What drives parking choices: a laboratory experiment

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Abstract

In this paper we verify whether a laboratory experiment can be properly used to analyse individual behaviour in the transportation sector as an alternative to widely used revealed preference (RP) and stated preference (SP) approaches. We explore individual behaviour under risk and uncertainty with application to parking choices. Indeed, the parking activity entails different degrees of risk and uncertainty that are usually well explored with laboratory experiments. The laboratory experiment is conducted using two treatments, the unlabelled and labelled treatment, to test whether the framing effect plays a role in the decision process. Results allow us to affirm that laboratory experiment can be successfully adopted also to investigate consumer behaviour in the urban mobility sector, as it appears that the different levels of individual heterogeneity in term of risk and uncertainty play an important role in the parking decision's process.

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1. Introduction

This paper contributes to the existing literature on individual behaviour by exploring decisions in a context of risk and uncertainty. Our application is on parking choices since, for its nature, they are affected by different degrees of risk and uncertainty, according to the type of parking alternatives available for the individuals.

Previous papers on similar topic rely on the revealed preference (RP) and stated preference (SP) approaches, which are the mainstream techniques to observe consumer behaviour and collect data in the transport economics literature. Also existing papers on parking choices employ SP/RP techniques (among the others, Axhausen and Polak 1990, 1991; Thompson et al. 1998; Golias et al. 2002, Dell'Olio et al. 2009). In this work, we use an innovative approach that, to the best of our knowledge, has never been used before in transportation literature. Actually, we rely on a laboratory experiment to verify whether this methodology can be properly used to observe individual behaviour in the transportation sector as an alternative to the traditional SP/RP techniques. In addition, the parking activity entails different degrees of risk and uncertainty that are usually well explored with laboratory experiments.

The laboratory experiment is conducted using two treatments, the unlabelled and labelled treatment. In the first treatment, the experimental design is conducted in a neutral context with no reference to the parking activity. Instead, in the second treatment the context is explicated either in the commodity tasks and the set of information that the subjects can use, in order to avoid any kind of misunderstandings or confusion among the subjects. This allows us to test whether the framing effect plays a role in the decision process. The data collected from the laboratory experiment are then analysed, compared and discussed, using different econometric models.

In our attempt to describe the parking activity, we identify the attributes that influence the choice: the parking ticket, the searching time and the walking time. However, we introduce a new attribute, called parking probability, that enables us to control for different degrees of risk and uncertainty, and then to understand the role played by the information on parking slots' availability. Further, to point out the effect that certain or uncertain information has on respondents, we introduce a new parking mode: an SMS booking system for the parking slot, an easy procedure that allows to book in advance the slot, avoiding the searching time for it and removing any uncertainty about its availability. This has been conceived in light of the improvements in the technological tools adopted in real-time transport related communications, about traffic situation, road access, bus/train delays etc., that could attenuate the degree of risk and the uncertainty perceived by individuals. Our idea is then to understand how a new technological tool, which can influence people's perception of risk and uncertainty of parking availability, would be used by individuals when approaching a parking choice.

We also contribute to the literature on transportation, tackling the issue of congestion. Actually, the urban transport sector is affected by the congestion connected with the daily commuting from the suburban areas to the city centre or to the central business districts (CBD). The commuting directly affects the road access and citizens' quality-life as the presence of working activities, offices and institutions in the downtown leads to a rising demand for parking slots that often does not match with the quantity supplied.

The comparison between the two experimental approaches' results provides evidence that moving from the unlabelled to the labelled context, individual risk aversion does not drastically change. The increase of the ticket price and of the searching time are perceived as a disutility by the subjects, while a higher probability of finding an available slot, i.e. the probability to reduce the risk and the uncertainty, has a positive impact on individuals' utility. The results are consistent across the two experimental approaches; the only noticeable difference is related to walking time. In fact, this attribute does not affect individual behaviour when we decontextualize the experiment. This is a relevant point, as it would suggest that the contextualization leads individuals to give the appropriate weight the walking time. In addition, the results show that, once we have contextualized the experiment, individuals are willing to pay more in order to reduce the risk or the uncertainty in finding an available slot.

In conclusion, results allow us to affirm that a laboratory experiment can be successfully adopted also to investigate consumer behaviour in the urban mobility sector, as it appears that the different levels of individual heterogeneity in term of risk and uncertainty play an important role in the parking decision's process.

The remainder of the paper unfolds as follows. In Section 2 we survey the literature. In Section 3 we present the methodology and in Section 4 we give a description of the data. In Section 5 we show and discuss the empirical findings and in Section 6 we draw conclusions.

2. Literature Review

Previous contributions on parking choice have manly relied on the survey data. To deal with travellers' behaviour, researchers adopt the revealed preference (RP) approach (Ben-Akiva and Polydoropoulou, 2001) and the stated preference (SP) approach (Axhausen and Polak, 1991; Jones and Polak, 1993; Hensher, 2001; Golias *et al.*, 2002). This work differentiates from the existing ones as it relies on a different approach, i.e. an incentive compatible laboratory experiment, never used before in the related literature. As our purpose is to explore individual choice under risk and uncertainty, we believe that the laboratory experiment (unlabelled and labelled) is the appropriate strategy to collect *ad hoc* data on the parking activity. Nevertheless, we review the main contributions on parking choice using RP/SP approach in order to identity the parking attributes to build up the experimental design.

Analysing the parking demand requires the investigation of different aspects, such as the travel time, usually expressed in terms of travel-time saving, the risk or the uncertainty related to the probability of finding an available slot and the way individuals schedule their daily activities on the basis of the parking slot they choose. Therefore, we articulate the review in two parts. First, we survey contributions treating the issue of travel-time saving; then, we focus on studies dealing with the role of risk and uncertainty in parking decision.

2.1 The value of travel-time savings (VTTS)

Becker (1965) is the first that accounts for the allocation of time across different activities. Specifically, he evaluates the cost of time with regard to workers commuting from home to the workplace. In the transport economic literature the value of travel-time savings (VTTS) is a deemed as a crucial issue as the reduction in the travel time is a benefit not only for the travellers but also for urban planners (Cherlow, 1981; Hensher, 2001a). However, assessing the real value of travel time is a difficult task as there is no market for such savings. Along the years, different methodologies have been implemented to estimate the VTTS. Past papers focusing on data obtained from discrete choice questionnaires on commuters' behaviour and job related trips adopt the minimization of incorrect choice, the indifference analysis, the discriminating analysis, logit and probit models.[5] The VTTS estimation is then used as a tool to measure the willingness to pay for the reduction of travel time. The traditional multinomial logit models (MNL), initially adopted for that purpose, have been improved to allowing for random taste heterogeneity with the mixture models (MMNL) (see Hensher, 2001a, 2001b and 2001c; Jara-Diaz and Guevara, 2003; Hess *et al*., 2005). More recently, a few applications employ the more flexible non-parametric and semi-parametric techniques (Hensher and Green, 2003; Fosgerau 2006 and 2007; Hjorth and Fosgerau, 2012).

Concerning the parking activity, a key role is played by the time invested in searching and deciding where to park. Generally, the value of time can be tackled as the time spent travelling, usually divided into *in-vehicle* time and *out-vehicle* time (Hensher and Truong, 1985; Hensher, 2006; 2008); the time spent in the parking activity such as the searching time[6] and egress (walking) time[7] (Axhausen and Polak, 1990, 1991; Thompson *et al*., 1998; Golias *et al*., 2002); and, finally, the

[5] For an exhaustive reviews and details the reader is referred to Cherlow (1981).
[6] The time spent searching and queuing for the parking space.
[7] The time spent walking to the final destination.

travel time saving[8] (Moses and Williamson, 1963; Becker, 1965; and Cherlow, 1981). It is worth noting that the *out-of-vehicle* cost has the highest influence on travellers than the *in-vehicle* cost (Feeney, 1989). Moreover, the value given by the individuals to the walking time is two/three times higher than the time spent in the car for searching a parking slot (Axhausen and Polak, 1991).[9]

2.2 The role of risk and uncertainty in parking choice

While there is plenty of contributions on parking decisions under risk, a very few studies examined parking decisions under uncertainty. In the following, we review contributions investigating on the elements that influence individuals' behaviour when facing risky or uncertain situations in the parking activity, for instance, the role of knowledge about the spatial distribution of the parking area, the role of pre-trip information.

Polak *et al.* (1990) claim that drivers' expectations on spatial and temporal distribution of parking opportunities and on the relative parking cost are based on own knowledge. For instance, no parking space would be selected before a round search has been done to test the availability of slots (free parking or parking slots that have a fee) in the area of interest. In this way drivers can lower the uncertainty and have a clearer comprehension of the dynamics related to parking decision. Consistently, Polak and Jones (1993), by using pre-trip information, prove that the knowledge and information on the travel and on the availability of parking space play an important role on the decision process of travellers.

