The relationship between instrumental, symbolic and affective factors as predictors of car use: A structural equation modeling approach

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ABSTRACT

Traditionally, urban mobility has been studied from the utilitarian or practical viewpoint, focusing on instrumental motivations and ignoring symbolic and affective aspects that may play a relevant role. The purpose of this work is to analyze from a psychosocial perspective the influence of symbolic, affective, and instrumental motivations on the frequency of car use, taking into account diverse reasons for traveling. From a sample of the Spanish population, participants were 284 people (50.3% female), with a driver’s license, car owners and residents in cities of various sizes, who completed an anonymous questionnaire. The effect of each type of variable was estimated by a structural equation model. Results indicate that people’s affective link with their private vehicle explains 12% of frequency of car use, as a latent variable of different kinds of trips: visiting friends or relatives, going to work or to a study center, going shopping, or to leisure areas. The instrumental advantages associated with cars and thinking that it expresses one’s status predict the affective link with the car. These findings corroborate the relevance of the non-instrumental aspects involved in the selection of the means of transportation.

1. Introduction

Popularization of the automobile has generated important social changes, in terms of citizens’ improved quality of life and greater efficiency of their journeys. However, the use of motor vehicles has also led to a series of problems such as environmental pollution, increase of respiratory diseases, and the high cost in road infrastructure. Vehicles are the biggest source of pollution and emission of carbon monoxide in cities (Sempere and Riechman, 2000). Likewise, the negative effects of city traffic noise are evident, with special impact on attentional processes, verbal communication, sleep, and individuals’ emotional response patterns (Miedema, 2007). Despite the negative consequences of car overuse, the number of drivers increases daily. In Spain, the country in which this work was carried out, the total number of automobiles is 500 cars for every 1000 inhabitants, a ratio that has doubled in the past 10 years, equaling that of countries like France or the United Kingdom (BIPE-Cetelem, 2007). For example, in the city of Madrid, 50.7% of the people used cars to travel in 2004, in contrast to 40.4% in 1996; that is, 10% points in favor of the private car in only 8 years (Consortio de Transportes [Transportation Consortium], 2006). This phenomenon is partly due to urban sprawl, that is, the extensive and disperse growth of modern cities (Bovy, 1999; Sempere and Riechman, 2000; Vivier, 1999). Whereas in the metropolitan area surrounding Madrid, the population has increased by 68% in 15 years, the municipality of Madrid has only increased by 7% (Instituto Nacional de Estadística [National Institute of Statistic], 2009).

As shown by the discrete choice theory (Ben-Akiva and Lerman, 1985), frequency of use of a transport mode can be statistically explained by variables such as place of residence, workplace, or car ownership. This theoretical perspective, much
used by disciplines such as economics and transport engineering, grants special importance to elements like trip time or the cost of the trip (Salon, 2009; Vega and Reynolds-Feighan, 2009) and, in general, it assumes that people choose the transport mode that provides them with the highest utility or relative advantage (Domencich and McFadden, 1975; cited in Dong et al., 2006, p. 165). From another perspective, Mokhtarian and Salomon (2001) consider that, although most trips with a specific kind of transport mode derive from the conditions and infrastructure associated with a concrete activity, some aspects involved in the behavior of mobility do not depend only on this kind of factors. For example, the emotions that people feel during the trip (feeling of speed, movement, control, enjoying the scenery) may affect the final transport mode choice even in contexts of forced mobility, and seeking such emotions represents a basic reason for the trip, in the case of leisure trips.

As stated by Domarchi et al. (2008), transport mode choice is a complex process that involves both socioeconomic factors and psychosocial variables. These authors incorporate psychological factors (e.g., attitudes and affect) into a discrete choice model based on the usual level of service and cost variables, showing how its degree of fit and statistical significance increase.

