Institut de Recerca en Economia Aplicada Regional i Pública
Research Institute of Applied Economics

Document de Treball 2018/12 1/39 pág.
Working Paper 2018/12 1/39 pág.

"Misinformation and Misperception in the market for parking"

Albalate D & Gragera A

UB IREA
Institut de Recerca en Economia Aplicada | *Research Institute of Applied Economics*

Institut de Recerca en Economia Aplicada Regional i Pública
Research Institute of Applied Economics
Universitat de Barcelona
Av. Diagonal, 690 • 08034 Barcelona

WEBSITE: www.ub.edu/irea/ • CONTACT: irea@ub.edu

The Research Institute of Applied Economics (IREA) in Barcelona was founded in 2005, as a research institute in applied economics. Three consolidated research groups make up the institute: AQR, RISK and GiM, and a large number of members are involved in the Institute. IREA focuses on four priority lines of investigation: (i) the quantitative study of regional and urban economic activity and analysis of regional and local economic policies, (ii) study of public economic activity in markets, particularly in the fields of empirical evaluation of privatization, the regulation and competition in the markets of public services using state of industrial economy, (iii) risk analysis in finance and insurance, and (iv) the development of micro and macro econometrics applied for the analysis of economic activity, particularly for quantitative evaluation of public policies.

Abstract

This article studies the level of knowledge and information held by drivers in the car parking market. By drawing on a survey conducted with 576 garage customers in Barcelona, we provide new evidence on the market frictions produced by the misinformation and misperception of drivers searching for parking spaces. We identify the factors that aggravate/mitigate misinformation and misperception, and examine how they affect the functioning of the parking market, damaging market competition, undermining effective regulatory actions and exacerbating negative externalities. Our evidence shows that drivers' misperceptions increase cruising-for-parking and its consequences: congestion, pollution and accidents.

JEL classification: D82, D62, L15, R41, R48

Keywords: Parking, imperfect information, misperception, search cost, cruising.

Daniel Albalate: Universitat de Barcelona, Departament d'Estadística, Econometria i Economia Aplicada, Avda. Diagonal 690, 08034 (Barcelona), Telf: +34.93.4031131, E-mail: albalate@ub.edu

Albert Gragera: Technical University of Denmark, Produktionstorvet Building 426, 2800 Kgs. Lyngby

Acknowledgements

The authors wish to thank BSM for their collaboration and in the data gathering process. This study received support from the Spanish Government - project ECO2016-76866-R and from the Regional Government of Catalonia - project SGR2017-644. We are also thankful to Mireia Bundó for organizing and coordinating the data gathering process and to all assistants and interviewers that helped in collecting the necessary information.

1. Introduction

Cities today face increasing traffic-related problems. Their mobility patterns are still heavily dependent on cars, which results in severe congestion, pollution, noise and greenhouse gas (GHG) emissions that generate severe economic and environmental problems (OECD, 2007 and 2014). To tackle these issues many local authorities have adopted car parking regulations as a travel demand management (TDM) tool, but the intrinsic distortions of the parking market (i.e.: cruising-for-parking, garage localized market power, etc.), their true cost and the implications for land use demand, public space allocation, city economic vitality and the transmission of distortions to other (intermediate good) markets are not yet fully understood.

Cities have largely underrated the importance of parking and policy implementation in this area still lags behind the advances proposed by researchers to exploit the benefits of parking regulations to the full (Barter, 2015; Mingardo et al., 2015). Many cities continue to apply regulations that consider parking as an infrastructure that needs to satisfy on-site demand and, thus, avoid spillovers. Others have adopted more intense curbside parking regulations and, additionally, have opted to promote off-street supply. Yet, curbside fees have generally been set too low and policymakers have neglected the fact that curbside parking and garages form a bundle of what are essentially substitute services that consumers choose by imposing their interlinked demands (Kobus et al., 2014; Gragera and Albalate, 2016).

Parking research has shown the relevance of the welfare loss associated with market distortions (Inci et al., 2017) and proposes various market-oriented policy interventions to eliminate cruising-for-parking. These include optimal uniform, time-varying (performance-based) and differentiated fees, and the regulation of the price differential between garages and the curb (Inci, 2015). However, such interventions rely on the

assumption that parkers have perfect information about the spatial/temporal availability of parking options and their characteristics (prices and quality).

The information economics literature shows that, as long as information acquisition (search) is costly, it is rational for consumers not to be fully informed at the expense of their taking non-optimal decisions, such as visiting stores that they might otherwise not choose if they had availed themselves of more accurate information or giving up a search rapidly owing to its high costs with respect to its expected benefits. Indeed, the impact of information frictions on market outcomes is well recognized in a wide variety of sectors (Stigler, 1961; Stiglitz, 2000 and 2002).

Recent evidence on information frictions in the parking market has likewise been reported. Albalate and Gragera (2018) show that a lack of knowledge on the part of consumers results in their paying higher prices (even when there are many competitors in the market) and, furthermore, that garage operators take advantage of this by employing price obfuscation strategies.[1] They also suggest that active information acquisition (search) is no guarantee that drivers obtain better deals and that only experience seems to help them purchase at lower rates. The authors show that drivers do not have enough information to optimize their decisions and information frictions mean market outcomes deviate from a scenario of perfect competition.

Lee and Agdas (2017) report that errors in driver perceptions of parking costs are among the main factors encouraging drivers to cruise for on-street parking, revealing that even drivers who claim to be familiar with these costs are not in possession of complete or accurate information. This, combined with the information frictions

[1] That is, actions aimed at increasing the consumers' search costs so as to raise prices and avoid competition. In Barcelona's garage market, obfuscation is achieved by failing to display prices outside the garage or by devising complex pricing schemes to impede understanding of real costs. See Albalate and Gragera (2018) for more information about these strategies.

described above, undermines any potential benefits from the implementation of suggested policy interventions.