Moreover, drivers seem to consider more relevant the searching time and walking time than other parking activities components. Axhausen and Polak (1991) explore driver's behaviour when facing the choice between three alternative parking types: free on-street parking, different types of off-street parking (lots and garages) and illegal parking.[10] The results point out that drivers that consider viable also the illegal parking are more impatient during searching time and tolerate less long walks. This highlights commuters' attitude towards risky situation.

Thompson et al. (1998) and Golias *et al.* (2002) focus on the choice between off-street and on-street parking slots. Thompson et al. (1998) consider the evaluation of the parking space based on previous experience and network knowledge, in particular regarding the off-street parking for which the parking space is already known. Further, they apply a restriction on the duration of on-street parking. The results show that the imposed restriction changes drivers' behaviour since they prefer

[8] To quantify in monetary terms the value of the travel time saving, Moses and Williamson (1963) refer to the average wage rate or to the average family income of the sample considered.

[9] Marsden (2006) reviews works on the issues related to the parking choices, taking into account different subjects, as commuters, non-commuters and residents, and for most of them data have been collected through stated preference experiments, with a particular focus on commuters' behaviour and their perception of time.

[10] Parking type differentiation results to be useful for measuring the willingness to pay as it allows to account for different segments of the sample.

to reduce the searching time and to increase the walking time. Golias et al. (2002) add the option of refusing the on-street and the off-street parking type. They define the searching time as tiring and hence state that the uncertainty of finding an available space has a negative impact on the utility, leading drivers to prefer the off-street to the on-street instead of cruising more for an available slot. Specifically, the time saving have a higher influence on drivers' behaviours as long as the on-street searching time increases. Finally, off-street parking is preferred for longer parking period than the on-street parking.

Some papers focus on the sensitivity of pricing regime and on the supply of parking slots by the time of the day. In Hensher and King (2001) the sample is composed by commuters (employees which parking fee is partially, totally or not guaranteed by the employers) and individuals who travel to the Central Business District. In Anderson et al. (2006) respondent are only tourists. Despite the different travel purpose, tourists and commuters show a similar behaviour since both prefer cheaper transit alternatives and dislike spending long time in transit as well as in a congested road.

More recent studies (Clinch and Kelly, 2004; 2006; 2009 and Simicevic et al., 2012) show that it is possible to understand the effect that changes in parking price has on the travel demand by observing user's behaviour. Actually, they find out the price at which travellers would give up parking and to which other transport mode they would likely shift. A higher percentage of users prefer to travel by car until a certain modal connection point (e.g. park and ride) and then switch directly to public transport, or to carpool.

Dell'Olio *et al.* (2009) investigate the potential demand of travellers for a new parking alternative. In the specific, they study the individuals' behaviour when the new underground car park is available. Individuals state their preference among three alternatives: free on-street parking, paid on-street parking and the new underground car parking. They measure the individuals' willingness to pay for the new parking alternative, focusing on the economic benefits gained by both the private parking managers and the car park users.

3. Methodology

As stated before, this study evaluates how individual behaviour changes when individuals face risky and uncertain situation. While previous papers use the revealed preference (RP) approach and the stated preference (SP) approach to collect the data, we find more appropriate to rely on a laboratory experiment, which we consider more suitable when dealing with the issue of risk and uncertainty.

In light of this, we run a laboratory experiment composed by two treatments an unlabelled treatment and labelled one. The main differences between the two treatments are as follow:

(i) In the unlabelled treatment, instructions do not recall the parking situation and subjects are asked to choose among lotteries, whereas in the labelled treatment, instructions are precisely associated to the parking activity and subjects are asked to choose among different parking types.

(ii) In the unlabelled treatment we decontextualize the design to find a more neutral as possible context; conversely, in the labelled treatment the aim and the context are explicitly defined, in order to avoid any kind of misunderstandings or confusion among the subjects.

This allows us to test whether the framing effect plays a role in the parking decision process (Harrison and List, 2004).

The data obtained by the experiments are analysed through different econometric techniques. In order to find the model that better fits our data we implement and test different models. We start with the simple multinomial logit model (MNL). After, in order to investigate for the presence of correlation between the alternatives, we estimate nested logit model (NL). Finally, we move to mixed logit models (MMNL) that enable us to capture the potential heterogeneity in the sample.

The estimated coefficients have been used to calculate the willingness to pay (WTP), and the related confidence intervals, for the different parking attributes. We implement the Delta method, the Krinsky and Robb (1990, 1986) approach and the Fieller method.

3.1 Experimental design

In the city centres the most common parking alternatives that an individual can face are of two types:

- *on-street parking* is represented by the popular slot on the roadside, characterised by high searching time and a low probability to find an available slot during the rush hours. These slots are located close to the city centre, usually free of charge for all the day or they require a fixed fee, in a limited time period, that is cheaper than the ones of the other *off-street* alternatives;
- *off-street parking* are usually located in a dedicated areas, i.e. the multi-store car park, multi-floor parking garages, underground parking garages, Park&Ride, etc. For the *off-street* alternatives, a fixed parking ticket is set or a different hourly tariff is defined according to the entry time into the parking slot (i.e. ante-meridian or post-meridian tariffs).

These parking alternatives differ for their nature (*on-street versus off-street*) and their attributes (Polak *et al.*, 1990; Axhausen and Polak, 1991; Golias *et al.*, 2002). Researchers, when detecting the attributes that have a crucial influence on individuals' choice, regularly contemplate the parking ticket; the time necessary to find an available slot (*searching time*); and the *walking time* to reach the final destination.

In our experimental design we introduce a new parking alternative called *technological*. This alternative, relying on the possibility to reserve in advance, by an SMS booking system, the parking slot allows us to capture the importance individuals give to real-time updates. Moreover, the introduction of this technological tool helps in modelling for different degrees of risk and uncertainty and hence in understanding the trade-off between "certain" *versus* "uncertain" information.

Among the parking attributes mentioned above, a new parking attribute, called *parking probability*, has been introduced in our experimental design. To our knowledge this is the first time that the probability of finding a parking slot is explicitly - and defined in terms of probability - included into the framework. This new attribute, modelled according to the nature of the parking considered, indicates the probability individuals have to find the available slot.

Accounting for the traffic and the urban congestion we allow the parking probability to vary on two levels. A higher probability to find an available slot is assumed in the *off-peak hours,* conversely in the *on-peak hours* that probability drops.

In conclusion in our experiment we implement three parking alternatives – *technological, non-technological* and *on-street* – and for each choice set individuals are asked to state their preference. The number of scenarios (or choice sets) to implement in each treatment (risky and uncertain) is defined according to the resolution of the factorial design elaborated. A recap of the scenarios' setting is reported in Table 1 below.

Table 1: Attributes' levels

Parking type	**Technological**	**Non-technological**	**On-street**
Ticket price (euro)	L: 1 + 2.5 H: 1 + 3.5	Fixed: 2.5	L: 0 H: 2
Searching Time (mins)	Fixed: 0	Fixed: 7	L: 15 H: 30
Walking time (mins)	Fixed: 10	Fixed: 5	L: 5 H: 10
Parking Probability (%)	L: 80 H: 100	L: 50 H: 70	L: 5 - 35 H: 35 - 65

The *on-street* slots, close to the city centre, are usually free of charge or require a parking fee (2€) that is cheaper than the ones of the other *off-street* alternatives. The *on-street* alternative is represented by the popular parking slot on the roadside, characterised by high searching time (equal to 30 minutes in the rush hours and 15 minutes in the *off-peak* hours) and a low probability to find an available slot during the rush hours (defined in a range between 5% and 35%). The probability to find an available slot in the *off-peak* hours can assume a value in the range between the 35% and 65% of chances.

We assume that the *non-technological parking* (multilevel parking and the garages), very common and popular in the downtown, requires an hourly fixed fee of 2.5€ and allows individuals to have higher probability to find an available slot than in the *on-street* in both the *on-peak* (equal to 50%) and in the *off-peak* hours (70%). Conversely the searching time is reduced with respect to the *on-street* alternative to 7 minutes.

Lastly, the *technological parking*, relying on the SMS booking system, allows modelling for different degrees of risk and uncertainty. In this way individuals can rely on real-time information and have a certain - or less uncertain - probability to find an available parking slot. The *technological parking* requires the payment of two-part tariff: a fixed fee (1€) and an hourly usage-related fee that can be equal to 4.5€ or 3.5€.

The fixed tariff allows to reserve the parking slot for a fixed amount of time but once the reservation time expires, the parking probability drops and the reservation right is no longer valid. The usage-related tariff, instead, varies according to the parking duration. Since individuals can reserve the slot in advance there is no searching time. The SMS update provides the information on the parking location.

Since these slots are not, normally, situated in the city centre, it is reasonable to assume a certain time to reach the final destination. In particular, walking time to reach the final destination is set equal to 10 minutes.