Generally, specialized literature analyzes urban mobility focusing on utilitarian and practical aspects provided to users, for example, availability, flexibility, and load capacity (for a review, see Jakobsson, 2007). However, some authors have noted that, in addition to the instrumental aspects associated with cars, psychosocial aspects involving values (Joireman et al., 2001; Van Lange et al., 1998; Van Vugt et al., 1995, 1996a, 1996b), identity (Gardner and Abraham, 2007), symbolic processes – such as status and social comparison – and affective or emotional processes, which associate cars with pleasure and the excitement produced by speed (Steg, 2005; Steg and Tertoolen, 1999; Steg et al., 2001) also play a role. From this psychosocial perspective, attitudes towards cars are related to other psychological motives besides the need for mobility. No doubt, any kind of vehicle fulfills an instrumental function – transporting people from one place to another – but the private vehicle satisfies other, symbolic needs, which may become particularly important as an expression of the self.

In this vein, we underline the contribution of Dittmar (1992) to the study of the psychosocial meaning of the possession of objects, among them, the automobile. This author distinguishes between (1) the instrumental and functional use of objects, (2) their emotional dimension, related to pleasure and relaxation, and (3) their symbolic meaning, as a symbol of identity. The symbolic function can, in turn, be subdivided into two components: the person's position or social status and the expression of personal identity and values.

Allen (2002) also distinguishes two meanings associated with owning a product: utilitarian and symbolic. The utilitarian function of a product allows its buyer to control the physical context and to gain practical benefits. The symbolic function represents self-expressive motivation and helps the buyer to achieve the desired self-image, or ideal self. The multifunctionality of the car, as the object of an attitude, has been noted by Ennis and Zanna (2000), who verified that this object elicits beliefs and feelings that are related to instrumental and symbolic needs. Among the latter, they distinguished between needs with a social expression function (related to interaction and social acceptance) and needs with a function of expression of values (referring to values essential for the self-concept). According to Abelson and Prentice (1989), the symbolic function of a product has two essential axes: the axis related to social expression – processes related to self-presentation (Schlenker, 1982) - and the axis related to social identity processes – their quality of expressing characteristic group values with which individuals identify. Thus, cars can become a symbol of identity, as verified by Mann and Abraham (2006), so that, for some people, having a big, expensive car allows them to express their status-related values, whereas other people would feel ashamed of having such a car, because they want to be identified as opposing those values.

It has been verified that the practical aspects of cars are more positively valued than those of public transportation (Mackett, 2003; Steg, 2003). Research on instrumental motivations that lead people to prefer using a car to other means of transportation supports the importance of this function. Some of the arguments that explain this preference are based on the fact that adequate public transportation is not always available, and the car allows one to move faster and also to load one's purchases (Jakobsson, 2007; Jakobsson et al., 2002). In contrast, symbolic motivations that enhance the use of the car refer to the fact that, through processes of social comparison, the car allows people to display their status and some aspects related to their social identity and self-concept (Gatersleben, 2007; Steg, 2005). To have a certain model of car, as with any other kind of material possession, gives individuals the practical benefit derived from its use, and also symbolic benefits that the individual expresses to others when buying or using a certain product. With regard to the affective aspects of cars, the studies carried out focus mainly on the motives related to pleasure or excitement (Steg, 2005; Steg and Tertoolen, 1999; Steg et al., 2001) in accordance with the proposal of Mehrabian and Russell (1974) about the components of emotions. The pleasure of driving and the excitement caused by speed are examples of these affective aspects.

Car brands use these symbolic and affective motivations profusely in their ads aimed at different target groups – executives, women, or youth – depending on the model they advertise. Doubtless, market studies have shown that these persuasion techniques increase sales. However, when people are asked about these topics, they rarely admit that they use their car for status-related motives or because of the excitement that speed may provoke (Jensen, 1999). Nevertheless, by means of qualitative techniques, evidence has been obtained of the importance of these affective and symbolic motives in people's minds when they think about buying a car (Hiscock et al., 2002; Lupton, 2002; Mann and Abraham, 2006; Steg et al., 2001).

With reference to particular trips by car, in a study on mobility in the city of San Francisco, Ory and Mokhtarian (2004) analyze the factors that make people consider a trip to be more or less attractive. Along with objective aspects of the trip (such as the kilometers covered), these authors include attitudinal variables and lifestyle. Three variables in this latter category were the most powerful predictors of the variable attraction to traveling: (1) the practical benefits of the trip (traveling is not perceived as empty time, but as something useful and advantageous), (2) the sense of freedom (being able to travel
wherever one wishes), and (3) status seeking through the trip (the opportunity that daily trips provide for individuals to display a major symbol of opulent and luxurious consumption, a “beautiful car”).