The parking industry recognizes the importance of information as revealed by its gradual application of innovative technologies to promote real-time communication of pricing and availability, smartphone applications and new guidance systems to better serve its customers. Indeed, there has been a boom of new business models including transaction brokers and information-gathering platforms (Parkopedia, SpotHero, Yellowbrick, Bestparking) that provide parking information-related services. The parking research literature has analyzed drivers' search strategies (Polak and Axhausen, 1990; Thomson and Richardson, 1998; Bonsall and Palmer, 2004; Karaliopoulos et al., 2017) and examined more broadly the theoretical or simulated advantages of different designs and applications of innovative technology to parking guidance systems (Caicedo, 2010; Wang and He, 2011; Kokolaki et al., 2012; Shin and Jun, 2014). However, parking research to date has evolved separately from the consumer behavior literature and has tended to overlook the importance of just how consumers acquire information and transform it into useful knowledge that determines their choices.

Most consumers learn about market characteristics when shopping, be it consciously or unconsciously (Jensen and Grunert, 2014); yet, it is not unusual for them to have very little actual knowledge, being particularly unaware of producers' pricing strategies (Estelami and Lehmann, 2001). Here, the literature differentiates between subjective knowledge (in our context what parkers think they know) and objective knowledge (the accuracy of what they know), and suggests that the two have a different impact on consumers' ability to optimize their purchase decisions (Raju et al., 1995). Both dimensions are mildly to moderately correlated (Flynn and Goldsmith, 1999; Alba and Hutchinson, 2000) and indicate that consumers do not correctly calibrate what they

really know, leaving room for intrinsic biases that impose imperfect information resulting in market demand misallocation. Repeated exposure to prices due to purchase frequency is shown to increase the likelihood of the elaboration and rehearsal of price information (Estelami and Lehmann, 2001). This affects both consumers' objective and subjective knowledge but is reported as being more strongly correlated with the latter (Park et al., 1994). The intuition is that extensive exposure does not necessarily lead to more accurate knowledge of market characteristics but does increase the amount of information gathered leading to greater knowledge self-assessment (Mägi and Julander, 2005).

In this paper, we study the level of subjective information – hereinafter, *misinformation* – and its accuracy – hereinafter, *misperception* – in the market for parking in Barcelona. By drawing on a survey conducted with 576 garage users, we are the first to assess the contribution of several potential determinants of these two dimensions of information for the parking market. This analysis is relevant both for local authorities and the parking industry, given that a lack of knowledge might cause demand misallocation, reduce the effectiveness of pricing strategies, impede effective price competition, aggravate current market distortions (cruising and garages' localized market power) and hinder the efficiency of any proposed policy intervention that does not first address parkers' information levels.

The rest of this paper is organized as follows. Section 2 describes the data and variables used and section 3 describes the methods employed. Results are presented in section 4. The paper ends with a brief summary and a policy discussion derived from our main results.

2. Data and variables

As described in Albalate and Gragera (2018), we use the data gathered in a survey conducted with 576 respondents among garage users at 61 different facilities located throughout Barcelona, but concentrated primarily in the city's central business district and surrounding areas (see Figure 1).[2] The survey was conducted in a single wave over two consecutive weeks in February 2016, during business hours. The survey was conducted to parkers that were either about to leave the garage facility after parking their vehicle or when they returned to pick it up (but always before payment). As users included both subscribers and occasional parkers, we opted to discard all observations from subscribers and all-day parkers and to focus our analysis on the market for occasional parking demand. This gave us a final sample of 534 valid responses.

To assess the determinants of the parkers' misinformation, the survey included questions about the drivers' level of information about the parking options available to them (other garages) and the fees associated with each option, both regulated curb (commercial and mixed-use spots) and off-street (other garages) parking.[3] The survey also included questions about the active information acquisition activities (search) users undertook, and other items that might passively influence the parkers' ability to obtain this information, in addition to their trip and demographic characteristics.

As we seek to measure misperception (i.e. the accuracy of the information they hold), we need to measure the parkers' ability to recall the prices to which they have

[2] Our empirical strategy draws on a sample that discarded responses from car park subscribers and all-day parkers.

[3] Commercial parking spots are regulated (paid) spaces in rotation where any driver can park without price discrimination. Mixed-use parking spaces are regulated (paid) spots where residents enjoy much cheaper prices than the rest of parkers. Mixed-use spaces are implemented in cities such as Amsterdam, London, Paris, Munich, Copenhagen, Stockholm and Chicago, among others. In Barcelona, mixed-use spaces are more expensive for non-residents than are commercial spaces.

been exposed by comparing the prices they recall with the garages' real prices.[4] Curbside parking information was provided by *Barcelona Serveis Municipals* (BSM), and garage fees and characteristics were extracted from a parking inventory conducted during the same period, as described in Albalate and Gragera (2017; 2018). From the inventory we also obtained data about the garage market structure in the area in which the respondents parked. Finally, information about specific features of the area (district and neighborhood) was obtained from the Barcelona City Council Statistics Department.

2.1 Dependent variables:

We consider three binary variables to study misinformation. They specifically measure parkers' subjective knowledge about alternative garage parking options and about both curbside and garage prices:

- *Info_Options:* takes a value of 1 if the respondent declares having current knowledge of the existence of other parking options available in the area where he/she parked, and 0 otherwise. This variable is considered in order to study the determinants of the level of knowledge of the set of market alternatives in the area of parking.
- *Info_CF:* takes a value of 1 if the respondent declares having current knowledge of the fee charged at the curb (both commercial and mixed-use spots) in the area surrounding the garage where he/she parked, and 0 otherwise. This variable is

[4] We use the term 'price recall' as employed in the consumer behavior literature. Thus, we assume that parkers have been exposed to some price information that they have processed and stored (either consciously or unconsciously) for later use. It is specifically this stored knowledge that we are interested in here and which we ask them to recall.

included as a dependent variable to study the determinants of knowledge of curbside prices that compete with garages.

