TRAVELLING TO WORK OR JUST FOR FUN? EXPLORING DIFFERENCES IN PERCEPTIONS AND ATTITUDES BY TRAVEL MODES

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ABSTRACT

This paper examines the effect and relative contribution of attitudinal factors and demographic variables in explaining mode choice behavior and to test for differences in journeys for work or for leisure/ shopping. Results show that for work journeys all respondents evaluate the performance of public transport service quality attributes worse than for other trips. Also, public transport users overall satisfaction and service quality evaluation is lower for work trips. Moreover, they seem to be less likely to recommend that mode of transport to a friend or relative. As expected car users perceived the performance of public transport must worst than regular public transport users. The most important aspects of the service that are being provided below the desired standards are: cost, waiting time, on-time performance, comfortable stops and frequency. Also, results show that attitudinal data is very important in explaining mode choice behavior. Car dependence, need for control and cost emerged as the most important attitudinal variables in explaining mode choice whether the journey is for work or for leisure/ shopping. However, individuals making a leisure trip are more sensible to travel stress. Moreover, car availability strongly influences mode choice.

Keywords: Mode choice, journey purpose, travel behavior, service quality, public transport, car.

INTRODUCTION

Nowadays most people are highly dependent on car travel (Anable 2005). But, the car is far more than just a means of transport (Steg 2005). Other motives than just its instrumental functions seem to play an important role, such as feelings of sensation, power, freedom, status and superiority (Steg 2005). Moreover, the perceived benefits of cars depend on the lifestyle and social–spacial relations engaged by the user (Hiscock, Macintyre et al. 2002).

Policies which aim at increasing public transport usage should promote its image, but at the same time, public transport systems need to become more market-oriented and competitive. This requires an improvement in service quality, which can only be achieved by a clear understanding of travel behavior and consumer needs and expectations. Therefore, it becomes essential to evaluate the level of service in order to identify the potential strengths and weaknesses of public transport systems. This can provide clues to public transport management in the process of evaluating alternative service improvements aimed at enhancing user satisfaction and increasing market share.

The measurement of service quality is a challenging and important research area with practical implications for all service providers and has been extensively studied since it's a key determinant of the intention to use a service (Brown, Churchill et al. 1993). However despite the extensive research and expertise in the customer service arena, this has not been replicated in the transport sector (Stradling, Anable et al. 2007). But in the public sector, namely in the transportation field assessing and improving the quality of service is becoming more important. The increasing trend in car ownership and people dependence on car travel and its consequences, namely on environment and urban congestion, is forcing the development and implementation of measures to promote alternatives to car usage. Encouraging and facilitating public transport use must become a viable alternative, which implies making the transport system more appealing to travelers by improving the service quality of public transport. In consequence measuring and improving the quality of service in public transport is becoming critical for transport service providers. However, consumer evaluation of quality is an abstract and elusive concept to measure (Parasuraman, Zeithaml et al. 1985) making difficult the development of valid and accurate measures of service quality. It deals with abstract and intangible attributes, which are not easily measured. It is not expected that all car users, in general, will change from driving a car to using public transport exclusively by improving the public transport system (Jensen 1999), but service quality is perceived as an important determinant of users' travel demand (Prioni and Hensher 2000). Additionally, transit behavior is influenced by attitudes towards using public transport and beliefs about whether or not transit can fulfill one's transport needs (Thøgersen 2006). This implies that traveler attitudes and preferences are an important component of travel behavior (Kuppam, Pendyala et al. 1999; Golob 2003; Parkany, Gallagher et al. 2004). Moreover, the contribution of attitudinal variables in explaining mode choice behavior appears to be greater than that of demographic variables (Kuppam, Pendyala et al. 1999).

So, in order to reduce car dependence it is necessary to promote several measures, such as modifying the opportunities for travel by improving the availability of alternative modes;

modifying the inclinations and preferences towards travel by alternative modes; and modifying the lifestyle patterns that generate obligations to travel from current origins to present destinations (Stradling 2003). At the same time policies that involve an improvement in the transit service should be implemented. Furthermore, it is necessary to promote measures to reduce the attractiveness of car use (Gärling and Schuitema 2007).
Evidence suggests that policies should be designed towards specific target groups (Jensen 1999; Anable 2005; Steg 2005). Marketing campaigns should target individuals that are most motivated to experience public transport (Thøgersen 2006). This suggests the need for segmentation taking into account travel attitudes and behaviors. Recent studies have revealed the importance of individuals' attitudes to the acceptance of transport demand policies (Thorpe, Hills et al. 2000; Beale and Bonsall 2007). Furthermore, the negative beliefs of individuals with no desire to use a bus are very difficult to overcome (Beale and Bonsall 2007).
This brief literature review points that traveler attitudes, preferences, and perceptions and their effect on travel behavior have been under considerable analysis by researchers.

METHOD

Sample and procedure

The survey was administered during the fall of 2005, from mid September to the beginning of November. In all, 3009 telephone interviews were conducted by trained interviewers. The "nearest birthday method" was used to randomly select the member of the household older than 15 to complete the survey. The sample population consisted of individuals, older than sixteen, who reside in the Porto region and is representative in terms of city of residence. The response rate was 24.4%. After screening the data and removing some outliers 2778 usable responses were obtained.
Greater Porto is the second largest metropolitan area of Portugal, with about 1.5 million people. This urban area around Porto city includes fourteen municipalities in northern Portugal. In a 10-year period, from 1991 to 2001, car journeys to work or school increased from 31% to 52%, and public transport usage declined from 42% to 28% (INE 2003). Buses are the most used form of public transport. A new mode of transport, light rail, is being constructed in the metropolitan area. Light rail, which started its operation in 2003, offered only two lines at the time this study was carried out.

Survey instrument

The research instrument was based on an extensive literature review and the previous qualitative study, as well as inputs from a local transport operator. The study focuses on the trip respondents undertake most regularly during the week, meaning the trip they do more often for the same purpose during a usual week.

The survey instrument included several sections. One with questions to ascertain the importance of 20 public transport service quality attributes on a eleven point Likert scale ranging from '0' (not important at all) to '10', (extremely important). Public transport service quality performance was measure, using the same 20 attributes. Then the respondents were asked to evaluate overall satisfaction, service quality and loyalty with their own travel mode (car, bus, metro, train, others) in the most regular trip. Another section included 35 attitude questions measured on a Likert scale ranging from 0 ("totally disagree") to 10 ("totally agree"). Attitudinal questions included aspects related to time spent on traveling, attachment to the car, feelings towards public transport, travel stress, cost and environmental concerns. The questionnaire also gathered general information about the respondent travel behavior (focusing on the most regular trip), such as mode of transportation, reasons for the trip and frequency. Additionally questions regarding socioeconomic information including age, gender, employment, education, income, occupation and household characteristics.