In the review of the relation between these three motivations (instrumental, affective, and symbolic), Gatersleben (2007) concluded that the affective appraisal of a car depends on the instrumental and symbolic aspects. This proposal coincides with the theoretical model proposed by Steg and Tertoolen (1999, p. 21) in which they establish that car use depends on instrumental, social (symbolic aspects), and affective motivations, with the affective aspects being a consequence of the instrumental and social motivations (Fig. 1). Steg and Tertoolen (1999, p. 20) describe the motivational model of car use represented in Fig. 1 as follows: “the instrumental motives refer to the convenience or inconvenience of car use, and to the more or less objective consequences of car use, such as its speed, flexibility, safety, and environmental problems resulting from car use. Social motives refer to the fact that people can express themselves by using a car, and people can compare themselves with others. Affect refers to various emotions that are evoked by using a car, i.e., car use may potentially alter people’s mood”. In successive works, Steg and colleagues (Steg, 2005; Steg et al., 2001) have verified that both, practical or instrumental elements and symbolic and affective elements, can have a high impact on people’s decisions when choosing a means of transportation. Nevertheless, the model proposed by this author along with Tertoolen in 1999 was not proven empirically.

On the basis of the theoretical model of Steg and Tertoolen (1999), the purpose of this work is to verify, by means of a structural equation model, how the three kinds of motivations are related to each other with regard to the frequency of car use. This model can be useful to understand the nature of the relationships among people’s diverse motivations toward car use: instrumental, symbolic and affective.

2. Method

2.1. Participants

We attempted to collect a sample with a broad array of individual transportation situations and infrastructures, because these structural elements undoubtedly affect people’s behavior and mobility. In the sample, we selected towns with more complex public transportation infrastructures (radial highway networks, subway, train, and urban and interurban buses) as well as smaller towns, in terms of fewer residents and fewer transportation alternatives. Of the people who completed the questionnaire, 47.3% reside in cities of more than 500,000 inhabitants, 19.3% in municipalities of 100,000–500,000 inhabitants, and 33.4% in towns of less than 100,000 inhabitants. By means of analysis of variance we confirmed that the size of the town did not affect any of the three types of motivations of the model: instrumental motivations ($F(2, 282) = 1.9$, $p = .16$); symbolic motivations ($F(2, 282) = 0.5$, $p = .62$); affective motivations ($F(2, 282) = 0.7$, $p = .48$). Given the goals of the study, we only selected individuals who went at least once a week to their workplace or study center, who had a driver’s license and a car for these trips. Participants were 284 (50.3% female, mean age = 34.40, $SD = 10.43$) residents of different cities. This sample was recruited from a total of 18 Spanish provinces, in a total of 20 businesses from the private sector and seven educational centers.

2.2. Procedure and measures

The investigation was presented as “a survey of people’s opinions and social preferences of transportation,” emphasizing its anonymous and confidential nature. At each workplace or study center, a collaborator was in charge of handing out and collecting the self-completed surveys. Participants individually completed a questionnaire in which they described their transportation habits and appraised the instrumental, symbolic, and affective attributes of cars. Completing the questionnaire took approximately 15 min. In addition to the sociodemographic variables and other measures that are not germane to this paper, the questionnaire comprised the following scales:
2.2.1. Symbolic motivations scale
(elaborated by the authors in Spanish from the items of Steg et al., 2001; Jensen, 1999). This scale measures the degree to which owning and driving a car may afford people prestige and distinction, by displaying “the way the owner is”. Participants indicated their degree of agreement on a Likert scale ranging from 1 (totally agree) to 4 (totally disagree) with the following statements: “If I could choose, I would prefer a classy car”, “Your car can distinguish you from the rest of the people”, “A car is an object with which you can sometimes show others the way you are and your tastes”, “The car you drive can give you prestige among friends and acquaintances”, and “I fully agree with people who think that the better your car is, the more successful you are in life”. The Cronbach alpha of the scale is .82 (divided by the number of items, Mean = 2.13, SD = .64).