The probability of parking associated to the *technological parking* varies on two levels: the first one gives respondents the certainty of finding the reserved slot (100%); the second assures a lower probability of finding an available parking slot (80%). The lower probability is justified by the fact that rush hour traffic and/or congestion due to other factors might delay arrival to the parking facility beyond the reservation time frame and, thus, the respondent must look for a free lot and does not maintain the right to use the reserved lot.

We implement the full factorial design, where all the possible treatment combinations of the alternatives' attributes are used. We have 128 scenarios (2^7) for both the risky and uncertain treatments.[11] Basically, the experiment unfolds into three parts. In first part, respondents' face risky lotteries. In the second part, we introduce a questionnaire to collect data about socio-demographic information on the respondents. In the last part, respondents' face uncertain lotteries.

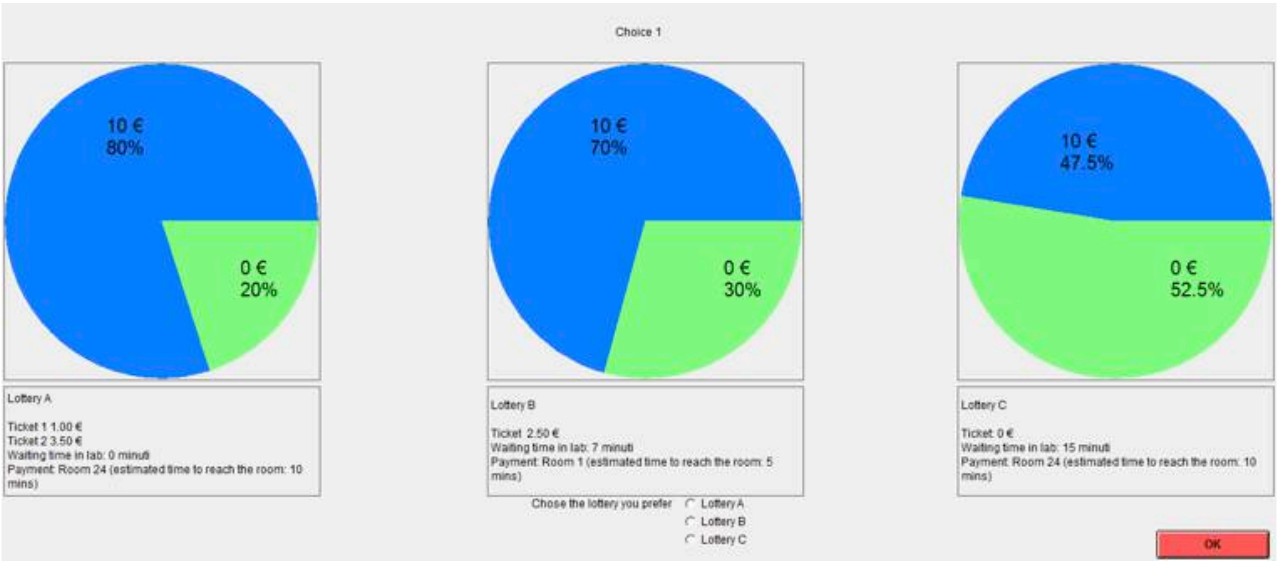
[11] The full enumeration of possible choice sets is equal to L^{MA} for labelled choice experiments and L^{A} for the unlabelled choice experiment, where L is the number of level, M the number of alternatives and A the number of the attributes.

The experiments are conducted considering two different settings: unlabelled and labelled.[12] In the unlabelled treatment subjects do not know which is the aim behind the experiment for two main reasons: the treatment is run in a context-free setting such that the situation represented in the tasks does not recall the real situation the we want to investigate. On the contrary, in the labelled treatment the context is explicitly defined. Indeed, subjects know which is the experiment's aim since instructions describe the parking situation, which individuals would face.

In the experiment, each scenario is composed of three lotteries. In the unlabelled treatment lotteries are named as follows: Lottery A, represents the technological parking type; Lottery B, represents the non-technological parking slot; Lottery C, represents the on-street slot.

Two sessions, the risk session and uncertain one compose the unlabelled treatment. An example of the risky and uncertain scenarios is reported Figure 1 and 2, respectively. Each subject has to choose among the three lotteries his or her preferred one in each scenario.[13]

Figure 1: Risky lottery choice in the unlabelled treatment.



Source: our elaboration using Z-tree software.

In Figure 1 subjects face a risky problem: they have to state their preference among the three risky lotteries. If they choose Lottery A (i.e. the *technological parking*) they have to pay ‘*cost 1*’ (i.e. the booking price) irrespectively to the outcome of the lottery and get an 80% chance to win 10€ (i.e.

[12] “An unlabelled treatment is by definition, an experiment in which the heading or the title of the alternatives is generic or uninformative to the decision maker. […] the only way of differentiating between each alternative is via the attributes and attribute-level labels as assigned by the experimental design” (Hensher et al., 2010).

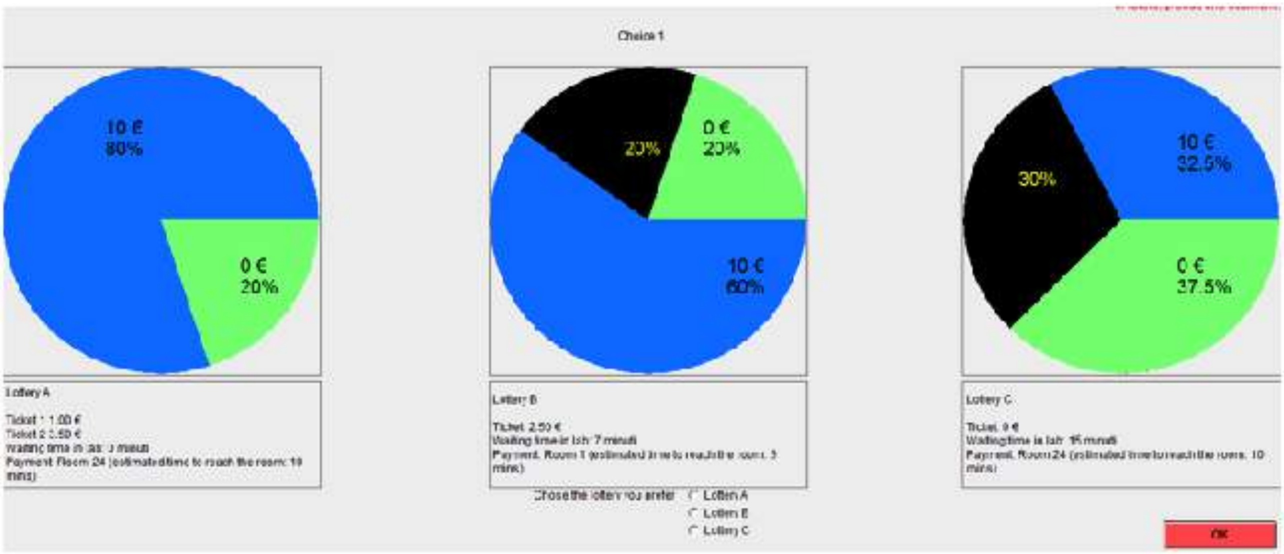
[13] Note that we are deliberately not allowing subjects to express indifference between lotteries. This simplifies our data analysis since, if subjects are given the opportunity to express indifference and take advantage of this opportunity, it is not obvious how one should treat such responses (see Hey, 2001). Moreover, this choice does not affect the value of the experiment to the subjects, since if subjects are truly indifferent it does not matter how they respond, given the adopted incentive mechanism.

find a parking slot) and 20% chance to get 0 (i.e. do not find a parking slot). Only in the case they find a free parking slot, they receive 10€ and will pay the parking ticket (i.e. '*cost 2*'). In order to get paid, since they choose a *technological parking* they do not have to wait in the laboratory (i.e. the searching time is 0), and they can immediately reach their final destination. Since we assume that *technological parking* are less common and may be not in the city centre we fixed a walking time of 10 minutes (i.e. '*root 1*: estimated time to reach the payment's room 10 minutes').

If they choose Lottery B (i.e. the *non-technological parking*) they have a 70% chance to win 10€ (i.e. find a parking slot) and a 30% chance to get 0 (i.e. do not find a parking slot). Only in the case they find a free parking slot they receive 10€ and will pay the parking ticket (i.e. '*cost*'). In order to get paid, they have to wait in the laboratory for 7 minutes (i.e. the searching time is 7), and then they can go to their final destination. Since we assume that *non-technological* parking are quite common and located also in the city centre we fixed a walking time of 5 minutes (i.e. '*root 2*': estimated time to reach the payment's room 5 minutes).

Finally, if they choose Lottery C (i.e. the *on-street parking*) they have a 47.5% chance to win 10€ (i.e. find a parking slot) and 52.5% chance to get 0 (i.e. do not find a parking slot). In this particular case, irrespectively to the outcome of the lottery, the players do not have to pay any costs (they are parking in a free slot). But now searching time and walking time are higher: 15 and 10 minutes, respectively.