RESULTS

Profile of the respondents

Table 1 lists the sample key demographics. The sample comprised 49.5% of public transport users, 38.5% of private car users, 4.8% of both public and private transport users and 6.3% walk. The demographics of the sample indicate that 32 percent of the respondents were male and 68 percent of them were female. Respondents ranged in age from 16 to 79 years. Only 16 percent had completed undergraduate or postgraduate studies. Half of the respondents were employed (53.6%), and a further 8.9% were currently studying. More than seventy seven per cent reported monthly incomes of €1,000 or less, with women having lower incomes than men. Almost 66% of respondents have a driver´s licenses. A higher percentage of men hold driver's license (84.2% of men and 56.7% of women), and own a car (76.9% of men and 49.8% of women). The mean household size for the sample is 2.99 people and the average number of vehicles is 1.18.
Almost half of the respondents' most regularly trip was to commute to work (49.7% of men and 44.3% of women), which is consistent with men's high levels of employment found in Porto Metropolitan Area population (55% of men and 45% of women *(INE 2003)*).
As expected, some difference in travel patterns emerged. For non-work trips 61.5% of women use public transport, 25.4% travel by car and 8.2% walk. But for work trips women car usage increase to 45.2% and 42.2% use public transport. Men use car more, not only for work trips but also for other trips and also walk less than women. Sixty per cent of the men use car for non-work trips and 27.7% use public transport and only 4.4% walk. For work trips men use mainly car (65.0%), only 24.3% commute by public transport and 2.9% walk. It is interesting to note that for school trips, young men also use more car than young women (38.1% of men and 28.6% of women).

Table 1: Sample key demographics

Variable	Total	Transit	Car	Transit & Car	Walk
Number	2778	1376	1070	133	174
% of sample	(49.5%)	(38.5%)	(4.8%)	(6.3%)	(21.6%)
Gender					
Male	31.9%	72.9%	39.2%	37.6%	81.6%
Female	68.1%	27.1%	60.8%	62.4%	18.4%
Age category					
<24	11.9%	13.2%	11.4%	10.5%	7.5%
25-34	11.2%	7.8%	16.2%	12.0%	6.3%
35-64	54.8%	47.29%	63.4%	56.4%	59.8%
>65	22.1%	31.8%	9.1%	21.1%	26.4%
Education					
Less than high school	55.1%	63.2%	42.5%	51.9%	70.1%
High School	20.7%	19.4%	22.5%	24.8%	19.0%
College or more	24.1%	17.4%	34.9%	23.3%	10.9%
Occupational category					
Management	14.3%	6.6%	25.8%	10.5%	6.9%
Professionals	3.5%	2.4%	5.0%	2.3%	2.3%
Administrative staff	10.8%	7.7%	14.2%	15.0%	10.9%
Technicians	13.0%	10.9%	15.8%	12.8%	10.9%
Non-specialized worker	12.1%	14.5%	8.8%	11.3%	16.1%
Housewife	7.6%	8.1%	6.3%	9.0%	12.1%
Student	8.9%	11.2%	6.9%	8.3%	4.6%
Retired	25.0%	33.6%	12.6%	24.8%	31.6%
Unemployed	4.9%	5.0%	4.6%	6.0%	4.6%
Monthly income (€)					
< 1000	77.5%	87.4%	63.8%	76.7%	84.5%
1000-1999	16.2%	10.0%	24.8%	14.3%	13.2%
>2000	6.3%	2.6%	11.4%	9.0%	2.3%
Reasons for doing the trip					
Work	46.0%	33.6%	62.1%	50.4%	43.1%
School	9.3%	11.3%	7.8%	7.5%	5.2%
Leisure/ Shopping	22.9%	26.1%	16.5%	23.3%	37.9%
Others	21.8%	29.1%	13.6%	18.8%	13.8%
With kids at home	30.5%	25.6%	37.0%	33.1%	28.2%
Have a driver's license	65.5%	49.1%	88.7%	75.2%	44.8%
Household number of vehicles (mean)	1.18	0.72	1.79	1.40	0.84
Duration (in minutes) of regular trip					
<15	26.8%	17.2%	36.3%	18.0%	51.7%
15-30	39.3%	41.0%	38.5%	39.1%	29.3%
30-45	19.4%	22.8%	15.1%	28.6%	12.1%
>45	14.5%	19.0%	10.1%	14.3%	6.9%

Women make more short trips than men (less than 15 minutes) and longer trips (more than 45 minutes). The analysis of the trips length by mode of transport reveals that women's trips by car are shorter than men's, also women make shorter walking trips.

The purpose of this study is to identify and understand travel behavior, attitudes toward travel, and perceptions of public transport service quality, not to rigorously represent the

distribution of those aspects across the population as a whole. However it is relevant to examine the extent to which the sample is representative of the Great Porto population. The sample is representative in terms of city of residence, however is biased in terms of gender, age and public transport usage. Woman are overrepresented (68%) compared to Census data for the Porto Metropolitan Area population (52%). Therefore, descriptive statistics based on the sample as a whole will in general be biased, particularly those for variables correlated with gender. Also, the sample is on average relatively older than Porto Metropolitan Area population and consequently public transport users are overrepresented in the sample. The gender bias may be explained because older women tend to be more at home.

Importance, performance and disgruntlement

Understanding the importance of certain aspects of public transport service and how they are evaluated is crucial for service providers. Consideration of both these factors – attribute-importance measures and attribute-performance ratings – is critical when priorities for maintain or/ and improving overall satisfaction are designed. To ascertain which aspect of the service are in most need of improvement a dissatisfaction measure, which combines measures of importance and performance labeled user disgruntlement (Stradling, Anable et al. 2007), was used.

Figure 1 shows how different mode users rate the importance of the 20 attributes of public transport service. First, all individuals feel that all attributes are quite important. As can be seen, attributes such as ride smoothness and safety, vehicle cleanliness, frequency, on-time performance, vehicle comfort, waiting time and travel time were perceived as most important.