2.2.2. Instrumental motivations scale
Appraisal of the instrumental elements associated with the car (elaboration by the authors in Spanish from the items of Van Vugt et al., 1996b; Steg et al., 2001). Participants were requested, by means of an 11-point Likert scale ranging from 0 (not at all) to 10 (completely) to assess the degree to which each one of the following items describes the car, thus obtaining the subjective appraisal of each one of the service attributes that characterize this transport mode: “Comfortable”, “You are guaranteed to get there on time”, “Availability”, “Beneficial for the environment”, “Flexible”, “Fast”, “Low cost of traveling”, “Storage and transportation capacity”, “Relaxing”, “Provides independence”, “Beneficial for public health” and “Safe”. The Cronbach alpha of the scale is .79 (divided by the number of items, Mean = 6.31, SD = 1.19).

2.2.3. Affective motivations scale
This scale measures the affective aspects of driving, such as the degree of enjoyment and pleasure when driving, the feeling of having “everything under control” and the attraction of speed (elaboration by the authors in Spanish from the items of Steg et al., 2001). It has six items, rated on a four-point Likert scale, ranging from 1 (totally agree) to 4 (totally disagree). The specific scale items are: “I enjoy driving a good car”, “You could say I’m fond of my car”, “I’m the kind of person who, once in a while, likes to speed with my car”, “Driving a car can be an exciting adventure”, “Sometimes you feel you have everything under control when you drive”, and “For me, my car is, above all, an object of pleasure”. The Cronbach alpha of the scale is .85 (divided by the number of items, Mean = 2.44, SD = .67).

2.2.4. Car use
Traveling habits were estimated by the participants from their past behavior, measuring them in a way similar to the one that is described in the works of Thøgersen (2006), Anable and Gatersleben (2005). The frequency of car use was assessed for four common activities: shopping, visiting friends or relatives, going to work or to the study center, and visiting a leisure area. Responses were rated on a four-point Likert scale, ranging from 1 (never) to 4 (very often).
In addition, the questionnaire measures the following variables related to the perception of the characteristics of the trips made to the workplace: the time it takes to arrive when using the car (car time), the time it takes when using public transportation (public transportation time), and the time it takes to park when using the car (parking time). Therefore, these are psychological variables that measure participants’ perception of the temporal characteristics of the trip to work.
The participants also indicated in the questionnaire the annual kilometers they travel with their car and the car characteristics. As a function of the brand, model, and license year, each vehicle was assigned a relative market value and included in a specific price category (low, medium, high).

3. Results

3.1. Model results
Prior to the analysis of the model, we studied the correlation among its variables. In Table 1 are described the resulting correlation coefficients. Regarding the indicators of the latent variable, frequency of car use reflects the correlation indexes higher than .50 among the activities of going shopping, visiting friends/relatives, and visiting leisure areas. The frequency of

<table>
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<th>Variables</th>
<th>1</th>
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<th>6</th>
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<tr>
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<td>.32***</td>
<td>.15***</td>
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<td>.13***</td>
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<td>–</td>
<td>.40***</td>
<td>.09</td>
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<td>–</td>
<td>.29***</td>
<td>.25***</td>
<td>.11</td>
<td>.23***</td>
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<td>4. Car use: going shopping</td>
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<td>–</td>
<td>–</td>
<td>.51***</td>
<td>.38***</td>
<td>.55***</td>
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<tr>
<td>5. Car use: visiting friends/relatives</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>.22***</td>
<td>.54***</td>
<td></td>
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<tr>
<td>6. Car use: going to work or to study center</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>.28***</td>
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<tr>
<td>7. Car use: visiting leisure area</td>
<td>–</td>
<td>–</td>
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Nonsignificant at p > .05.
*** p < .05.
** p < .01.
trips due to work presents weaker levels of correlation with the other activities: .38 with going shopping, .22 with visiting friends/relatives and .28 regarding visiting leisure areas. The predictors of affective motivations correlate significantly with this variable (instrumental motivations $r = .32$ and symbolic motivations $r = .40$).