- *Info_GF:* takes a value of 1 if the respondent declares having current knowledge of the garage's fee where he/she parked, and 0 otherwise. This variable is included as a dependent variable to study the determinants of knowledge of garage prices.

Additionally, we constructed two dependent variables to study misperception. These seek to measure the parkers' objective knowledge based on the accuracy with which they can recall the garage and curbside prices to which they have been exposed:

- *Garage_misp*: Garage fee misperception is measured by the difference between the garage fees recalled by the respondents and real garage fees (absolute rates, cents of euro) for the first hour of parking, as described in equation (2).

$$Garage\_Misp = |Recall\ GF_i - Real\ GF_i| \quad \textbf{(2)}$$

where GF_i is the fee charged by the garage in which respondent *i* parked.

- *Curb_misp:* Curbside fee misperception is measured by the difference between the curbside fees recalled by respondents and real fees (absolute rates, cents of euro) for the first hour of parking, as described in equation (1).

$$Curb\_Misp = |\ Recall\ CF_i - Real\ CF_i\ | \quad \textbf{(1)}$$

where CF_i is the weighted curbside fee charged in the area around the garage in which respondent *i* parked.

2.2. Covariates

To explain the level of misinformation and the degree of misperception, we consider a variety of possible determinants that might influence both consumers' subjective and

objective information dimensions by determining their ability to obtain and process parking market information which they can put to use. The categories of variables considered are the respondents' socioeconomic and demographic traits, covariates related to their actual parking behavior, trip characteristics, regressors associated with the garages' features and with certain characteristics of the area in which the garage is located.

- Sociodemographic covariates:
    - *Age*: This variable is a continuous variable with values equal to the respondents' ages. We also experiment with models in which we categorize this variable by age intervals. We considered three intervals to distinguish broad age groups. *Age18-30* takes a value of 1 if the respondent's age is between 18 and 30 and 0 otherwise; *Age65* takes a value of 1 if the respondent is older than 64, and 0 otherwise. The reference category is the group of respondents aged between 31 and 64.
    - *Gender:* This binary variable takes a value of 1 if the respondent is male and 0 if female. We include this variable to account for the fact that consumers of a specific gender might account for a larger volume of purchases and, thus, have higher knowledge levels.
    - *Vehicle price*: The price of the vehicle is computed as the actual selling price of the vehicle (in thousands of euro) reported as being driven by the respondent.[5] We use this continuous variable as an income proxy. We also created binary variables to identify three vehicle price groups for those below 10,000 euros

[5] As in Albalate and Gragera (2017), this is calculated using an internet price information aggregator (coches.com). As a robustness check, we also include a depreciated vehicle value taking into account the year of purchase as reported by the respondent.

(which works as a benchmark variable), for those between 10,000 and 20,000 (VP10K-20K) and, finally, a last group including vehicles priced over 20,000 euros (VP20K+). The inclusion of these binary variables improves the fit of the model with respect to the same model with the continuous variable.

- Parking behavior covariates
    - *Teletac*: This binary variable takes a value of 1 if the respondent uses an electronic payment method, teletac (Bip&Drive), to pay, and 0 otherwise. This variable is included to evaluate whether indirect involvement with the act of payment affects user information and perception of parking costs.
    - *Time*: This variable is constructed with the number of minutes the respondent left (or expects to leave) their vehicle in the garage. It is included to evaluate whether the length of time affects the information of customers that park for longer time periods, given that the hourly cost may have a greater weight in the total parking cost.
    - *Discount:* This binary variable takes a value of 1 if the respondent is entitled to some kind of discounted parking fee. It is included to assess whether receiving a discount affects information about the full or regular parking fee, due to higher levels of exposure and the greater demands made on information processing.
    - *Searchgarage*: This binary variable is included to account for the previous search activity of respondents looking for other garages before opting to park their vehicle in the present one. It takes a value of 1 if the respondent reported having looked for other garages, and 0 otherwise.
    - *Searchcurb*: This variable takes a value of 1 if the respondent reported having looked for an on-street parking space before parking at the present garage, and 0 otherwise.

- *Searchinfo*: This binary variable is included in models of misinformation (regarding both the availability of garages and parking prices) and price misperception. It takes a value of 1 when the respondent reports having searched for information before the trip, and 0 otherwise.

- Trip characteristics:
  - *Frequent*: This is a binary variable that takes a value of 1 if the respondent had used that garage on a previous occasion and 0 if they are a first time user. This variable is included to assess whether parkers have acquired information from previous purchasing experiences on past visits.
  - *Frequency*: This discrete variable takes the value of the number of times the respondent parks in a given garage each month. It is included to assess more precisely whether parkers acquire information due to greater exposure to the same market area.
  - *Trip purpose*: We include a set of binary variables related to the main purpose of the driver's trip in an attempt to capture differences in the garages' attributes which might condition the level of user knowledge and its accuracy.
    - Compulsory_Mobility: takes a value of 1 if the main purpose is related to work or educational activities, and 0 otherwise. This variable captures the effects of compulsory mobility.
    - Leisure: takes a value of 1 if the trip's main purpose is related to shopping or leisure activities, and 0 otherwise.
    - Personal: takes a value of 1 if the main purpose of the trip is to visit family or friends, or it is made for health care reasons, and 0 otherwise.

        - Administrative: takes a value of 1 if the main purpose is related to the need to complete some administrative obligation in or around the area, and 0 otherwise.