Figure 2: Uncertain lottery choice in the unlabelled treatment.

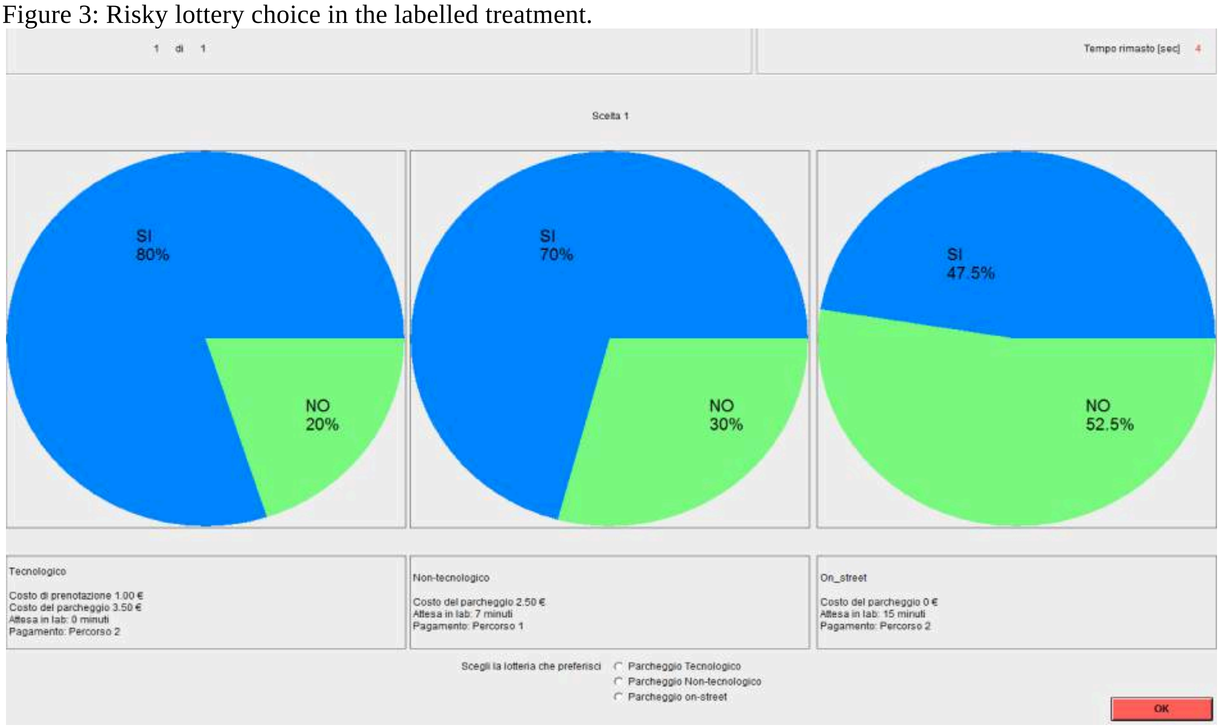


Source: our elaboration using Z-tree software.

In Figure 2 subjects face an uncertain problem that is represented by the black part of the pie in the Lottery B and Lottery C. If they choose Lottery A (i.e. the *technological parking*) there is no uncertainty. They will pay '*cost 1*' irrespectively to the outcome of the lottery, and get an 80% chance to win 10€ and 20% chance to get 0. Only in the case they win the lottery (i.e. find a free park slot available) they will pay the '*cost2*' (i.e. the parking ticket). In order to get paid, since a *technological parking* is chosen, they do not have to wait in the laboratory (i.e. the searching time is 0) and they can immediately reach their final destination, going through '*root 1*'.

If they choose Lottery B (i.e. the *non-technological parking*) uncertainty is involved. They have a 60% chance to win 10€ and a 20% chance to get 0. The black area represents the uncertainty. Subjects do not know if the black part of the pie hides chance of winning the 10€ or not; meaning that the probability of winning 10 € is between 60% and 80% and the probability of getting 0 is between 20% and 40%. Only in the case they get 10€, they have to pay the ticket. In order to get paid, before going to collect their money through '*root 2*', subjects have to wait in the laboratory for 7 minutes. Finally, if they choose Lottery C (i.e. the *on-street parking*) they have a 32.5% chance to win 10€ and 37.5% chance to get 0 and a 30% probability of uncertain outcome (10€ and/or 0€). This will end up with a probability between 32.5% and 62.5% of getting 10€, and a probability of 37.5 % and 67.5% of getting 0€. In case subjects choose this lottery C, irrespectively of the lottery's outcome they do not have to pay any cost, but now the searching time and walking time are higher: 15 and 10 minutes, respectively.

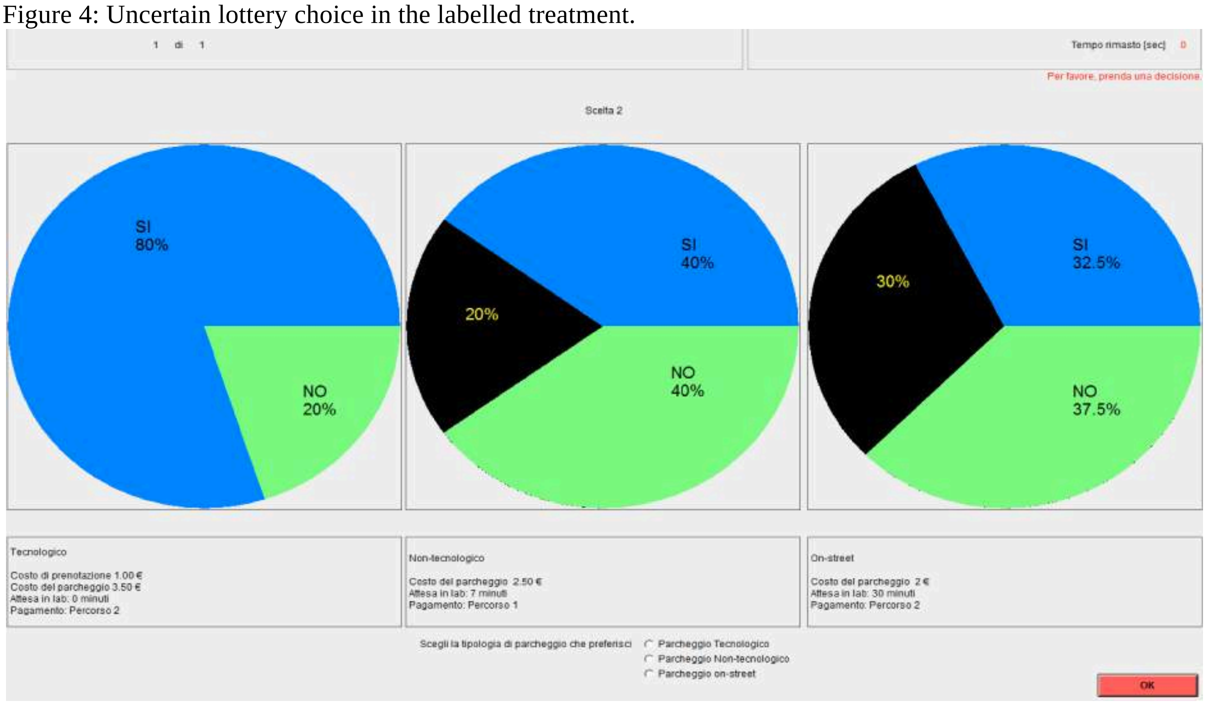
Figure 3: Risky lottery choice in the labelled treatment.



Source: our elaboration using Z-tree software.

Instead, in the labelled treatment lotteries are defined as: technological, non-technological and on-street. The way the alternatives are presented is exactly the same as in the unlabelled treatment, however, we have defined, for each alternative, the ticket price, the searching time (defined as the waiting time in the laboratory) and the walking time, define as the place where to go for the payment (see Figure 3 and Figure 4).

Figure 4: Uncertain lottery choice in the labelled treatment.



Source: our elaboration using Z-tree software.

The differences between the two treatments are not only in the framing context but also in the way the treatments has been described in the instructions for the individuals. As instructions can affect the outcome of the laboratory experiments (Harrison and List 2004), we decided to run first an unlabelled treatment, in which the instructions are given as more neutral as possible. In the second treatment, the labelled one, the instructions clearly described the situations that individuals would have had in mind when making the choice. Indeed, parking slots' pictures have been used to be make sure that individuals did not misinterpret the situations that they were going to face once the experiment started. This contextualization enabled us to make sure that all the individuals had access to the same set of information and at the same time it put the subjects in an everyday life activity, characterized by risk and uncertainty.

Once the experiments finished, only one lottery is randomly chosen by the computer and played out for real. Depending on the choice stated in this lottery, the student receives the payment, which amount is between a maximum of 10€ and a minimum of 0€, excluding the show up fee of 5€, that each student receives for participating.

3.2 Econometric strategy

The data stemming from the unlabelled and labelled treatments are then employed in the econometric estimations in order to explore the determinants of a parking choice.