However, affective motivations correlate with frequency of car use for going shopping (.29), visiting relatives or friends (.25), and leisure activities (.23), unlike frequency of car use to travel to work (.11, $p = .07$). Instrumental motivation correlates with frequency of car use for trips to the workplace or study center (.13) and for going shopping (.15). There is no statistically significant relation between symbolic motivations and the four kinds of trips examined in the investigation.

To sum up, the results indicate that: (1) affective motivations are related to the four kinds of trip analyzed; (2) instrumental motivations are only related to trips of a more obligatory nature (to the workplace) or whose functional aspects are more determinant (shopping), and (3) symbolic motivations are not related to the frequency of car use. These correlations do not indicate the mutual influence of the variables. The model to be tested establishes specific relationships among the series of variables of interest.

The variable car use is represented in the model as a latent variable that is the product of the combination of the frequency of car use in four possible activities used as indicators: shopping, visiting friends or relatives, going to work or to the study center, or visiting leisure areas. The model proposed shows the capacity of the variables instrumental motivations and symbolic motivations to explain affective motivations. In turn, affective motivations are incorporated as a predictor of car use. The model also estimates the possible direct effect of both instrumental and symbolic motivations on car use. Therefore, it is a relatively simple model, in which we attempt to present parsimoniously the relation of the psychological factors with the behavior of mobility, in this case using a private vehicle, according to the theoretical model proposed by Steg and Tertoolen (1999).

3.1.1. Goodness of fit of the model

We assessed the goodness of fit of the model using the chi-square test, the root-mean-square-error of approximation (RMSEA), the comparative fit index (CFI), the goodness-of-fit index (GFI), and the adjusted goodness-of-fit index (AGFI). The indexes were computed using the program AMOS 6.0 (i.e., see Schermelleh-Engel et al., 2003).

In order to evaluate the global fit of the model, the first index considered was the chi-square statistic. A non significant chi-square test is indicative of a satisfactory fit. In our model, the value of chi-square is 27.9 (12), $p < .01$. This index has an important limitation because, in the case of large samples, it leads to rejecting the models even though the residuals are small. Therefore, in order to prove the model, we have employed other fit indexes not affected by this limitation. Values of RMSEA less than .08 as well as CFI, GFI and AGFI values greater than .90 are indicative of a satisfactory fit (Bentler and Bonett, 1980; Bentler and Dugeon, 1996; Browne and Kudeck, 1993; Jöreskog and Sörbom, 1993). On the basis of these criteria, the model fits the data well, RMSEA = .07, CFI = .96, GFI = .97 and AGFI = .93. In view of the results of the main goodness-of-fit indexes, we can conclude that the model meets our expectations insofar as concerns its statistical adequacy.

3.1.2. Description of the resulting model

Fig. 2 displays the proposed explanatory model of car use. The relations of the diverse variables are represented, along with the corresponding weights of the standardized version (beta) that represent both the magnitude and the direction of each relation.

The model has a total of three observable variables – instrumental motivations, symbolic motivations, and affective motivations – and one latent variable – car use – with four associated indicators as a function of the motive for traveling: going shopping, visiting friends or relatives, going to work or to study, or to leisure areas. We point out that our intention was to verify the contribution of each of these four ways of using cars to the explanation of the model. Firstly, as can be observed, both the effects of the instrumental motivations and the symbolic motivations on the affective motivations are statistically significant and positive. The magnitude of this effect is higher for symbolic motivations ($\beta = .34$) than for instrumental motivations ($\beta = .25$). Conjointly, these two variables explain 18% of the variance of affective motivations. The effect of affective motivations on the latent variable car use is significant and positive ($\beta = .34$). The amount of explained variance for the dependent factor is 12%. We also expected to find direct effects of instrumental motivations and symbolic motivations on car use but this did not occur in either case ($p > .10$).