- Garage features
    - *Saliency*: This binary variable takes a value of 1 if the garage in which the respondent parked displays its prices outside the facility and they are visible. It seeks to measure exposure to price information, since by construction all respondents have been exposed to prices when surveyed. We would expect price saliency to be negatively correlated with misinformation and misperception as an obfuscation effect.
    - *Complexity*: This continuous variable takes the value of the number of string characters used in the price schedule displayed and charged to garage customers. This variable captures the degree of complexity of the prices garages charge their customers, i.e. requiring additional cognitive effort to transform information exposure into usable knowledge. We expect this variable to correlate positively with the degree of misinformation and misperception given that complexity is an obfuscation strategy.
    - *Facility*: A binary variable taking a value of 1 if the garage is located within a specific facility, typically a shopping mall, cultural venue or a hospital. As such, this gives drivers incentives to disregard a garage's attributes, given that the choice of parking might be highly correlated with the facility as trip end.
    - *Franchise*: A further binary variable taking a value of 1 if the garage belongs to a network of several same brand garages. This is included to capture the possibility of a user having better knowledge due to the fact they know the brand, thus facilitating attribute recognition and making knowledge gathered in

each of their facilities highly transferable (i.e. pricing strategies). This is expected to increase both objective and subjective knowledge and so affect misperception and misinformation.

- Area features:
  - *N_Garages:* This variable takes the value of the number of other garage signs visible from the entrance to the garage where the respondent has parked their vehicle. This variable is included to account for other nearby garage alternatives readily identifiable by in-situ inspection.
  - *Economic_Activity*: This continuous variable takes the value of the number of square meters (in thousands) of economic activities that lie within each respondent's relevant market area. It is included to capture an additional source of information acquisition since the greater an area's economic vitality the easier it is for drivers to undertake various errands during the same trip, thus increasing their passive exposure to parking information in the area.
  - *Districts*: We also include district fixed effects to account for certain unobservable area characteristics that might be correlated with the respondents' misinformation and misperception.

Table 1 shows the main descriptive statistics of the variables employed.

<<Insert Table 1. Descriptive Statistics of covariates >>

3. Methods

We specify two kinds of model depending on the nature of the dependent variable. To analyze misinformation in the parking market, we explore three different subjective knowledge dimensions that take into consideration whether parkers report having

knowledge of alternative garages available in the area (*Info_Options*), garage prices (*Info_GF*) and curbside prices (*Info_CF*). In this way we consider the binary nature of all the dependent variables and apply probabilistic models, including logistic regressions. To analyze misperception in this market, we explore two different objective knowledge dimensions that take into consideration the accuracy with which parkers can recall garage (*Garage_misp*) and curb (*Curb_misp*) prices, measured as the absolute difference between the prices they recall and the true prices. In this way we consider the continuous nature of most of the dependent variables. We apply ordinary least squares (OLS) and generalized linear regression models (GLM), the latter to verify the OLS results and to account for the fractional response nature of price deviation ratios.

Given the number of variables and possible specifications, our ultimate choice is based on the fit of the models.[6] Likewise, we take into account potential problems of multicollinearity from the inclusion of the covariates. Below, we present the models that offer the best fit for each dependent variable, even if this means our having to exclude some of the covariates at our disposal.

3.1 Misinformation models (logistic regression).

As all three dependent variables related to misinformation are binary in nature we implement logistic regression models. Both probit and logit models are types of GLMs

[6] Each model uses only those observations for which complete information was available for all the variables used. This means we eliminated those items for which respondents were unable/unwilling to report specific information.

that can be used to model the relationship between one or more numerical or categorical predictor variables and a categorical outcome such as a binary dependent variable.

In spite of the similarity in their respective outcomes, the models differ in terms of the link function they use. Logistic models use a logistic link function – known as the cumulative distribution function of the logistic distribution – which is more flexible than that employed by the probit models, that is, they use the inverse of the normal distribution as a link function – known as the cumulative distribution function of the standard normal distribution. Thus, the latter relies on the strict assumption of the normal distribution. An additional reason to opt for logistic regression models is to facilitate the interpretation of coefficients. Unlike probit models, the logistic regression allows us to back transform log-odds into odds ratios (by exponentiation of the coefficients) and so obtain a more intuitive way of interpreting effects. Thus, our results here are presented in odds ratios.

The logistic link function takes the following form:

$$logit\,(p) = \beta_0 + \beta_1 X_1 \beta_2 X_2 + \ldots + \beta_k X_k \qquad \textbf{(1)}$$

where p is the probability of the dependent variable taking a value of 1 (y=1) and X is a vector of explanatory variables or predictors. The logit transformation is defined as the logged odds:

$$\text{logit}\,(\text{p}) = \ln\left(\frac{\text{p}}{1-\text{p}}\right) = \beta_0 + \beta_1 \text{X}_1 \beta_2 \text{X}_2 + \beta_\text{k} \text{X}_\text{k} \qquad \textbf{(2)}$$

The logistic regression estimation chooses parameters that maximize the likelihood of observing the sample values. Note also that the logistic regression equation is readily expressed in terms of an odds ratio:

$$\frac{\text{p}}{1-\text{p}} = \exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k) \qquad \textbf{(3)}$$

and *logit(p)* can be back-transformed to p using the following formula:

$$p = \frac{1}{1+e^{-\text{logit(p)}}} = \frac{1}{1+e^{-(\beta_0+\beta_1 X_1+\beta_2 X_2+\beta_k X_k)}} \quad \textbf{(4)}$$

The following specifications for each regression model offer the best fit and, therefore, constitute our definitive models. Equation (5) refers to the customers' knowledge of alternative garages, equation (6) to their knowledge of the curbside fee and (7) to their knowledge of the fee charged by the garage in which they parked their vehicle.

