error, that is, commuters that overestimate travel time and ones that underestimate it. This allowed us to identify different aspects between each of the subsamples.

The results obtained provide evidence that some of the variables that explain the behavior of commuters who overestimate travel time are different from those of users that underestimate it. One common result is that the error rate decreases as real travel time increases, which could account for the fact that commuters know the approximate maximum travel time and on approaching this maximum, errors tend to increase less than the real time. Another common result is that an increase in the waiting time at the tram stop increases the error rate.

The results for the overestimating users show that the error rate increases when the access time walking to tram stop increases, although the time component outside the vehicle that most affects the overestimation of travel time is the waiting time at the stop. Furthermore, it has been found that the students who travel most frequently to their education center are those with the highest error rates. It is possible that this overestimation is attributable to fatigue acquired during their trips, which could lead them to exaggerate commuting conditions. This is the explanatory variable with the greatest weight, which indicates that policies aimed at this segment would have the greatest success. Likewise, commuters that access the stop by car, as a passenger, show higher travel time error rates than those who reach the stop by other modes. This confirms the results obtained in other studies, in the sense that private vehicle users tend to view public transport as being worse than it is.

The results for underestimating users reveal that students that make transfers between transport modes tend to underestimate travel time to a greater degree, which reflects a favorable perception of tram travel conditions. Moreover, it has been demonstrated that commuters who walk to access the tram tend to underestimate travel times even more. This could be due to the fact these users have tram stops close to their homes and, thus, perceive this mode of transport to be convenient. In fact, this is the variable with greatest marginal effect. Therefore, the results of other studies in which the importance of route design regarding ease of access on foot for the majority of passengers are confirmed.

An appropriate public transport policy would focus on commuters that overestimate travel time, establishing as one of its goals to have perceived travel time be as close as possible to actual travel times, so that perceptions of service quality are improved. It would seem that actions such as publicity campaigns highlighting real travel times, increasing the frequency of the service to reduce waiting time, and an appropriate location of stops to facilitate access on foot are called for. In this work, the importance of quantifying and analyzing public transport users that overestimate travel time through surveys revealing preferences is worth noting. This line of research, with the aim of designing specific polices targeting this segment of users should mitigate the risks of commuters changing from public transport to private vehicle use.

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