![Fig. 2. Structural model. Graphic representation. Prediction of car use. Note: I1, going shopping; I2, visiting friends/relatives; I3, going to work or to study center; I4, visiting leisure area. $p < .01$.](image-url)
All the indicators of the latent variable car use obtained high weights in this factor, ranging between the maximum value of .77 for frequency of car use for shopping, and the minimum of .41 for going to work or to the study center. Frequency of car use to visit friends and relatives and to visit a leisure area had positive relations with the latent variable of .69 and .74, respectively.

### 3.1.3. Role of perception of the car time to travel to work versus public transportation time

With regard to the variance of each one of the indicators accounted for by the latent variable (see Table 2), 59% of the behavior of going shopping, 54% of the behavior of visiting a leisure area, 47% of the behavior of visiting friends or relatives, and 17% of the behavior of going to work or to a study center are explained by the latent variable. Therefore, trips that are characterized by the daily obligation of going to work are those with the worst fit to the characteristics of a global pattern of use of private vehicles based on psychosocial variables.

A possible explanation is that urban traffic flow and the existing infrastructures to travel on work days probably facilitate or limit people’s behavioral predisposition to use a certain means of transportation. For example, a person may show a special affective preference for car use, but limitations such as the inexistence of parking lots near the workplace may reduce the possibilities of using the car. In contrast, people who prefer public transportation may be “forced” to use the car because the public network is inexistent or inefficient. To contrast this point and to contribute an integral view of the behavior of interest in this study, we incorporated some possible predictors of the criterion variable frequency of trips by car to the workplace or study center. We used three predictor variables as indicators of the advantages of each alternative of transport: car time, public transportation time, and parking time. The choice of these three variable does not imply that other objective factors, such as income, the availability of cars, or profession do not contribute to the explanation of trips to work, as mentioned by some authors (Otlet, 2001; Snellen, 1999; Curtis and Headicar, 1997).

As a result of stepwise linear regression analysis (see Table 3), we observed that 17% of the trips to work by car are accounted for by the variables parking time and public transportation time ($R^2 = 0.17, F(2, 235) = 24.19, p < .001$), with a somewhat higher weight for the total explanation of parking time (11% of the variance explained).

These data seem to point in the above-mentioned direction. The more time people need when using public transportation, the more they are inclined to use the car to travel to work. In contrast, the more time spent parking near the workplace, the lower the probability of traveling by car to work. The variable car time was not significant. That is, for the participants, more or less car time is not as influential compared with parking time or public transportation time.

If we relate parking time to the frequency of public transportation use, we verify correlationally that, the more difficult it is to park, the greater the tendency to use public transportation ($r = .32, p < .001$). The association of these variables is reproduced in an environment where the combined use of car and public transportation in the home-to-work trips – for example, parking the car at an intermediate point of the trip and catching a subway – is not frequent, according to the data of our sample. Thus, the correlation between frequency of car use to travel to work and the use of the bus or subway for the same purpose is high and negative ($r = -.75, p < .001$).

### 3.2. Instrumental, symbolic, and affective motivations and sociodemographic variables

Although the goal of our work was to test empirically a theoretical model based on psychosocial variables, we also analyzed, using analysis of variance, the way some sociodemographic factors (sex, age, annual kilometers driven, and price of the car) affect these variables. Table 4 shows that there are statistically significant differences as a function of sex both in affective motivations ($F(1, 283) = 20.0, p < .001, \eta^2 = .07$) and in symbolic motivations ($F(1, 283) = 8.2, p < .01, \eta^2 = .04$), with males

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<td>Visiting an area of leisure</td>
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<tr>
<td>Going to work or to study center</td>
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<td>Going shopping</td>
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<table>
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<th>Standard error</th>
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<tr>
<td>Parking time</td>
<td>.11</td>
<td>.11</td>
<td>29.28</td>
<td>.009</td>
<td>-.33</td>
<td>-5.52**</td>
</tr>
<tr>
<td>Public transportation time</td>
<td>.17</td>
<td>.06</td>
<td>17.08</td>
<td>.002</td>
<td>.25</td>
<td>4.13**</td>
</tr>
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Nonsignificant predictor: variable car time.