$$logit(Info\_options_i) = \beta_0 + \beta_1 Age_i + \beta_2 Gender_i + \beta_3 \text{Frequent}_i + \beta_4 \text{Vehicle\_Price}_i + \beta_5 Discount_i + \beta_6 Teletac_i + \beta_7 SearchGarage_i + \beta_8 SearchInfo_i + \beta_9 \text{Leisure}_i + \beta_{10} \text{Personal}_i + \beta_{11} \text{Admin}_i + \beta_{12} \text{Facility}_i + \beta_{13} \text{Eco\_Activity}_i + \varepsilon_i \quad \textbf{(5)}$$

$$logit(Info\_CurbFee_i) = \delta_0 + \delta_1 Age1830_i + \delta_2 Age65 +_i + \delta_3 Gender_i + \delta_4 Frequent_i + \delta_5 \text{VP10K} - 20\text{K}_i + \delta_6 \text{VP20K} +_i + \delta_7 Discount_i + \delta_8 Teletac_i + \delta_9 Time_i + \delta_{10} SearchCurb_i + \delta_{11} SearchInfo_i + \delta_{12} Leisure_i + \delta_{13} Personal_i + \delta_{14} Admin_i + \delta_{15} Facility_i + \delta_{16} \text{N\_Garages}_i + \delta_{17} \text{Eco\_Activity}_i + \varepsilon_i \quad \textbf{(6)}$$

$$logit(Info\_GarageFee_i) = \lambda_0 + \lambda_1 Age1830_i + \lambda_2 \text{Age65}_i + \lambda_3 Gender_i + \lambda_4 \text{Frequent}_i + \lambda_5 Vehicle\_Price_i + \lambda_6 Discount_i + \lambda_7 Teletac_i + \lambda_8 Time_i + \lambda_9 SearchGarage_i + \lambda_{10} SearchInfo_i + \lambda_{11} \text{Leisure}_i + \lambda_{12} \text{Personal}_i + \lambda_{13} \text{Admin}_i + \lambda_{14} \text{Facility}_i + \lambda_{15} \text{Franchise}_i + \lambda_{16} \text{Complexity}_i + \lambda_{17} \text{Saliency}_i + \lambda_{18} \text{N\_Garages}_i + \lambda_{19} \text{Eco\_activity}_i + \varepsilon_i \quad \textbf{(7)}$$

3.2 Misperception models (OLS and GLM).

Misperception or information accuracy is measured as the difference between price recall and the true price. Here, therefore, we implement linear regression models with the OLS estimator which requires that the error distribution follows a normal distribution. An inspection of the error term indicates a fit that is closer to that of a negative binomial distribution. Hence, we applied a log-transformation of our dependent variable to obtain a distribution that was closer to the normal. This helps both

in applying the OLS estimator and in obtaining an interpretation of coefficients that is more straightforward than that of models accounting for Poisson and Negative binomial distributions. To verify the OLS results, we also conducted GLMs that allow for different error distributions and different relationships between the response variable and the independent variables. However, as the results are largely similar, here we opt to report and discuss just OLS results of the following models.[7]

$$log(Garage\_Misp_i) = \beta_0 + \beta_1 Age_i + \beta_2 Gender_i + \beta_3 \text{Frequency}_i + \beta_4 Vehicle\_Price_i + \beta_5 Teletac_i + \text{Time}_i + \beta_6 SearchGarage_i + \beta_7 SearchInfo_i + \beta_8 \text{Leisure}_i + \beta_9 \text{Personal}_i + \beta_{10} \text{Admin}_i + \beta_{11} \text{Facility}_i + \lambda_{15} \text{Franchise}_i + \lambda_{16} \text{Complexity}_i + \lambda_{17} \text{Saliency}_i + \beta_{12} \text{N\_Garage}_i + \beta_{13} \text{Eco\_Activity}_i + \varepsilon_i \quad \textbf{(8)}$$

$$log(Curb\_Misp_i) = \delta_0 + \delta_1 Age1830_i + \delta_2 Age65 +_i + \delta_3 Frequency_i + \delta_4 Vehicle\_Price_i + \delta_5 Teletac_i + \delta_6 Time_i + \delta_7 SearchCurb_i + \delta_8 SearchInfo_i + \delta_9 Leisure_i + \delta_{10} Personal_i + \delta_{11} Admin_i + \delta_{12} Eco\_Activity_i + \varepsilon_i \quad \textbf{(9)}$$

4. Results

4.1 Misinformation

Our descriptive statistics show that drivers have a significant lack of knowledge about their alternative parking options and about parking fees. Only 51% of parkers reported knowing of the existence of at least one other garage in the area and 65% of these reported not knowing their characteristics. The mean knowledge of available alternatives is higher among those that have previously used the specific garage facility

[7] GLMs applied in the verification of the OLS results do in fact account for the negative binomial distribution of the error term. Results available upon request.

than it is among first time users, providing preliminary evidence of the accumulation of knowledge of available alternatives through experience.

The respondents' lack of information about prices is even more striking: 74% reported not knowing the fees charged by the garage where they parked. This percentage is higher (and statistically different) for drivers unaware of alternative garages in the area (79%), but is not much better in the case of those with knowledge of alternatives (69%). In fact, 78% of the latter reported not knowing the fees charged by these other garages.

Similarly, the level of information on curbside fees was no better: 72% of respondents reported not knowing the hourly fee they would have to pay if parking in an on-street regulated space. This percentage fell to 64% – statistically lower – among those reporting have looked for a curbside space before entering the garage. Thus, drivers who search for on-street parking seem to be slightly better informed – or at least they believe themselves to be, as we shall argue below. It seems likely that this group look for curbside parking because they either know or think prices there are much cheaper than off-street parking, in addition, that is, to what is the usually greater preference for on-street parking.