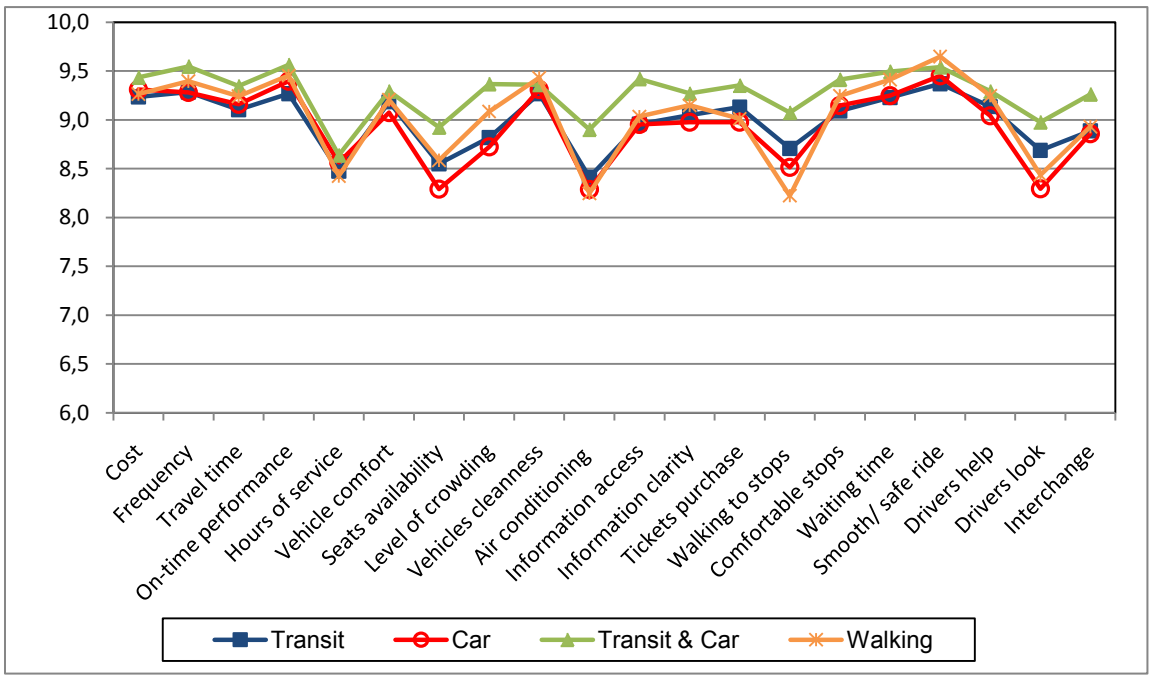

Figure 1: Mean importance ratings of the 20 attributes

Individuals' performance evaluation of public transport service quality is illustrated in Figure 2. On average the attributes with worst performance are: cost, seats availability, level of crowding, wait time, and comfortable stops. It should be noted that some of the most important attributes obtained the lowest scores. Car users scored all service quality features lower than other mode users, indicating that they perceived the performance of public transport must worst than real transit users.

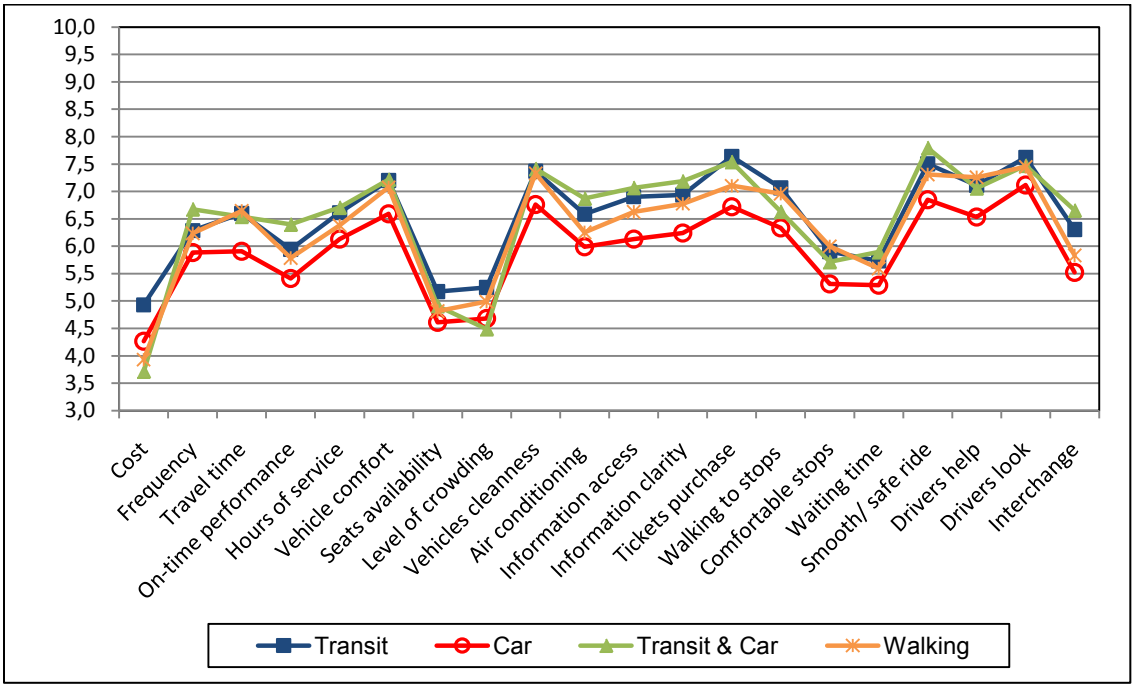

Figure 2: Mean performance ratings of the 20 attributes

It is interesting to note that, both for importance and performance the scores pattern is quite similar for all transport modes.

Next, a disgruntlement measure was computed by cross-tabulating the performance ratings (respondents who strongly disagree and disagree) against importance scores (respondents rating important and very important) for each attribute. This measure gives the advantage of identifying how many respondents think that an aspect of a service is important to them but, currently, is not being provided well (Stradling, Anable et al. 2007). Figure 3 shows the percentage of disgruntled respondents for each attribute in decreasing order. The aspects of the service with the highest percentage of disgruntlement are cost, level of crowding, seats availability, waiting time, comfortable stops, and on-time performance. The overall disgruntlement is higher for car users' on almost all service quality attributes.