** ** $p < .001.$
obtaining higher scores in both variables. We found an effect of age in the three motivational variables: in affective motivations, \(F(2, 282) = 20.2, p < .001, \eta^2 = .08\), symbolic motivations \((F(2, 282) = 3.6, p < .05, \eta^2 = .05)\) and instrumental motivations \((F(2, 282) = 4.3, p < .05, \eta^2 = .04)\). The post hoc analyses (Bonferroni method) indicate that people under 30 years of age are significantly different from the rest of the groups in the variable affective motivations \((p < .001)\) and from the segment of 30–44 years in instrumental motivations \((p < .02)\). With regard to the symbolic motivations, people under 30 years of age obtained higher scores than the rest, in this case, displaying a significant tendency \((p < .09)\). The price of the car is also related to differences in the symbolic motivations \((F(2,282) = 6.5, p < .01, \eta^2 = .07)\). The data indicate that the people who drive high-range cars obtain higher scores in the variable symbolic motivations than the owners of medium-range \((p < .01)\) or low range cars \((p < .04)\). With regard to annual distance driven in kilometres, we also observed a statistically significant effect on affective motivations \((F(2, 282) = 3.5, p < .05, \eta^2 = .001)\). The affective function is more important in the group that drives the most kilometers in their vehicles (>25,000 km), if we compare them to the participants who drive less than 10,000 km a year \((p < .03)\).

These results indicate that motivations for car use are not distributed in the same way among the diverse segments of the sample, although the magnitude of the effect of the sociodemographic variables on the motivational ones is very low \((\eta^2 < .09\) in all cases).}

### 4. Discussion

When addressing the field of urban mobility, many factors must be taken into account. Disciplines such as economics, engineering, or psychology contribute to our knowledge of a phenomenon in which factors of various types and complexity interplay simultaneously. The contribution of this work is confined to the psychosocial sphere, and the results described herein show the relevance of taking affective variables into account as predictors of the frequency of car use when carrying out daily activities like shopping, visiting friends or relatives, visiting a leisure area, or traveling to the workplace.

The main goal of this work was to verify empirically the theoretical proposal of Steg and Tertoolen (1999). According to our model, instrumental and symbolic factors do not have a direct effect on car use except when mediated by affective motivations. Taking into account the variables incorporated, this fact confirms the fundamental role of affective motivations as regulators of car use. That is, the fact that a person grants such high scores to the car in aspects like speed, availability, or comfort (instrumental motivations) would produce an increase in the probability of car use if such appraisals cause positive affective experiences. In contrast, symbolic motivations such as aspects related to the expression of individual and group identity via the car could influence the affective motivations, due to the capacity of the car to contribute to a better adjustment between the real self and the desired or ideal self, according to the proposal of Gatersleben (2007).

Despite the simplicity of the structural equation model, which has only three independent variables, its capacity to predict affective motivations (18%) and the latent variable car use (12%) can be considered satisfactory. If we compare the ratios obtained with those of other works that use more complex models, the percentages of explained variance obtained are of a similar magnitude. For example, in the above-mentioned work of Ory and Mokhtarian (2004), the authors report \(R^2\) values for the dependent variable “attraction to the trip” that range between 12% (attraction to trips to visit areas of leisure and amusement) and 35% (attraction to trips to the workplace). If all the short trips, independently of their destiny, are
aggregated, the model proposed by these authors explains 21% of the dependent variable, also incorporating sociodemographic variables (profession, income, gender, educational level, number of people living at home) that are not contemplated in our model.

Our results partially coincide with those of Steg (2005), although the variables were not exactly measured in the same way. From her data, this author concludes that car use is especially related to symbolic (descriptive norm, expectations family, social comparison and self-presentation) and affective motives (arousal), and not to the instrumental ones. According to our data, instrumental motives do not directly predict car use as a latent variable, but neither does symbolic motivation (the self-expression variable in our work). In our model, affective motivations are the key factor in the prediction of car use and, in turn, they are accounted for by instrumental and symbolic motivations.