Although descriptive statistics are useful for demonstrating that drivers would appear to know very little about garage availability and parking fees, a multivariate analysis enables us to assess the factors that aggravate/mitigate problems of misinformation. Table 2 shows our main results for the multivariate analysis of the determinants of the customers' level of information. The column illustrating Eq. (5) specifically refers to the model which explains customers' knowledge of other garages (at least another one) in the vicinity of the one in which they parked, while Eq. (6) and Eq. (7) show our results for the models explaining customers' level of information

about curbside and garage fees, respectively. As expected, because our survey specifically targeted garage users, the model for curbside fee knowledge performs worse than the other two. It is important, therefore, that we limit the results of this model to garage parkers and that we exercise caution when generalizing this result to all drivers. Yet, having said that, our descriptive statistics show that knowledge is not biased by the fact of our interviewing garage users, given that we find a surprisingly similar percentage of users claiming to know the curbside fee (28%) and those claiming to know the garage fee (26%).

<<Insert Table 2. Logistic regression on misinformation>>

In the multivariate models, the respondents' age offers mixed results, while their gender does not seem to be statistically significant in any of the three models. Age is positively correlated and statistically significant with knowledge of other garages in the area, but it does not account for knowledge of curbside fees. When distinguishing by age groups – which offers a better fit than including age as a continuous variable – we find that young drivers (aged between 18 and 30) are almost four times more likely to claim to know garage prices than the other age groups (OR=3.82).

Previous experience, based on the fact of having visited the garage on an earlier occasion (at least once), seems to be an important contributor to the users' level of information about garages (both fees and availability), but irrelevant with respect to curbside information. Repeat users are 3.6 times more likely to know at least another garage in the area and 5.6 times more likely to know the fees charged by the garage in which they parked. This result is consistent with previous evidence on the importance of the accumulation of knowledge through experience. On the other hand, the likelihood of these drivers knowing curbside prices is no different from that of the rest of respondents.

To evaluate the purpose of the users' trip, we use compulsory mobility for reasons of work or education as our reference category. The other trip purpose variables only offer significant effects in relation to misinformation about curbside fees. Model 2 shows that respondents reporting the chief purpose of their trip to be shopping or leisure are less likely (OR=0.49) to know the curbside fee than those whose main purpose was compulsory mobility. In the rest of the models, differences in trip purpose do not seem to explain differences in misinformation.

The price of the vehicle, included as a proxy for income, tells us that higher values seem to be statistically and positively correlated with knowledge of garage availability. Although it might be assumed that higher income parkers have lower incentives to acquire information due to the higher search costs, it also seems to be the case that they are likely to accumulate higher knowledge levels due to more parking purchases (exposure) and higher education levels (ability to process information), as discussed in the consumer behavior literature (Magi and Julander, 2005). In the models that categorize this variable by price interval, we find that with respect to drivers with the cheapest vehicles (up to 10,000 euros), those with vehicles valued between ten and twenty thousand euros, and those with vehicles valued higher than twenty thousand euros are about two times (OR=1.74 and 2.01, respectively) more likely to claim to have knowledge of at least another garage. This characteristic, however, does not seem to account for knowledge of fees, as evidenced by the estimates for Eq. (6) and Eq. (7). Nonetheless, having teletac seems to be a more important determinant of misinformation. Our results show that respondents with teletac are less likely to know about available garages in the area (OR=0.65) and even less likely to know the fees of the garage where they parked (OR=0.25). This finding is consistent with Soami (2001), who suggests that payment methods affect consumer spending behavior to the extent

that, in the case of routine purchases particularly, consumers tend to be less forward looking and to rely heavily on past experience. Teletac reduces consumer price awareness and, hence, their ability to evaluate past payments retrospectively. At the same time it acts as a constraint on the parking alternatives of those using this payment system, since it is typically given by employers to employees for work-related trips and serves, in part, as payment in kind (company car). To the best of our knowledge, this is the first empirical confirmation of such a relation in the transport sector.

The length of parking stay appears statistically significant at the 10% level and positively correlates with the knowledge of garage fees (OR= 1.01), while it does not seem relevant for knowledge of curbside fees.

Active information acquisition strategies, such as undertaking search activities, also offer interesting results. First, we find that drivers who reported having searched for other garages in the area are three times more likely to claim they know of the existence of other garages (OR=3.10). As such, active search seems to provide better knowledge about supply, but no statistically significant difference is found in relation to knowledge about garage fees. In contrast, respondents that searched for on-street parking are twice as likely to report knowing the curbside fee. Active pre-trip search only correlates with a considerable degree of misinformation about curbside fees, but it does not seem to have a statistically significant impact on garage fees, even though the odds ratio recorded is 1.5. This might be explained by the fact that such parkers are specifically interested in parking in their final destination and rule out the option of curbside parking, while the low degree of precision in the estimates might be explained by the small number of respondents who actually conducted a search before starting out on their trip (about 3%).

The characteristics of the garage also seem to influence the level of user information. When the garage is linked to a specific facility (a shopping mall, public building, theater or hospital), the respondents' level of information is significantly lower (OR=0.44) but they are nearly twice as likely to know the fee (OR= 1.81). These respondents do not differ with respect to other respondents in the case of information about curbside fees. This suggests that drivers parking in garages linked to specific facilities tend to have a limited knowledge of the market outside that particular facility (i.e. their final destination constrains their information acquisition needs), but better knowledge about the specific garage of the facility.

Respondents parking in garages that are franchises of garage networks are twice as likely (OR=2.24) to claim to know the garage fee than the rest of the respondents. Knowledge of the brand can facilitate the recognition of shared attributes and make the knowledge gathered in the franchise's facilities highly transferable, including the fee.