To identify the attributes that affect individuals utility we consider the ticket cost, the value of time (here expressed in terms of searching time and walking time) and the parking probability. Since the lotteries in the risky and uncertain treatments are symmetrical we introduce a scale parameter to capture the individuals' behaviour once the uncertain lotteries are showed.[14] The scalar parameter enables us to understand if individuals differently perceive the risky and uncertain lotteries. If the scalar is significant, then the risk and uncertainty have a different effect on individuals' choice. In the estimations we normalise the alternatives with respect to the *on-street* and express all the attributes of the *technological* and *non-technological* parking type as difference with respect to the *on-street* attributes.

The systematic utilities for the MNL model with alternative-specific coefficients are expressed as follows:

$$V_t = ASC_t + \beta_{t-ticket}\,\Delta_{t-os}\,ticket + \beta_{t-wt}\,\Delta_{t-os}\,wt + \beta_{t-st}\,\Delta_{t-os}\,st + \beta_{t-pp}\,\Delta_{t-os}\,pp \qquad (1)$$

$$V_{nt} = ASC_{nt} + \beta_{nt-ticket}\,\Delta_{nt-os}\,ticket + \beta_{nt-wt}\,\Delta_{nt-os}\,wt + \beta_{nt-st}\,\Delta_{nt-os}\,st + \beta_{nt-pp}\,\Delta_{nt-os}\,pp \qquad (2)$$

$$V_{os} = ASC_{os} + \beta_{os-ticket}\,ticket_{os} + \beta_{os-wt}\,wt_{os} + \beta_{os-st}\,st_{st} + \beta_{os-pp}\,pp_{os} \qquad (3)$$

where, for the parking alternative, *t* indexes the technological parking, *nt* the non-technological parking and *os* the on street parking. For the parking attributes, *wt* indexes the walking time; *st* the searching time and *pp* the parking probability.

In order to test whether there might be cross-alternative correlation, we estimated two NL models structured as in the baseline specification. In the first NL model – *off-street* vs. *on-street* – we assume that the *technological* and *non-technological* parking type are ascribable to the *off-street* alternatives, as they might share some common futures such as well defined areas, usually buildings or controlled parking area, use of automatic payment system, etc. In the second NL model – *tech* vs. *non-tech* – we assume that the *on-street* and the *off-street* (non-technological) can be perceived as identical by respondents.

If the results obtained from the NL models point out that alternatives are perceived as different from each other by the respondents, then it is crucial understanding whether it is still necessary to adopt the MNL model with alternative-specific coefficients or it is preferable to use the MNL with

[14] The value of the estimated attributes' coefficients has to be multiplied by the uncertain scale parameter in order to have the exact value of the uncertain coefficients.

generic-coefficient. In the that case, the systematic utility functions would be:

$$V_t = ASC_t + \beta_{ticket}\, \Delta_{t-os}\, ticket + \beta_{wt}\, \Delta_{t-os}\, wt + \beta_{st}\, \Delta_{t-os}\, st + \beta_{pp}\, \Delta_{t-os}\, pp \quad (4)$$

$$V_{nt} = ASC_{nt} + \beta_{ticket}\, \Delta_{nt-os}\, ticket + \beta_{wt}\, \Delta_{nt-os}\, wt + \beta_{st}\, \Delta_{nt-os}\, st + \beta_{pp}\, \Delta_{nt-os}\, pp \quad (5)$$

$$V_{os} = ASC_{os} + \beta_{ticket}\, ticket_{os} + \beta_{wt}\, wt_{os} + \beta_{st}\, st_{st} + \beta_{pp}\, pp_{os} \quad (6)$$

The choice among the MNL with alternative-specific coefficients and the MNL with generic coefficients will be driven by the results of the Likelihood Ratio Test.

Finally, the mixture models are estimated to explore the presence of taste variations, namely the Alternative Specific Variance (ASV) and the Random Coefficient (RC) model.

4. Data description

The unlabelled treatment was conducted in May 2013, while the labelled treatment was conducted in October 2013 at the University of Bari Aldo Moro. The unlabelled treatment's sample is composed by 112 students (45% male and 55% female that are on average 22 years old), while the labelled one is composed by 105 students (52% male and 48% female students). In total we have 26,880 observations stemming from the unlabelled treatment and 28,672 stemming from the labelled treatment.

Table 2: Descriptive statistics.

	Unlabelled				Labelled			
Variable	***Mean***	***Std. Dev.***	***Min***	***Max***	***Mean***	***Std. Dev.***	***Min***	***Max***
Male	0.446	0.499	0	1	0.5238	0.4994	0	1
Household size	4.143	0.758	2	6	4.209	0.7891	2	7
Hometown	0.580	0.496	0	1	0.4190	0.4934	0	1
Distance Uni-home (km)	23.650	25.399	0	150	21.99	289.425	0	150
Average income*	0.679	0.922	0	5	0.4	0.9319	0	5
Driving licence	0.902	0.299	0	1	0.8952	0.3062	0	1
Cars in the household	1.973	0.729	0	5	1.980	12.187	0	10
Weekly trip frequency	4.277	1.050	1	6	4.533	0.8844	1	7
Vehicles-Uni	5.125	2.519	1	8	4.933	24.034	1	8
Commuting time	1.688	0.978	1	5	1.771	0.9284	1	4
Searching time	0.946	0.889	0	4	0.8190	10.215	0	4
Parking duration	1.366	1.208	0	4	1.038	12104	0	4

* Income classes: not worker= 0; 0€=1;less then 500€ =2; between 500€ and 1000€=3; between 1000€ and 1500€=4; more than 1500€=5;

The experiment took on average 50-60 minutes to be completed. However, this varies across students, as each student has been allowed to complete the tasks at its own speed. In Table 2 the descriptive statistics of the unlabelled and labelled samples are reported.

It is noteworthy noting that the samples stemming from the unlabelled and labelled treatments are very similar in term of socio-economic characteristics. Almost the 90% of respondents in both samples holds the driving license. Further, the average commuting distance from the home to the university is about 22-23 km. Finally, there are, on average, two cars per household.

Figure 5 and Figure 6 show gender differences regarding the parking choice in the unlabelled and labelled treatments.

Figure 5: Gender differences. Unlabelled treatment.

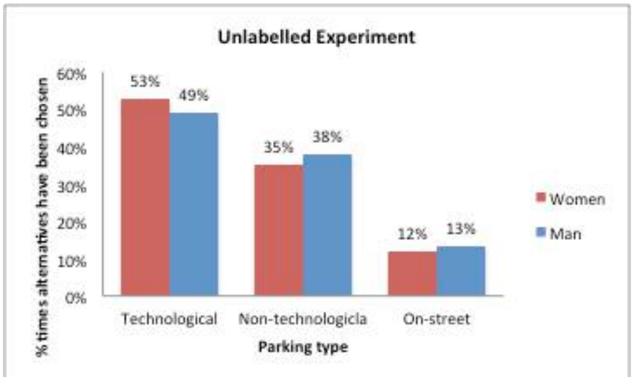
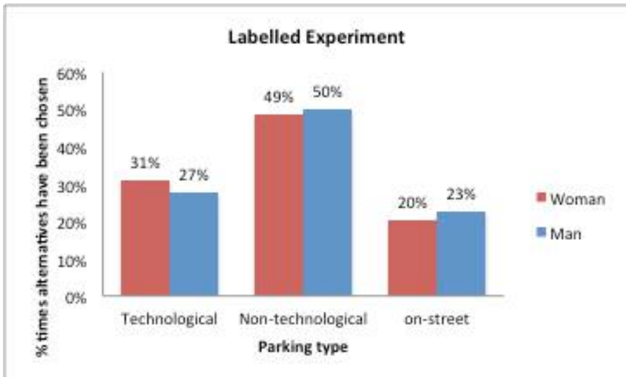


Figure 6: Gender differences. Labelled treatment.



Usually women are found to be more risk averse than men (Eckel and Grossman, 2008). Indeed, in our analysis we find is a systematic difference in behaviour between man and woman, which validate what is observed in literature is supported (see Figure 5 and 6). The results of our experiment show that women, rather than man, prefer the less risky alternatives (*off-street* parking alternatives) and that they do not dislike the idea of booking by an SMS the parking slot, avoiding any kind of risk or uncertainty. Comparing the results from the unlabelled with the results from the labelled treatment, subjects seem to prefer the technological parking alternative in the unlabelled context, whereas they seem to prefer the non-technological parking alternative in the labelled context. This can be explained considering that in the labelled context subjects use their own knowledge about parking area and this might influence their perception about the risk and uncertainty related to the non-technological parking alternative.

5. Results

Results of the econometric analysis using data collected from the unlabelled treatment are presented along with the results obtained using data from the labelled treatment, in order to provide an immediate comparison among the two approaches and to understand whether subjects change their behaviour when moving from a decontextualized environment to the one in which the context and the instructions are explicated. Data from both kinds of experiments are analysed by employing the same empirical strategy. In this way, the differences in behaviour due to the aseptic frame and to the contextualized one can be easily detected.