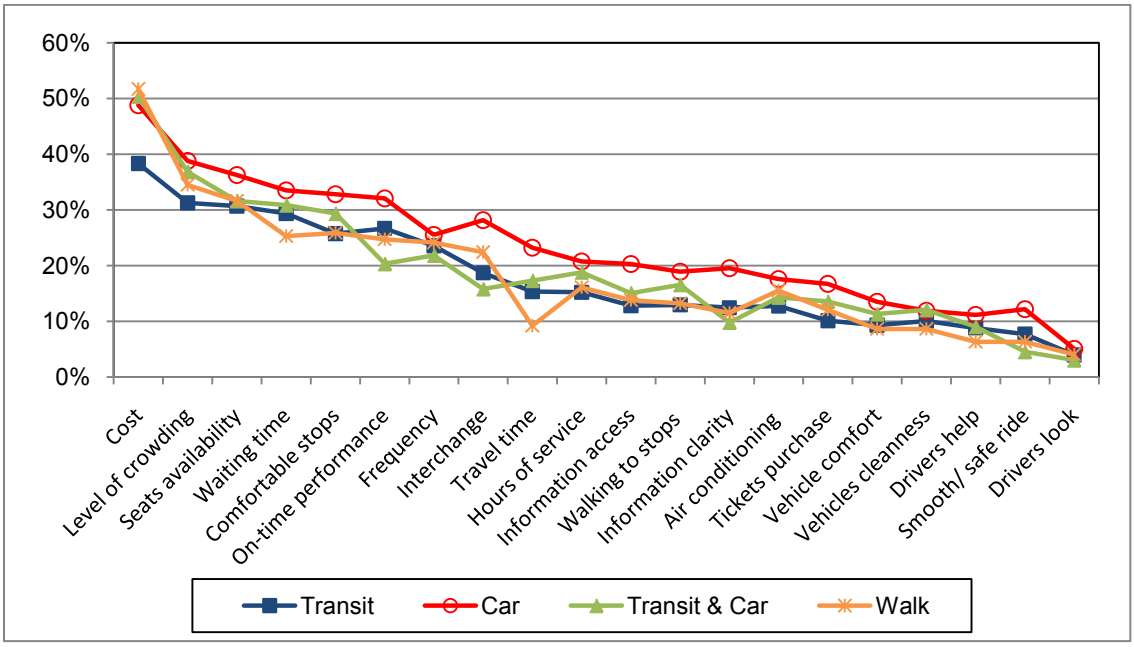

Figure 3: Disgruntlement measures for the 20 attributes (% disgruntled respondents)

Analysis by travel motive

Individuals tend to attach different values to aspects of service whether the journey is for work or leisure. Usually for work journeys instrumental aspects such as flexibility, convenience, cost, and reliability, are more important than affective factors like relaxation, freedom and no stress (Anable and Gatersleben 2005). The analysis focused on journeys either for work or for a leisure/shopping trip.

Figure 4 shows how respondents who commute to work or to leisure/shopping trip evaluate the importance and performance of public transport attributes. Respondents who either commute to work or for leisure/shopping trip rated importance quite similarly. Although, the factors seems to be slightly more important for respondents who commute to work, with the exception of seats availability, level of crowding and drivers help. However, public transport performance evaluation was quite different. Respondents commuting to work perceived public transport worst than respondents making a leisure journey. Despite this difference the performance score pattern is similar.

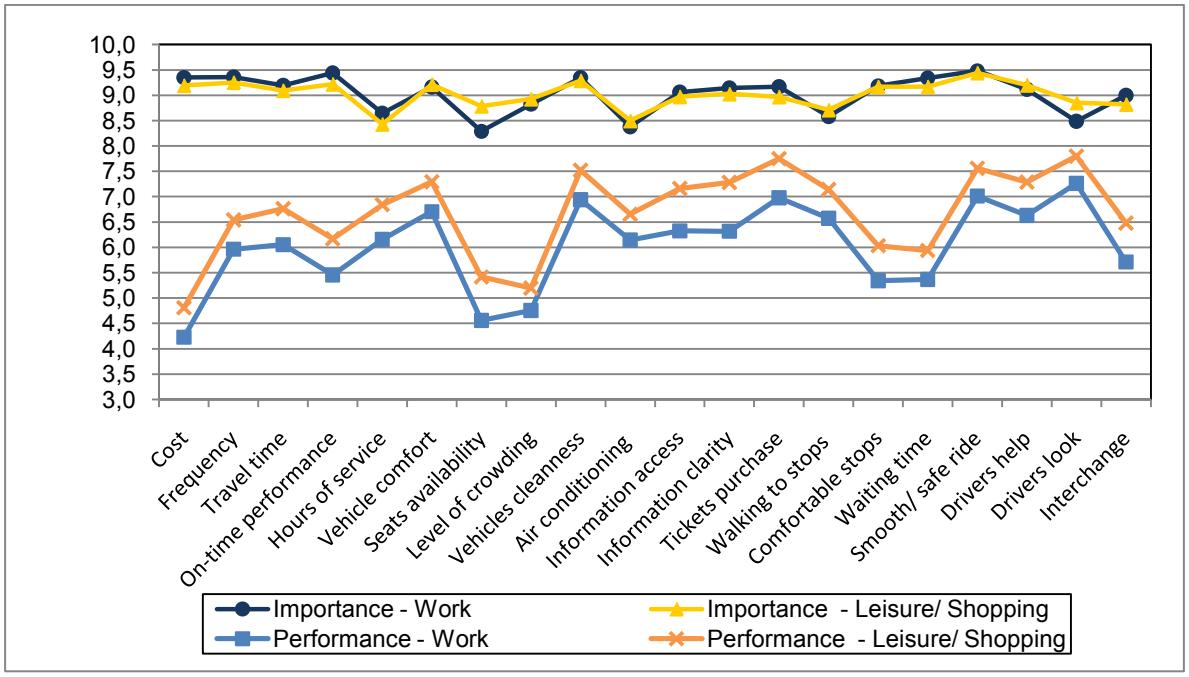

Figure 4: Importance and performance ratings for a journey to work and for a journey to leisure/shopping

Improvement areas for public transport service

Knowing the gaps between customer desire level of the service and the service being provided and matching these expectations to the relative importance of each aspect is crucial to ascertain which areas of the service should be improved first. In Figure 5 and 6 disgruntlement is plotted against importance for public transport car and users, respectively. The plot was divided in four areas around the centroid of the data, in order to allow an identification of those elements that need to be improved. Cost, waiting time, on-time performance, comfortable stops and frequency are very important and its performance is perceived as below the required standards. It is interesting to note that for car users cost is more important than for public transport users and that they are more disgruntled with it.