The variables related to obfuscation activities also provide important insights into the problem of misinformation. We find that fee complexity slightly aggravates misinformation on garage fees (OR= 0.98), while fee saliency increases parkers' subjective knowledge of prices (OR= 1.26). Finally, the fact of being entitled to some kind of discount means respondents are much more likely to claim they know the garage fee – note we estimate a massive odds ratio of 18.77. This increase in subjective knowledge presumably reflects greater exposure to price information and the higher cognitive requirements needed to process it. In short, the implication is that such users are much more likely to have consciously transformed this information into actual knowledge.

The economic activity of the area is significant – and positively related – to the knowledge of the curbside fee reported by the respondents (OR=1.17), which might be

explained by the enhanced possibilities of completing various errands within the same parking episode. The number of garages that can be observed from the entrance to the garage where the respondent parked is statistically significant at the 10% level but negatively related to knowledge of the garage fee (OR= 0.76). This could be attributable to the fact that search costs depend on the number of available firms one might purchase from; thus, in atomistic markets it is increasingly difficult for customers to gain such information (Stiglitz, 1989). The less informed consumers are, the more the market equilibrium will tend towards monopoly prices. This highlights an important relation between misinformation and market competition.

4.2 Misperception

Declaring that one knows or does not know the price to leave one's vehicle in a garage is no guarantee that this information is accurate. According to our survey, the average garage fee recalled for the first hour of parking was 2.91 €/h (Std. Dev. 0.96 €/h) compared to a true sample mean of 3.18 €/h (Std. Dev. 0.33 €/h). We found no statistical difference between those that reported knowing (2.84€/h) and those that reported not knowing the fee (2.95€/h). Both groups recalled lower fees than those actually charged.

We can simply measure fee misperception as the difference between the price recalled and the actual fee charged at the garage, which gives an average of -0.27 €/h (Std. Dev. 1.04€/h). This misperception is the same for those who undertook an active search for a garage, while the opposite was the case for those who had previously looked for a curbside spot. As Albalate and Gragera (2018) argue, the fact that the latter tried to park on the curbside initially is probably an indication that on-street parking was their preferred option and that these users are less likely to park in a garage (having less

prior experience). This is, in fact, confirmed by comparing means between both groups with a t-test.

When computing the average deviation of recalled fees from the real fee without taking into account whether they were higher or lower – in absolute values – we find that respondents deviate by an average of 0.78 €/h (Std. Dev. 0.70€/h) from the real price of the garage. Respect to the real curbside fee, this represents an average deviation of 25%.

Misperception also seems to exist in the case of curbside fees. The average price recall of respondents (all of whom claimed to know the fee) was 1.78 €/h (Std. Dev. 1.23€/h), which is much lower than the real average fee of 2.63 €/h (Std. Dev. 0.14€/h). Interestingly, the difference seems to be led by the group of drivers that actually searched for on-street spaces. These drivers recall much lower fees (0.96€/hour) than those who went directly to park in a garage (2.46 €/hour). This might mean that part of the cruising for parking can be explained by driver misperceptions, that is, the belief that on-street parking is much cheaper than it actually is. Additionally, it suggests that this misperception might partially explain the previously estimated curbside premium for garage demand (Gragera and Albalate, 2016), translating into a higher pricing distortion in the market that further exacerbates cruising. However, the average difference between recalled and real curbside prices is lower than that found for garages, namely -0.12 €/h (Std. Dev. 0.64€/h). If we take the average deviation in absolute terms, we find that respondents deviate from the real curbside fee by an average of 0.47 €/h (Std. Dev. 0.45 €/h). Respect to the real price, this represents an average deviation of 18%. Indeed, the correlation matrix between real and guessed fees indicates an important decoupling (See Table 3).

<<Insert Table 3. Correlation matrix between guessed and real fees>>

The descriptive statistics point to an important problem of misperception. Table 4 shows our main results for the multivariate analysis of the determinants of misperception, which enables us to identify the characteristics that aggravate/mitigate this problem. Estimates for Eq. (8) and Eq. (9) refer to the models assessing determinants of garage and curbside fee misperception, respectively.

<<Table 4. Least squares estimates on parking fee misperception>>

Age and gender variables do not seem to explain much of the parking fee misperception. Only in the case of respondents older than 64 do we find a positive correlation with misperception about curbside fees at the 5% significance level, possibly reflecting a decreasing ability to process price information with age. But no differences are found for garage fees.

Other individual features, specifically the frequency of monthly parking episodes in the area and using an electronic payment method (teletac), do seem to affect misperception. In the first case, repeated parking episodes in the area seem to help the driver have better information about both curbside and garage fees, suggesting that higher exposure to price information reduces misperception. In the second case, the use of teletac seems to worsen users' information accuracy in the case of garage fees, since the payment method offers fewer incentives and consciously reduces their price information processing. These results are consistent with our previous findings related to experience and the use of electronic payment devices in determining the level of knowledge of parking fees.

Search activities do not seem to improve information accuracy. Yet, garage characteristics do appear to be particularly relevant. We find evidence that obfuscation may promote misperception. On the one hand, price saliency is negatively correlated

with misperception, indicating that it is a good instrument for promoting more accurate price recall by drivers, that is by providing greater exposure to price information. On the other hand, complexity hampers drivers' ability to process price information and appears to be positively correlated with parkers' misperception. Thus, fee simplification and promoting price visibility seem to constitute two clear options for limiting misperception. Interestingly, respondents also seem to have more accurate information about the fees charged when they park in garages belonging to franchises or networks, probably due to pricing strategy similarities that increase the users' ability to recall prices more accurately, especially if they have parked on other occasions in garages belonging to that network.

Curbside fee misperception is also worse among users whose trip is undertaken for a purpose other than that of compulsory mobility (work and education), which seems to be the purpose that ensures parkers have a better knowledge of curbside fees due to higher information exposure (passive). However, this result is not maintained in the case of garage fees, which might require a more active information acquisition process compared to that associated with on-street parking.