In Table 3 we report the results of the MNL model with specific coefficients.

Table 3: Unlabelled vs Labelled: MNL with alternative specific coefficients.

	Unlabelled				**Labelled**			
Variables	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***
B_nt-pp	0.0391	0.001	38.97	0.00	0.0521	0.00115	45.27	0.00
B_nt-st	-0.0161	0.00256	-6.27	0.00	-0.0233	0.00288	-8.09	0.00
B_nt-ticket	-0.585	0.0197	-29.73	0.00	-0.619	0.0209	-29.58	0.00
B_nt-wt	0.00488	0.00762	0.64	0.52	-0.0232	0.00856	-2.71	0.01
B_t-pp	0.0347	0.00096	36.21	0.00	0.0436	0.00109	40.02	0.00
B_t-st	-0.0145	0.00247	-5.86	0.00	-0.0204	0.00284	-7.18	0.00
B_t-ticket	-0.55	0.0175	-31.34	0.00	-0.574	0.0189	-30.47	0.00
B_t-wt	0.0048	0.00735	0.65	0.51	-0.0185	0.00845	-2.19	0.03
ASC_nt	0.805	0.0618	13.03	0.00	0.693	0.0669	10.36	0.00
ASC_t	0.903	0.0911	9.91	0.00	0.55	0.100	5.50	0.00
N. obs	*28672*				*26879*			
L(0)	-31499.412				-29529.6			
L(β)	-25700.883				-23372.866			
ρ^2	0.184				0.208			
AdJ ρ^2	0.184				0.208			

The alternative specific constant (ASC in Table 3), in both unlabelled and labelled treatments, are positive and statistically different from zero, implying that subjects prefer the *off-street* alternatives rather than the *on-street*. The increase of the ticket prices has a negative impact on individuals' utilities. The robust t-test for the *non-technological* parking slot is respectively equal to -29.73 and -29.58 in the unlabelled and labelled treatment; the same happens if looking at the *technological* robust t-test in the unlabelled (-31.34) and labelled approach (-30.47). The increase of the searching time is negatively perceived in both samples, indeed the coefficients are significantly different from zero for both the *technological* and *non-technological* alternatives, although the magnitude of the coefficient is higher when considering the labelled treatment (non-technological value in the labelled is -0.0233 against the -0.0161 in the unlabelled; respectively -0.0204 in the labelled and -0.0145 in the unlabelled for the *technological* alternative). The same happens for the parking probability, in fact a higher probability of finding an available slot has a positively effects on the utility but the magnitude is different in the labelled and the unlabelled treatment. Regardless the experimental approach, in both the off-street alternatives the information guaranteed by the parking probability coefficient has a considerable influence on the choice. Lastly, the main noticeable difference regards the walking time coefficients. This parameter for both the off-street alternatives is not significant in the unframed experiment, while it becomes important in the labelled one, assuming also the negative sing as expected. This remarks that the furthest is the final destination from the parking area the higher is the disutility perceived by individual. The contextualization of the experiment made possible that all individuals had the same information on the walking time parameter, such that, when properly framed, its coefficient, accounted to be the one of the most important attribute driving individuals' choice, is significant and is negatively perceived.

We believe that the reason why the walking time in the labelled treatment is significant is due to the "frame effect" (in the instructions two alternative paths were defined and individuals physically took the two paths before starting the experiment, namely, this is a consequence of the way this attribute has been presented in the unlabelled treatment).

Once stated which are the main attribute that influence the choice in the labelled and unlabelled treatment, we can now discuss the differences when considering the NL models.

In Table 4 we report the results of the NL models in which we test the correlation between the *on-street* and the *off-street* alternatives.

Table 4: Unlabelled vs Labelled: Nested logit model: on-street vs. off-street.

	Unlabelled				**Labelled**			
Variables	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***
B_nt-pp	0.0422	0.00229	18.47	0.00	0.0486	0.00395	12.32	0.00
B_nt-st	-0.0288	0.00341	-8.43	0.00	-0.0327	0.00329	-9.95	0.00
B_nt-ticket	-0.343	0.0211	-16.26	0.00	-0.568	0.0235	-24.17	0.00
B_nt-wt	-0.0328	0.00841	-3.9	0.00	-0.0168	0.00897	-1.88	0.06
B_t-pp	0.0379	0.00208	18.26	0.00	0.0411	0.00335	12.24	0.00
B_t-st	-0.0278	0.00328	-8.48	0.00	-0.0309	0.00325	-9.49	0.00
B_t-ticket	-0.361	0.0166	-21.72	0.00	-0.514	0.0211	-24.37	0.00
B_t-wt	-0.0234	0.00806	-2.91	0.00	-0.0103	0.00888	-1.16	0.24
μ_off-street	1	0.0474	0.05[a]	0.96	1.09	0.0684	1.26[a]	0.21
ASC_nt	0.0568	0.12	0.47	0.64	0.61	0.131	4.66	0.00
ASC_t	-0.0675	0.157	-0.43	0.67	0.275	0.194	1.41	0.16
N. obs	28672				26879			
L(0)	-31499.412				-29529.6			
L(β)	-25870.453				-23370.84			
ρ^2	0.179				0.209			
AdJ ρ^2	0.178				0.208			

The ASCs show that, *ceteris paribus,* in the labelled treatment, the off-street alternatives are preferred to the *on-street* one, while in the unlabelled approach, the analysis of the ASCs show that the *non-technological* is preferred to the *on-street* while the *technological* is less preferred than the *on-street.* These results show that the parking attributes are all significant and with the expected signs. The walking time is significant in both cases and with the negative sign, implying that individuals perceive a higher disutility when the time to reach the final destination increases. The estimated nest parameter, $\mu_{off\text{-}street}$, is not significant (the robust t-test against 1 is not statistically different from zero) in both the experiments, suggesting that there is no correlation between the *on-street* an *off-street* alternatives.

The results of the NL model *technological versus non-technological* are reported in Table 5.

Table 5: Unlabelled vs Labelled: NL model: tech vs. non-tech.

	Unlabelled				**Labelled**			
Variables	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***
B_nt-pp	0.0453	0.00153	29.53	0.00	0.054	0.00126	42.9	0.00
B_nt-st	-0.0399	0.0041	-9.71	0.00	-0.0313	0.00337	-9.28	0.00
B_nt-ticket	-0.481	0.0223	-21.54	0.00	-0.588	0.0229	-25.72	0.00
B_nt-wt	-0.0229	0.00831	-2.76	0.01	-0.0188	0.00905	-2.08	0.04
B_t-pp	0.0397	0.00136	29.12	0.00	0.0454	0.00121	37.45	0.00
B_t-st	-0.0352	0.0035	-10.06	0.00	-0.029	0.00327	-8.88	0.00
B_t-ticket	-0.463	0.0178	-26.08	0.00	-0.535	0.0195	-27.4	0.00
B_t-wt	-0.0147	0.00778	-1.89	0.06	-0.0123	0.00894	-1.37	0.17
μ_tech-non-tec	1	0.0467	0	1.00	1	0.0231	0.04a	0.97
ASC_nt	0.0375	0.0696	0.54	0.59	0.48	0.071	6.77	0.00
ASC_t	-0.0298	0.105	-0.28	0.78	0.123	0.108	1.13	0.26
N. obs	28672				26879			
L(0)	-31499.412				-29529.6			
L(β)	-25809.762				-23384.095			
$\boldsymbol{\rho^2}$	0.181				0.208			
AdJ $\boldsymbol{\rho^2}$	0.18				0.208			

From the analysis of the ASCs we can state that, *ceteris paribus*, in the labelled the *off-street* alternatives are preferred to the *on-street* one, while in the unlabelled one, there is a preference of the *non-technological* over the *on-street,* while the *technological* parking is less preferred than the *on-street* one. Also, in this case the parking attributes are all significant and with the expected signs. The nest parameter, $\mu_{tech\text{-}nontec}$, in both the treatments, is not significant highlighting that there is no correlation between the two alternatives proposed and by then individuals differently perceive the three alternatives.

Since there is no correlation between the alternatives proposed we can now compare the results obtained by the MNL with generic coefficients, which results are showed in Table 6.