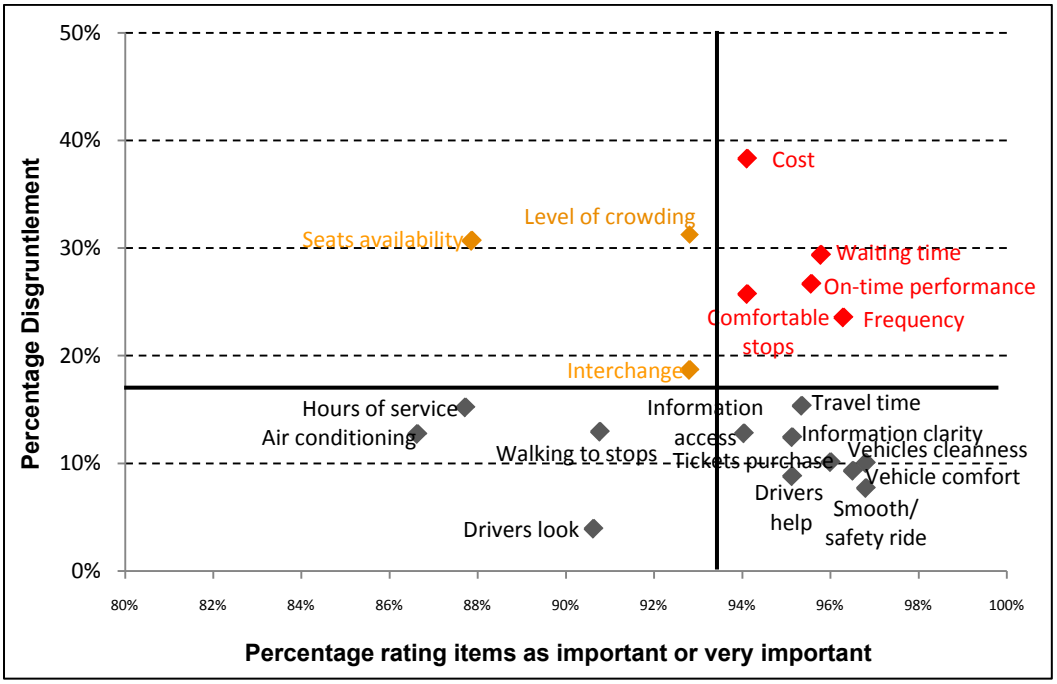

Figure 5: Scatter graph of disgruntlement vs. importance for public transport users

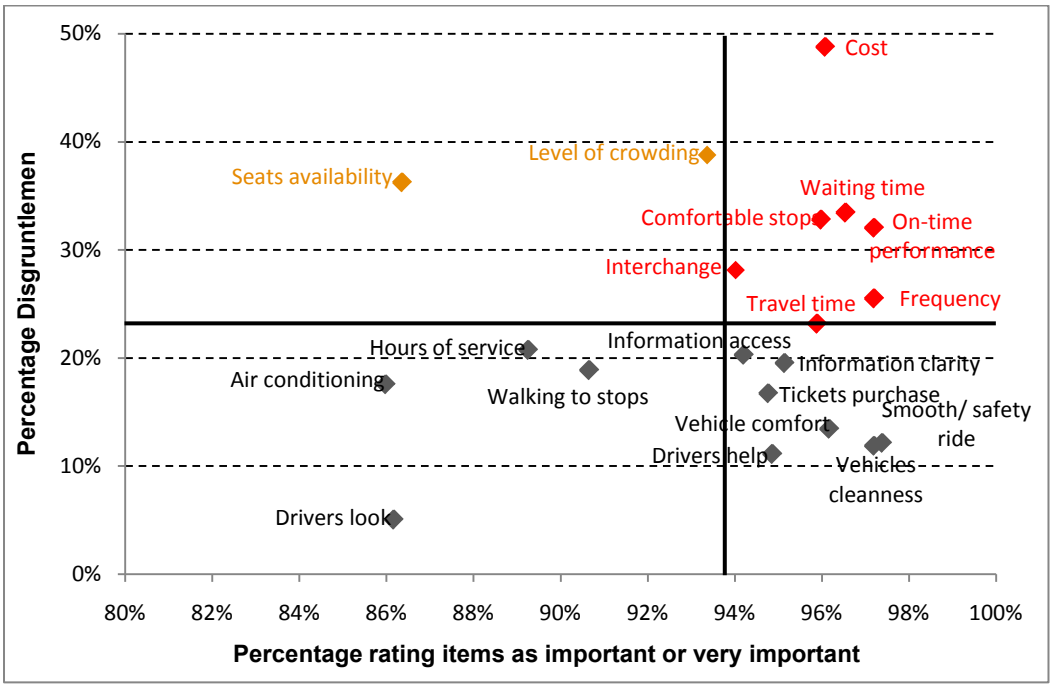

Figure 6: Scatter graph of disgruntlement vs. importance for car users

Overall service quality and satisfaction evaluation and Behavioral Intention to use Public Transport

Table 2 presents how different mode users evaluate their transport for a journey to work or for leisure/shopping. All individuals seem to be satisfied and like to use their mode of transport, however satisfaction increases for non-work trips. Walkers and car users seem to be the most satisfied. When asked how they would feel if they have to use public transport in their regular journey, most of the walkers and car users would dislike it, whereas individuals who use both public transport and car appear to prefer that. However, since they use both car and public transport they were also asked how they would feel if they have to use car in their regular journey and they seem to also prefer that, especially for a leisure/shopping trip. Public transport users seem to prefer their one mode and do not want to change to using car. Public transport users and individuals who use both public transport and car seems have the intention to use more public transport. On the contrary, car users and walkers do not appear be willingly to change to public transport.

Table 2: Satisfaction, Service quality evaluation, loyalty and behavioral intention to use public transport by travel mode on a journey for work or for leisure/shopping

	Transit		**Transit & Car**		**Car**		**Walking**	
	Work	Leisure/ Shopping	Work	Leisure/ Shopping	Work	Leisure/ Shopping	Work	Leisure/ Shopping
Are you satisfied in riding public transport?	6.8	7.8	7.9	8.5	.	.		
How do you rate the public transport service?	6.5	7.4	8.0	8.5	.	.		
Do you like to ride public transport in your most regular trip?	7.0	7.9	7.9	8.7	.	.		
Would you recommend public transport to a friend or relative?	6.7	7.7	8.4	8.6	.	.		
How would you feel if you had to use a car in your most regular trip?	6.0	5.8	7.2	8.0	.	.		
Are you satisfied in travelling by car in your most regular trip?	.		7.6	8.3	8.2	8.7		
Do you like (to use car or walk) in your most regular trip?	.		8.0	8.3	8.4	8.9	8.8	9.1
Would you recommend this mean of transport to a friend or relative?	.		7.5	8.0	7.3	7.8	8.8	8.8
How would you feel if you had to use a public transport in your most regular trip?			6.8	8.2	5.3	5.9	5.0	4.0
Intention to use (more) Public Transport	7.5	7.6	8.1	7.8	5.6	5.8	4.9	6.1

Multivariate Analysis

The aim of the models estimation in this paper is to examine the effect and relative contribution of attitudinal factors in explaining mode choice behavior and to test for differences in journeys for work or for leisure/ shopping. Demographic variables also play an important role in mode choice behavior and therefore are also included in the models. The models were estimated using logistic regression analysis. Regression models are beneficial because they allow us to account for multiple variables which affect the outcome variable simultaneously. Therefore, we can assess the impact of any given variable net of the effects of all other variables tested.
As mentioned earlier, the data set contained several variables representing attitudes, importance and performance ratings. It would be difficult to include all of them in a logistic regression model. So the variables were submitted to a factor analysis in order to identify similar dimensions underlying the set of variables. Factor scores were then computed for each factor and then used for subsequent analysis.