According to the regression model carried out for traveling to work, the difficulty to find a parking place or the greater speed of the public transportation network in the employment areas are aspects that could persuade people with an affective motivational profile to leave their car at home. The fit of the proposed model is higher for trips whose destination could be a commercial center, the home of a friend, or the cinema, where some of the instrumental motivations of the trip could be less important than traveling to work.

Complementarily, our data indicate that the instrumental, symbolic, and affective motivations present significant differences in their distribution if sociodemographic variables such as sex, age, and other variables, like the price of the car or the kilometers driven with it, are taken into account. The symbolic and affective motivations are especially relevant for males, in line with Ellaway et al. (2003), Steg (2005), whereas people under 30 years of age are more sensitive to the three kinds of motivations, especially the affective motivations (converging with Steg, 2005). These results could be due to differences in the cultural values related to gender and to the expressive and affective elements associated with cars and driving.

In our work, we also confirmed that ownership of a highly priced car is associated with a higher valuation of the symbolic motivations. This fact, also observed by Ellaway et al. (2003), could be related to the greater social prestige of high-range vehicles, whose drivers may be more receptive to the self-expression elements that are implicit in the driving of certain brands of cars.

Various practical consequences that can be applied to transportation policy campaigns can be derived from the outline of representations presented in the model. For example, when planning measures to reduce car use, the instrumental aspects with a direct impact on affective motivations should be specifically taken into account. Likewise, regarding the influence of the symbolic motivations, this kind of beliefs favors car use indirectly, just as another kind of values, for example, people’s pro-social orientation (Van Vugt et al., 1995, 1996a), seems to favor preference for public transportation. According to Thøgersen (2007), when values and social norms must be changed, social-marketing techniques in transportation demand management alone will have very little effect on the reduction of car use. Prior to the promotion of alternative means of transportation, public service announcements should probably be implemented for a long time to “de-market” car use in cities with high levels of traffic jams and contamination.

Our results show the influence of some sociodemographic variables on the variables of the model. If one intended to develop actions aimed at specific population groups that are more affectively disposed toward the car (for example, men, or people under 30 years of age), this kind of components should be incorporated into the model. The implementation of any action in transportation policy can be facilitated by our comprehension of the beliefs held by specific segments of the population concerning the measure to be applied (Eriksson et al., 2008). Future research should study in depth the origin and possible causes of these sex differences in affective motivations.

The present work also has some limitations that should be taken into account. Firstly, our model does not reflect the role played by the force of habit in car use, a psychosocial variable that has revealed its influence in various works (Gardner, 2009; Verplanken et al., 1998; Bamberg et al., 2003). Starting from the integrative model proposed by Triandis (1977), the work of Domarchi et al. (2008) confirms that both the variable strong habit and the variables positive attitude and positive affect towards cars improve the explanatory capacity of models based exclusively on the measurement of the indicators of service levels. However, these authors do not measure the influence of the variable social factor, described by Triandis, on behavioral intentions. The variable social factor (made up of roles, norms, and self-concept) could be considered equivalent to the symbolic motivations presented in this work. Future research should assess the possible effect of force of habit on people’s symbolic motivations, an aspect that was not taken into account in our model.

In our work, subjects’ perception of frequency of car use was measured, as well as car time. This kind of measurements may be liable to some bias related to the difficulty of recalling past behaviors or to the tendency to distort reality (Aarts and Dijksterhuis, 1999). Nevertheless, within the framework of social psychology, the way that people perceive their physical environment is considered to affect their behavior more than the objective elements that make up that environment (Gibson, 1979; Berlyne, 1960; Brunswick, 1956). Within the field of transportation, perceived time is frequently used by people in the decision-making process about the destination of a trip, transport mode, and when planning daily activities in general (Leiser and Stern, 1988).

With this work, we attempted to contribute to the theoretical models on urban mobility patterns, verifying empirically a simple and parsimonious model of car use based exclusively on psychosocial variables (affective, symbolic and instrumental factors). Future works should address this topic including more elements in which more detailed aspects of people’s mobility are examined and not only with regard to private transportation, but also to public transportation, in order to continue to study the relevance of psychological factors and to further our knowledge of the variables that mediate such a complex phenomenon as urban mobility.
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