Table 6. Unlabelled vs Labelled: MNL with generic coefficients

	Unlabelled				Labelled			
Variables	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***
B_pp	0.0368	0	40.97	0.00	0.0478	0.00103	46.25	0.00
B_st	-0.0151	0.00237	-6.38	0.00	-0.0218	0.00273	-7.99	0.00
B_ticket	-0.56	0.0174	-32.24	0.00	-0.59	0.0186	-31.68	0.00
B_wt	0.00484	0.00705	0.69	0.49	-0.0208	0.00809	-2.56	0.01
ASC_nt	0.85	0.0567	14.99	0.00	0.804	0.0617	13.02	0.00
ASC_t	0.802	0.0869	9.22	0.00	0.335	0.0953	3.52	0.00
N. obs	28672				26879			
L(0)	-31499.412				-29529.6			
L(β)	-25719.446				-23424.976			
ρ^2	0.183				0.207			
AdJ ρ^2	0.183				0.206			

The ASCs coefficients are statistically different from zero and with a positive sign, which remarks that *ceteris paribus* individuals prefer the off-street alternatives to the on-street one. The raise in the ticket price and searching time negatively influences the choice. The parking probability coefficients, conversely, is positively perceived and in both the treatments it is significant. The noticeable difference is in the walking time coefficients. In the unlabelled treatment it is not significant, while when we properly framed, the walking time is statistically different from zero (robust t-test equal to -2.56) and it also has the expected negative sign. Here, as before, we assume that this difference is due to how the experiment has been framed.

The investigation of the heterogeneity is now carried out by the analysis of interaction terms that we introduced in the MNL model, as reported in Table 7.

The ASCs coefficients, regardless the treatment, are both significant and with a positive sign remarking that the off-street alternatives are preferred to the *on-street* one. The analysis of the parking attributes shows that the ticket, searching time and parking probability coefficients are consistent and follow the same path. Only the walking time is not significant in the unlabelled estimation, while it is significantly different from zero and with negative sing, once we consider the labelled results.

The aim of this MNL model with interaction terms is to capture the presence of heterogeneity in the sample. The values of the ρ^2 obtained with the MNL with generic coefficients (Table 6) and the ρ^2 in the Table above, clearly state that there has been a improvement in the explanation of the phenomena when moving from a model to the other one in both the experimental designs analysed.

Table 7. Unlabelled vs Labelled: MNL interactions and dummies on off/on-street, out-city and free-os

	Unlabelled				Labelled			
Variables	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***
B_ticket	-0.506	0.047	-10.75	0.00	-0.775	0.0483	-16.04	0.00
B_st	-0.0368	0.00476	-7.73	0.00	-0.0229	0.00522	-4.39	0.00
B_wt	0.00531	0.00716	0.74	0.46	-0.02	0.00823	-2.43	0.02
B_pp	0.0321	0.0027	11.9	0.00	0.0656	0.00281	23.34	0.00
B_ticket-licence	-0.0859	0.0353	-2.44	0.01	0.211	0.0374	5.63	0.00
B_ticket-comm	0.0336	0.0135	2.49	0.01	-0.0125	0.0144	-0.86	0.39
B_ticket-duration	-0.0133	0.00798	-1.66	0.10	-0.0254	0.00909	-2.79	0.01
B_ticket-male	-0.132	0.0258	-5.14	0.00	0.00186	0.0287	0.06	0.95
B_st-male	-0.00478	0.00369	-1.3	0.19	0.0111	0.00405	2.75	0.01
B_st-comm	0.0134	0.00186	7.24	0.00	-0.00391	0.00207	-1.89	0.06
B_pp-licence	-0.00263	0.00217	-1.21	0.23	-0.022	0.0024	-9.17	0.00
B_pp-comm	0.00323	0.000677	4.77	0.00	0.000929	0.000705	1.32	0.19
B_pp-duration	0.00152	0.000496	3.06	0.00	0.00422	0.000554	7.61	0.00
B_pp-male	0.00406	0.00126	3.23	0.00	-0.00327	0.00138	-2.36	0.02
Off_peak	-0.0815	0.0529	-1.54	0.12	-0.228	0.058	-3.92	0.00
On_peak	0.301	0.0604	4.98	0.00	0.466	0.0758	6.15	0.00
Free_os	-0.216	0.0244	-8.86	0.00	-0.188	0.0266	-7.06	0.00
Out_city	-0.342	0.0414	-8.25	0.00	-0.253	0.0453	-5.59	0.00
ASC_nt	0.795	0.0577	13.78	0.00	0.771	0.0629	12.26	0.00
ASC_t	0.675	0.0876	7.71	0.00	0.225	0.0965	2.33	0.02
N. obs	28672				26879			
L(0)	-31499.412				-29529.6			
L(β)	-25527.668				-23190.676			
ρ^2	0.19				0.215			
AdJ ρ^2	0.189				0.214			

In particular when observing the differences in the estimation results we can observe a change in the sign of the interaction between parking ticket and driving licence holders. These coefficients assumes a negative sign in the unlabelled estimation while a positive sign in the labelled once underlining that there is no difference between individuals who do not have a driving licence and licence driving holders once we have contextualized the experiment. The increase of the parking ticket affects the individuals in the same way, irrespectively of the fact that they hold a driving licence. In the unlabelled treatment we are able to distinguish between men's and women' (risky) behaviour, through the interaction of the ticket parameter with the gender variable (robust t-test -5.14), conversely in the labelled context this distinction is not significant (robust t-test 0.06). Furthermore, in the labelled context it possible to state that men are not more impatience than women while curbing for an available slot (robust t-test 2.75); conversely in the unlabelled treatment we could affirm that men are more impatience that woman (even with a robust t-test of -1.3). On the other hand though, when considering the interaction between the parking probability and gender the sign of the coefficient changes according to the framing, namely in the unframed context the coefficient is positive and significant meaning that the information has the same effect on both women and men but, when we move to the framed context the negative sign underlines that men have a different perception of the parking probability than women. Lastly the perception of the four dummy variables that we introduced to capture individuals' reaction to different scenarios remains consistent across the experiment, showing that subjects did not perceived any difference in the way these scenarios have been labelled.

The mixture models implemented to analyse the presence of taste variations are the Alternative Specific Variance one and the Random Coefficient model. In Table 8 the Alternative Specific Variance results are showed.

Table 8: Unlabelled vs Labelled: Alternative Specific Variance[15]

	Unlabelled				Labelled			
Variables	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***
B_pp	0.0586	0.00824	7.12	0.00	0.138	0.0492	2.8	0.01
B_st	-0.0308	0.00684	-4.5	0.00	-0.0745	0.0292	-2.55	0.01
B_ticket	-1.06	0.164	-6.46	0.00	-1.89	0.688	-2.74	0.01
B_wt	0.00718	0.0142	0.5	0.61	-0.0734	0.0381	-1.93	0.05
ASC_t_std	1.69	0.441	3.83	0.00	-4.06	1.69	-2.4	0.02
ASC_os_std	-3.09	0.615	-5.02	0.00	5.78	2.29	2.52	0.01
ASC_nt	2.83	0.54	5.23	0.00	4.42	1.73	2.56	0.01
ASC_t	2.85	0.568	5.01	0.00	3.11	1.3	2.4	0.02
N. obs	28672				26879			
L(0)	-31499.412				-29529.6			
L(β)	-25672.518				-23363.145			
ρ^2	0.185				0.209			
AdJ ρ^2	0.185				0.209			

The parking coefficients – ticket, searching time and parking probability – are consistent and with the expected sing. The walking time coefficient is not significant, in the unlabelled treatment while in the framed context is significant and assumes the right negative sign. The standard deviations of the *technological* and *on-street* parking alternative are both significant implying that subjects in the sample correctly perceive the differences behind the two alternatives, regardless the framed or the unframed context.

The last model compared in this section is the random coefficient (RC) one, in which we allow the parameters to be randomly distributed across the individuals in the sample. Aiming at investigating

[15] In this estimation we have considered 1000 random draws.

for the presence of heterogeneity we estimate the parking attributes' standard deviations (see Table 9).

Table 9: Unlabelled vs Labelled: Random coefficients assuming a normal distribution[16]