Factor analysis

Factor analysis was performed for the importance, performance and attitudinal variables, separately, using principal component analysis with an oblique rotation. Oblique rotation allows the underlying dimensions to be correlated, while in the orthogonal rotation the initial factor solution is rotated maintaining factor independency. The oblique solution will generally provide a clear and more interpretable factor structure than the orthogonal one. Both methods were applied and both solutions provide similar results, grouping the same indicators into the same factors.
In order to improve construct reliability, the factor solutions, construct reliabilities and item-to-total correlations were analyzed. Items which loaded highly on more than one factor and had low item-to-total correlations were deleted. This process of scale refinement yielded an eight factor solution with eigenvalues greater than 1.0. The analysis of a scree test indicated that the number of factors was appropriated.
The factor analysis results derived from the 20 importance items is shown in Table 3. Two factors were extracted and explained 54.2% of the variance. The first factor named *Convenience/ General Service* captured those variables related to the importance of the various aspects of the general service and its convenience. The second factor consisted of variables that are related to the importance of comfort while travelling by public transport.
Table 4 shows the factor analysis performed on the 20 performance variables resulted in two factors (explaining 51.6% of the variance). The first factor, *Ease of Use* includes variables representing perceptions of performance related to the convenience and easiness of using the public transport. The second factor named *Efficiency/ Comfort*, is related to performance involving both riding operational efficiency and comfort.

Table 3: Factor Analysis of the Importance variables and Reliability (Oblimin rotation)

Factor/ Variable	**Factor Loadings**	**Cronbach's alpha (α)**
Convenience/ general service		0.93
The services are on time	0.86	
Waiting time is low	0.83	
The services are frequent	0.81	
The ride is smooth and safe	0.79	
The price is affordable	0.78	
The trip in public transport is fast	0.73	
The vehicles interior are clean	0.71	
The shelters/stops are comfortable	0.66	
The information is clear	0.63	
Getting information is easy	0.63	
Buying tickets is easy	0.61	
The vehicles are comfortable	0.59	
Changing vehicles is easy and fast	0.59	
The drivers are courteous and helpful	0.50	
Comfort		0.77
The drivers look nice and clean	0.77	
The vehicles have air conditioning	0.74	
Seats are always available on the vehicle	0.70	
The walking to shelters/stops is short	0.55	
The vehicles are not over crowded	0.46	

Table 4: Factor Analysis of the Performance variables and Reliability (Oblimin rotation)

Factor/ Variable	**Factor Loadings**	**Cronbach's alpha (α)**
Ease of use		0.89
The information is clear	0.79	
Getting information is easy	0.78	
The vehicles interior are clean	0.72	
Buying tickets is easy	0.72	
The drivers are courteous and helpful	0.70	
The ride is smooth and safe	0.68	
The vehicles are comfortable	0.68	
Changing vehicles is easy and fast	0.53	
The trip in public transport is fast	0.47	
The shelters/stops are comfortable	0.43	
Efficiency/ Comfort		0.81
The vehicles are not over crowded	0.83	
Seats are always available on the vehicle	0.72	
The price is affordable	0.63	
Waiting time is low	0.56	
The services are on time	0.43	
The services are frequent	0.45	

The factor analysis of the 35 attitudinal variables resulted in eight factors which accounted for 62.9% of the total variance (see table 5). All scales have been found to be sufficiently reliable, with coefficients of internal consistency (Cronbach's alpha) ranging from 0.68 to 0.87. Each of the eight dimensions name was based on the characteristics of its composing variables. The first factor is labeled *Need for Control*. Individuals scoring high on this factor feel that only car gives them the ability to be in control of their life. The *Car Dependence* factor combines four items. Agreement with these opinions suggests that these individuals think that they need to use a car everyday to have the lifestyle they want and also love their car and feel are very attached to it. The *Status Seeking* factor comprises six items. This dimension refers to subjective norm as regards taking public transport and the need for social status given by car. The *Desire to Change Transport Mode* factor combines four statements. A high score on this factor suggests that these individuals want to switch mode choice in order to save time or be have a less stressful trip. The factor *Pro Public Transport* has 4 statements. This dimension measures the attitude towards using public transport. Individuals who agree with these statements feel that riding the bus is a pleasant experience and an opportunity to relax. The factor *Environmental Awareness* reflects a pro-environment attitude and willingness to change travel behavior for environmental reasons. The *Insensitivity to transport cost* characterize individuals for whom the cost it is not the primary aspect when choosing the transport mode. The last factor is labeled *Sensitivity to Travel Stress*. This dimension reflects individuals´ sensitivity to travel stress and preference for having relaxing trips.

Model Estimation

The logistic regression models were performed with mode choice as the outcome variable, taking the value of 1 if the respondents use public transport and 0 if they take the car. In these analysis only two transport modes, public transport and car were considered, because the number of cases in other travel modes were insufficient to conduct logistic regression. The recommended sample size for each group is at least 10 observations per estimated parameter (Hair, Black et al. 2006).
The following independent variables regarding sociodemograpy and household characteristics were included in the models: gender, age (three categories and an excluded category), education (dummy with value one for college or more), income (dummy with value one for less than 1000€), occupation (dummy with value one low paid, blue collar), number of children in the household (under 18), number of household vehicles and travel time (dummy with value one for journeys longer than 30 minutes). The factor scores from the three factor analysis were also entered as independent variables.
Three different model specifications were estimated (see Table 6).

Table 5: Factor Analysis of the attitudinal variables and Reliability (Oblimin rotation)

Factor/ Variable	Factor Loadings	Cronbach's alpha (α)
Need for control		0.87
The car gives me the freedom to go wherever I want.	−0.88	
The car gives me control of my trip.	−0.87	
Usually, the car is the fastest way to get where I need to go.	−0.77	
Car dependence		0.86
It would be very difficult for me to adapt my life to not use the car everyday.	0.84	
Only the car is adapted to my lifestyle.	0.81	
I have ridden the bus for many years, but now that I have a car I don't ride anymore.	0.81	
I like to drive and love my car.	0.63	
Status seeking		0.80
Public transport is only for the less fortuned.	0.84	
The type of car people drives says a lot about lifestyle and social status.	0.75	
I don't like to ride near people I don't know.	0.67	
Riding public transport is a waste of time.	0.62	
The people I know would think odd if I didn't have a car.	0.58	
I would only ride public transport if I didn't have a choice.	0.53	
Desire to change transport mode		0.72
I have already thought of changing my transport mode in my frequent trips.	0.74	
I would change my mode of transportation if it would save me some time.	0.72	
There are many problems and difficulties with using public transport.	0.71	
Usually, I am tired and upset by the time I reach my destination.	0.69	
Pro public transport		0.77
I think it is pleasant to ride the bus.	0.81	
My overall opinion about public transport is positive.	0.79	
When I ride public transport I can relax or read and enjoy my time better than if I use a car.	0.75	
A lot of times a get tired of the car and prefer to ride public transport.	0.67	
Environmental Awareness		0.76
I would change my form of transportation to help the environment.	−0.80	
Using public transport helps to improve the environment.	−0.77	
I am willing to pay more when I travel if it helps the environment.	−0.71	
I use the car less to help the environment.	−0.70	
Insensitivity to transport cost		0.71
I use the most convenient transport mode regardless of the cost.	0.86	
I always use the fastest transport mode even if I have a cheaper alternative.	0.81	
Sensitivity to travel stress		0.68
If I see a public transport full, I wait for another.	0.75	
I avoid making some trips at certain times because it is too tiring.	0.74	
When the trip is short I prefer to walk during the day.	0.71	
Making a relaxing and stress-free trip is more important than reaching my destination quickly.	0.69	

Table 6 – Logistic Regression models predicting Public Transport usage (N =2579)

Independent variables	Model 1		Model 2		Model 3	
	B	Sig.	B	Sig.	B	Sig.
Constant	0,19	0,403	0,78	0,003	0,75	0,004
Socio- demography						
Women	0,51	0,000	0,14	0,248	0,18	0,142
Age 25-34	-0,66	0,001	-0,71	0,002	-0,69	0,002
Age 35-64	-0,35	0,025	-0,80	0,000	-0,82	0,000
Age >65	0,69	0,000	0,01	0,950	-0,06	0,779
Education (college or more) dummy	0,06	0,659	0,05	0,763	0,06	0,711
Income (< 1000€) dummy	0,69	0,000	0,49	0,001	0,46	0,003
Occupation (low paid) dummy	0,13	0,282	0,11	0,417	0,10	0,446
Number of Children in Household	-0,14	0,031	-0,03	0,719	-0,03	0,696
Number of Car in Household	-0,86	0,000	-0,50	0,000	-0,48	0,000
Travel Time (> 30 minutes) dummy	0,77	0,000	0,54	0,000	0,58	0,000
Importance of PT aspects						
Convenience/ general service	-0,09	0,067			-0,11	0,058
Comfort	0,02	0,684			0,09	0,143
Performance of PT aspects						
Ease of use/ comfort	0,15	0,002			0,21	0,001
Efficiency	0,19	0,000			0,24	0,000
Attitudinal constructs						
Pro public transport			0,21	0,000	0,08	0,228
Control Need			-0,95	0,000	-0,94	0,000
Car dependence			-1,36	0,000	-1,39	0,000
Desire to change transport mode			-0,09	0,100	-0,03	0,651
Sensitivity to travel stress			0,14	0,011	0,12	0,034
Status seeking			0,20	0,001	0,17	0,004
Environmental awareness			0,05	0,353	0,02	0,771
Insensitivity to cost			-0,37	0,000	-0,43	0,000
-2 log likelihood	2706.84 (p=0.00)		2113.80 (p=0.00)		2038.75 (p=0.00)	
Nagelkerke R^2	0.38		0.57		0.58	
Cox and Snell	0.28		0.43		0.44	

In Model 1 public transport usage was regressed on respondent demographic variables, and importance and performance scores. This model provides statistically intuitive results. Typical demographic variables such as gender, age, income, number of children, number of cars and travel time are found to significantly explain mode choice behavior. As expected, women, older individuals, individuals with lower income, households with less children and less cars available and longer travel times are more likely to use public transport. Also, public transport performance evaluation is positively associated with it usage. Although, importance scores were not statistically significant.

In model 2 attitudinal constructs and demographic variables were included, but public transport importance and performance scores were left out. Model 2 shows that gender and being older than 65 no longer significantly affect mode choice after accounting for the

attitudinal variables. Almost all attitudinal variables have statistically significantly coefficients, with the exception of environmental awareness and desire to change transport mode. Car dependence and need for control show the highest coefficients indicating a strong negative effect on public transport usage. On the contrary, a favorable attitude towards public transport, being sensible to travel stress, and sensible to cost have a significant positive effect on mode choice.
Mode 3 includes all variables. The results of this model are similar to those of the previous one, with an exception. A favorable attitude towards public transport in no longer significant, however a positive evaluation of public transport performance is associated with public transport usage.
An examination of goodness of fit statistics shows that the inclusion of attitudinal variables strongly improves model fit. Model 2 and 3 clearly outperform model 1. Model 3 provides the best statistical goodness of fit.

Analysis by journey purpose

Next, we examine the effect of demographic and attitudinal variables on public transport usage within work and leisure/shopping journey types.
Table 7 exhibits the estimation results for a work journey. For the three models certain demographic and travel characteristics (such as being female, not having a car in the household and longer travel times) suggest the individual is more likely to commute by public transport. None of the public transport importance and performance factors were statistically significant. Individuals with strong car dependence and need for control are not likely to use public transport. However, concern about travel cost is positively associated with public transport usage.
The models estimation results for a leisure/shopping journeys is presented in Table 8. Individuals age (older than 65) shows the highest positive coefficient in all three models, Furthermore, as in the previous analysis, control need, car dependence and cost awareness are strong determinants of mode choice behavior. The comparison of the models for work and leisure/shopping journeys shows that sensitivity to travel stress is positively statistically significant for leisure/shopping journeys. Moreover, for those journeys public transport performance is positive associated with public transport usage.
As in the first models the inclusion of attitudinal variables strongly improves model fit. Model 2 and 3 clearly outperform model 1 both for work and leisure/shopping journeys.