	Unlabelled				Labelled			
Variables	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***	***Coefficient***	***Robust Std err***	***Robust t-test***	***p-value***
B_ticket	-0.554	0.0563	-9.84	0.00	-0.984	0.0759	-12.97	0.00
B_ticket_std	0.00706	0.00357	1.98	0.05	-0.0107	0.0106	-1.01	0.31
B_st	-0.0941	0.0141	-6.69	0.00	-0.109	0.0196	-5.59	0.00
B_st_std	0.0711	0.01	7.08	0.00	0.0966	0.0129	7.49	0.00
B_wt	0.00624	0.00865	0.72	0.47	-0.0305	0.011	-2.78	0.01
B_wt_std	-	-	-	-	0.0113	0.0105	1.08	0.28
B_pp	0.035	0.00343	10.2	0.00	0.0814	0.00487	16.72	0.00
B_pp_std	-0.00487	0.00798	-0.61	0.54	0.0136	0.00408	3.34	0.00
B_ticket-licence	-0.119	0.0421	-2.83	0.00	0.305	0.0533	5.73	0.00
B_ticket-male	-0.152	0.0291	-5.22	0.00	-0.0061	0.0347	-0.18	0.86
B_ticket-commuting	0.0354	0.015	2.36	0.02	-0.0196	0.0176	-1.11	0.27
B_ticket-duration	-0.0143	0.00954	-1.5	0.13	-0.0332	0.012	-2.77	0.01
B_st-male	-0.00393	0.00451	-0.87	0.38	0.022	0.00604	3.65	0.00
B_st-commuting	0.0161	0.00241	6.66	0.00	-0.00531	0.00282	-1.88	0.06
B_pp-licence	-0.00238	0.00245	-0.97	0.33	-0.029	0.00337	-8.61	0.00
B_pp-commuting	0.00388	0.000801	4.85	0.00	0.00127	0.000909	1.39	0.16
B_pp-duration	0.00168	0.000567	2.97	0.00	0.0055	0.000746	7.37	0.00
B_pp-male	0.00497	0.00146	3.41	0.00	-0.00216	0.00175	-1.24	0.22
Off_peak	0.191	0.0407	4.69	0.00	0.0265	0.045	0.59	0.56
On_peak	-0.166	0.0377	-4.4	0.00	0.0568	0.0423	1.34	0.18
Free_os	-0.165	0.0304	-5.43	0.00	-0.121	0.0335	-3.6	0.00
Out-city	-0.409	0.0496	-8.26	0.00	-0.358	0.0559	-6.41	0.00
ASC_nt	0.66	0.0711	9.29	0.00	0.513	0.0935	5.48	0.00
ASC_t	0.149	0.146	1.02	0.31	-0.723	0.213	-3.39	0.00
L(0)	-31499.412				-29529.6			
L(β)	-25486.818				-23177.696			
ρ^2	0.191				0.215			
AdJ ρ^2	0.190				0.214			

The analysis of the ASCs, once again shows that in the framed context the *non-technological* alternative is preferred to the on-street one and that the latter, conversely, is preferred to the *technological* parking slot. In both the experimental approaches the parking attributes, i.e. parking ticket, searching time and parking probability, are significant. The walking time is significant only in the framed context.

The standard deviations of the searching time are the only ones that remain consistent across the experimental set up (in the unlabelled the robust t-test is -6.69, and in the labelled the robust t-test is

[16] In this estimation we have considered 1000 random draws.

-5.59). In particular we notice that individuals do not have a different perception of the ticket (estimated standard deviation t-test -1.01) and of the walking (estimated standard deviation t-test 1.08) rather than in the unframed one in which the heterogeneity was higher (ticket standard deviation' t-test 1.98).

On the other hand the perception of parking probability completely changed from the unframed to the framed context, such that in the previous situation its coefficient was not significant (robust t-test -0.61) while it become significantly different from zero once we have clearly explained the aim of the experiment (robust t-test 3.34).

The differences and similarities across the two experimental approaches can be also explained by the noticeable differences in the calculus of the WTP coefficients and their confidence intervals.

In Table 10 we have reported the comparison between the WTPs calculated on the *technological* parking slot, in the labelled and unlabelled treatments, while in Table 11 we report the results of WTPs for the *non-technological* parking.

Table 10. Unlabelled vs Labelled: WTPs on technological parking.

	Unlabelled				**Labelled**		
				Delta Method			
	t_wt	**t_st**	**t_pp**		**t_wt**	**t_st**	**t_pp**
wtp	0.01652467	-0.02794104	0.03726243	**wtp**	-0.03195061	-0.03481016	0.04518129
ll	-0.02385602	-0.04262462	0.02496387	**ll**	-0.06052046	-0.04547331	0.03585214
ul	0.05690535	-0.01325746	0.04956099	**ul**	-0.00338075	-0.02414701	0.05451044
				Fieller model			
	t_wt	**t_st**	**t_pp**		**t_wt**	**t_st**	**t_pp**
wtp	0.01652467	-0.02794104	0.03726243	wtp	-0.03195061	-0.03481016	0.04518129
ll	-0.01735839	-0.04133939	0.02777346	ll	-0.05656555	-0.04434015	0.03788901
ul	0.05142579	-0.01627061	0.04882259	ul	-0.00825935	-0.02628604	0.0537082
				Krinsky&Robb (2000)			
	t_wt	**t_st**	**t_pp**		**t_wt**	**t_st**	**t_pp**
wtp	0.01652467	-0.02794104	0.03726243	**wtp**	-0.03195061	-0.03481016	0.04518129
ll	-0.02235106	-0.04370074	0.02634577	**ll**	-0.06141965	-0.04595261	0.03675471
ul	0.05611448	-0.01503265	0.05118293	**ul**	-0.00481879	-0.02517314	0.05549589

Analysing the WTP for the *technological* parking slot, we can state that in both the experiments individuals show a different perception of the parking probability.

For a reduction of the 20% of the risk/uncertainty of finding an available slot, individuals, in the unlabelled are willing to pay 0.74€, while in the labelled treatment they are willing to pay more, precisely 1.2€. Regarding the searching time, here the negative signs means that individuals are willing to pay less if there is an increase of one minutes of the walking time, that is be equal to 0.027€ in the unlabelled and 0.035€ in the labelled. We cannot compare how much individuals are willing to pay in order to reduce the walking time as in the unlabelled treatment this parameter is not significant (this explains why the estimated coefficient has a positive sign).

In the *non-technological* alternative, we can only estimate and observe the willingness to pay for an increase in the parking probability, as the other parameters are fixed by design and as consequence it is not possible to estimate them.

The results underline a higher WTP in the labelled treatment rather than in the unlabelled one. Indeed if we consider an increase of the 20% of the parking probability, individuals are willing to pay 1.2€ more in a framed context, while a quarter less if they do not know which is the aim of the experiment.

In conclusion we can state that individuals are willing to pay more in order to reduce the degree of risk and of uncertainty related to the parking alternative chosen.

Table 11. Unlabelled vs Labelled: WTPs on non-technological parking

	Unlabelled				**Labelled**		
			Delta Method				
	nt_wt	**nt_st**	**nt_pp**		**nt_wt**	**nt_st**	**nt_pp**
wtp	0	0	0.01664609	**wtp**	0	0	0.06094706
ll	0	0	-0.01249908	**ll**	0	0	0.02034251
ul	0	0	0.04579126	**ul**	0	0	0.1015516
			Fieller model				
	nt_wt	**nt_st**	**nt_pp**		**nt_wt**	**nt_st**	**nt_pp**
wtp	0	0	0.01664609	**wtp**	0	0	0.06094706
ll	0	0	-0.00706397	**ll**	0	0	0.03526826
ul	0	0	0.05110963	**ul**	0	0	0.11880222
			Krinsky&Robb (2000)				
	nt_wt	**nt_st**	**nt_pp**		**nt_wt**	**nt_st**	**nt_pp**
wtp	0	0	0.01664609	**wtp**	0	0	0.06094706
ll	0	0	0	**ll**	0	0	0.03526826
ul	0	0	0	**ul**	0	0	0.12

The estimated WTPs show a smooth change when moving from the unlabelled to the labelled treatment. Considering the WTPs related to the *technological* alternative in the labelled context individuals show a higher willingness to pay to increase the value of the parking probability and a lower willingness to pay connected to the searching time and walking time, than what they state in the unlabelled treatment. Similarly the WTP estimated for the parking probability in the *non-technological* alternative is higher in the labelled than in the unlabelled treatment.

We can conclude than that the frame effect played an important role in the individuals' decision and subsequently on the measure of the willingness to pay. Individuals seem to accept a higher cost in order to reduce the aura of risk and uncertainty when the aim of the experiment is clearly defined.

6. Conclusions

With this work we verified that laboratory experiments can be successfully used to analyse consumer behaviour in the transportation sector as an alternative to largely adopted revealed preference (RP) and stated preference (SP) approaches. Specifically, we investigated individual behaviour under risk and uncertainty with reference to case of parking activity which involves different degrees of risk and uncertainty that are usually well explored with laboratory experiments. We have run two treatments, unlabelled and labelled, which differ in the set of information given to the subjects and in the characterization of the setting.

The comparison between the two experimental approaches' results enforce our initial conjecture about individuals' behaviour toward risk and uncertainty. When moving from an unlabelled to a labelled context, the individual risk aversion does not drastically change. Furthermore, results are robust and consistent across the econometric method used. The only remarkable difference that we notice is the role of the framing effect in the perception of one attribute, the walking time, to which individuals seem to give the right weight only in the labelled treatment.

Another important issue is about the willingness to pay. Individuals showed a higher willingness to pay in order to reduce the risk or the uncertainty in finding an available slot once we have contextualized the experiment. The propensity to pay more in order to reduce the risk and the uncertainty related to the probability of finding or not finding an available slot – is confirmed by the results. Individuals show a higher willingness to pay in the uncertain treatments rather than in the risky choice-sets, remarking that their propensity toward risk is emphasised in the uncertain treatments.

Finally, the technological SMS tool plays an important role in the decision's process, as the guaranteed real-time support is, nowadays, an essential service that should be taken into account These results may be interesting for policy-makers that want to investigate on individual behaviour in order to predict the potential demand for new parking alternatives.

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