Table 7 – Logistic regression analysis predicting Public Transport usage for a work journey (N =1194)

Independent variables	Model 1		Model 2		Model 3	
	B	Sig.	B	Sig.	B	Sig.
Constant	-0,26	0,458	0,33	0,426	0,39	0,348
Socio- demography						
Women	0,79	0,000	0,52	0,005	0,53	0,006
Age 25-34	-0,36	0,236	-0,46	0,204	-0,50	0,164
Age 35-64	-0,12	0,653	-0,67	0,039	-0,75	0,022
Age >65	0,85	0,040	0,27	0,572	0,24	0,619
Education (college or more) dummy	-0,16	0,430	-0,31	0,187	-0,30	0,209
Income (< 1000€) dummy	0,38	0,040	0,19	0,397	0,14	0,512
Occupation (low paid) dummy	0,32	0,039	0,28	0,129	0,28	0,138
Travel Time (> 30 minutes) dummy	1,02	0,000	0,78	0,000	0,82	0,000
Number of Children in Household	-0,20	0,027	-0,04	0,741	-0,05	0,666
Number of Car in Household	-0,88	0,000	-0,50	0,000	-0,48	0,000
Importance of PT aspects						
Convenience/ general service	-0,08	0,264			-0,05	0,545
Comfort	0,05	0,482			0,17	0,054
Performance of PT aspects						
Ease of use/ comfort	0,03	0,703			0,08	0,409
Efficiency	0,12	0,092			0,17	0,065
Attitudinal constructs						
Pro public transport			0,07	0,403	0,00	0,973
Control Need			-0,99	0,000	-1,01	0,000
Car dependence			-1,47	0,000	-1,48	0,000
Desire to change transport mode			-0,23	0,008	-0,17	0,054
Sensitivity to travel stress			0,04	0,646	0,00	0,978
Status seeking			0,19	0,034	0,16	0,092
Environmental awareness			0,08	0,391	0,05	0,594
Insensitivity to cost			-0,46	0,000	-0,51	0,000
-2 log likelihood	1238.17 (p=0.00)		970.73 (p=0.00)		912.71 (p=0.00)	
Nagelkerke R^2	0.35		0.59		0.59	
Cox and Snell	0.26		0.43		0.44	

Table 8 –Logistic regression analysis predicting Public Transport usage for a leisure/shopping trip (N =567

Independent variables	Model 1		Model 2		Model 3	
	B	Sig.	B	Sig.	B	Sig.
Constant	-1,54	0,051	-0,21	0,792	-0,50	0,541
Socio- demography						
Women	-0.12	0,601	-0,60	0,024	-0,47	0,085
Age 25-34	1,28	0,123	0,66	0,439	0,89	0,306
Age 35-64	1,75	0,015	1,10	0,124	1,21	0,100
Age >65	2,50	0,001	1,53	0,038	1,51	0,045
Education (college or more) dummy	0,64	0,051	0,44	0,219	0,42	0,251
Income (< 1000€) dummy	0,82	0,007	0,41	0,208	0,47	0,158
Occupation (low paid) dummy	0,52	0,166	0,01	0,984	0,03	0,942
Travel Time (> 30 minutes) dummy	0,32	0,158	0,08	0,753	0,11	0,681
Number of Children in Household	0,11	0,544	0,20	0,296	0,16	0,361
Number of Car in Household	-0,81	0,000	-0,49	0,000	-0,47	0,000
Importance of PT aspects						
Convenience/ general service	-0,21	0,056			-0,25	0,043
Comfort	-0,17	0,182			-0,05	0,710
Performance of PT aspects						
Ease of use/ comfort	0,29	0,008			0,47	0,001
Efficiency	0,30	0,003			0,34	0,006
Attitudinal constructs						
Pro public transport			0,20	0,095	-0,03	0,820
Control Need			-1,00	0,000	-0,92	0,000
Car dependence			-1,06	0,000	-1,15	0,000
Desire to change transport mode			-0,03	0,785	0,02	0,872
Sensitivity to travel stress			0,29	0,017	0,32	0,014
Status seeking			0,11	0,314	0,09	0,467
Environmental awareness			-0,01	0,900	-0,04	0,727
Insensitivity to cost			-0,47	0,000	-0,59	0,000
-2 log likelihood	600.77 (p=0.00)		507.61 (p=0.00)		487.56 (p=0.00)	
Nagelkerke R2	0.31		0.47		0.50	
Cox and Snell	0.23		0.34		0.37	

DISCUSSION

The analysis of public transport service performance evaluation revealed that car users tend to perceived public transport worst than its actual users and have low intention to start using public transport. It is essential to find out the primary reasons for not using public transport, and see if any solution to change behavior can be implemented. One reason could be the usual negative image associated with public transport, especially the one associated with bus (Fujii, Gärling et al. 2001). Private car users usually display an erroneous perception of public transport system performance (Beirão and Cabral 2007).
Furthermore habitual car users usually lack knowledge about alternatives modes, so it is important to provide them information about the advantageous of public transport and walking (Horeni, Gärling et al. 2007). Providing greater access to service information and more interactive services may be a way to increase individuals' perceptions of control with public transport (Gardner and Abraham 2007).
It has been showed that the use of public transport positively influences attitudes towards public transport and perceptions about its ability to fulfil one's transport needs (Thøgersen 2006). But, public transport must provide the desired level of service. We find that the most important aspects of the service that are being provided below the desired standards are: cost, waiting time, on-time performance, comfortable stops and frequency. So, public transport must improve these aspects to be more attractive. Still, it's not expected that all car users would start using public transport. Car dependence and the need for control emerged as the main effects in explaining mode choice. It is well known that the car gives a sense of freedom, power, independence and control (Jensen 1999). Public transport users appear to be less attached to the car, more sensible to cost and travel stress, and more concerned about social status. Also, perceived quality of public transport service seems to positively influence its usage. As expected, low income and not having a car available will also determine public transport usage.
The comparison of the factors influencing mode choice behavior whether the journey is for work or for leisure/ shopping, show that for both purposes attitudinal factors such as car dependence, need for control and cost are very important. However, individuals making a leisure trip are more sensible to travel stress. Additionally, car availability influences mode choice whether the journey is for work or leisure. Public transport performance was only significant for leisure journeys, perhaps because for work trips some of the public transport users have no alternative and the quality of the service does not influence its usage.
Awareness about car use impact on the environment did not seem to influence travel mode choice. This is consistent with studies which suggest that although information about the negative environmental effects of the car use raises some awareness, it is usually insufficient to change behavior (Tertoolen, van Kreveld et al. 1998; Hagman 2003; Anable 2005). However, there is some evidence that the inclusion of environmental concern measures provides additional beliefs that can be targeted in order to change behavior (Anable 2005).

In this study we pretended to examine the effect and relative contribution of attitudinal factors and demographic variables in explaining mode choice behavior and to test for differences in journeys for work or for leisure/ shopping. We revealed the value of indentifying mode users' evaluations of performance on those aspects most important to them. Also, in line with other studies, we showed the importance of attitudinal data in explaining mode choice behavior. It is known the importance of behavioral intention in predicting behavior (Fujii and Gärling 2003), so further research on the data is going to explore that relationship.

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