Finally, the amount of economic/commercial activity in the immediate area is associated with poorer accuracy in the case of garage fees, but with greater accuracy in the case of curbside fees. Likewise, district fixed effects seem to matter for the level of information accuracy, as they capture unobservable area characteristics influencing consumers' ability to accurately recall prices through information exposure levels associated with the urban pattern, parking options and the distribution of economic activity.

This confirmation of the misperception of both curbside and garage fees is a matter of concern. However, the misperception regarding the relative price of garage parking

and on-street parking is a matter that goes beyond a simple information problem, given that it would appear to be an essential determinant of cruising for parking, which leads to aggravated inefficiencies. Indeed, this misperception of relative pricing can be constructed as a difference between recalled and real fees. On average, respondents estimate a difference between garage and curbside fees of 1.04 €/h, while in reality the average difference between the two is 0.56 €/h (the garage fee being higher than that charged at the curb). Surprisingly, 82% of respondents believe the difference to be greater than it actually is. Differences per individual are even more substantial when we focus our attention on those searching for on-street parking (1.94 €/h) and contrast this with those not looking for curbside spots (0.44 €/h). These results are of particular relevance for parkers that prefer on-street parking and who are aggravating the existing pricing distortion in the market. The estimated misperception of drivers who head straight to a garage facility is almost equivalent to the curbside premium (0.55€/h) reported by Gragera and Albalate (2016), which suggests that the previously assumed curbside preference might not derive from walking costs and its more ubiquitous distribution (Kobus et al., 2013) but from a price misperception.

Moreover, individuals searching for curbside spots seem to be more prone to believe that the curb is comparatively cheaper than it really is. If we assume that the misperception of curbside parkers is the same as that estimated for those that searched for curbside spots in our sample, this means that the pricing efficiency gap computed in this market does not lie between 0.45€–1.05€/h as it did for garage parkers (Gragera and Albalate, 2016), but between 1.84€–2.44€/h for curbside parkers with the true value lying somewhere in between. This is of considerable relevance as it implies the need for much greater increases in fees if cruising is to be eliminated without first addressing information issues. It indicates that misperception does not only affect consumer

decisions, but that it further aggravates cruising-for-parking and associated externalities, and makes any policy intervention through prices much more difficult from a political economy perspective.

5. Concluding remarks

In this study, we have examined garage parkers' misinformation and misperception as measures of consumers' subjective and objective knowledge regarding available parking options and prices, respectively. This is the first paper to assess the contribution of several potential determinants of these two dimensions of information in the parking market.

Our findings suggest that parkers have low levels of knowledge about available parking alternatives and their prices. Moreover, the level of accuracy of this information is poor and biased towards prioritizing curbside parking. This results in demand misallocation that further exacerbates cruising-for-parking and limits effective price competition in the market. Misinformation and misperception hinder the beneficial effects of any parking policy interventions if they are not appropriately addressed.

The level of exposure to market information seems to be a crucial determinant of parkers' knowledge. Among our findings, we highlight that previous experience helps users increase both their subjective and objective knowledge dimensions, that income positively correlates with knowledge of garage options, and that users engaged on compulsory mobility-related trips show comparatively better knowledge of curbside prices. The conducting of search activity does not seem to be especially effective in increasing knowledge other than reducing misinformation regarding the availability of garage options and misperception of curbside fees.

The specific characteristics of the selected garage and its surrounding area also play a role in determining the users' levels of information. Drivers using garages associated with a particular commercial activity are less well informed about available competing alternatives, which acts as a restriction on their choice set, but have more accurate information about prices as do those who opt to park at a franchise facility, a characteristic associated with greater exposure levels and knowledge transferability. The level of economic activity in the immediate area increases users' knowledge about the prices of both garages and on-street parking, which seems to be associated with the increased probability of users running a series of errands. Finally, price saliency increases knowledge accuracy and fee complexity reduces it, suggesting that garages' obfuscation strategies are indeed keeping parkers uninformed.

As information is a public good it requires public intervention if it is to be provided in optimal quantity and quality. In this respect, we advocate a greater role for the public sector in the establishment of provision standards, incentivizing up-to-date, private-sector information disclosure and active cooperation, while curbing data gathering costs and data maintenance in a neutral platform. From the perspective of promoting competition, it would also be advisable to make parking price saliency mandatory in order to prevent the negative market effects induced by garages' obfuscation strategies. Indeed, our evidence suggests that the greater the exposure to this information, the better informed consumers are likely to be.

References

Alba, J.W. & Hutchinson, J.W. (2000) Knowledge calibration: What consumers know and what they think they know. Journal of Consumer Research, 27(2), 123–156.

Albalate, D., Gragera, A. (2018) "Empirical evidence on imperfect information in the parking market", *Journal of Transport Economics and Policy*, 52(3), 322-342.

Albalate, D., Gragera, A. (2017) "The determinants of garage prices and their interaction with curbside regulation", *Transportation Research Part A: Policy and Practice*, 101, 86-97.

Barter, P. (2015) 'A parking policy typology for clearer thinking on parking reform', International Journal of Urban Sciences, 19, 136-156.

Bonsall, P., & Palmer, I. (2004). 'Modelling drivers' car parking behaviour using data from a travel choice simulator'. Transportation Research Part C, 12(5), 321-347.

Caicedo, F. (2010) 'Real-time parking information management to reduce search time, vehicle displacement and emissions', Transportation Research Part D, 15, 228–234.

Estelami, H. & Lehmann, D.R. (2001). The impact of research design on consumer price recall accuracy: An integrative review. Journal of the Academy of Marketing Science, 29(1), 36–49.

Flynn, L.R. & Goldsmith, R.E. (1999) A short, reliable measure of subjective knowledge. Journal of Business Research, 46(1), 57–66.

Gragera, A. & Albalate, D. (2016) The impact of curbside parking regulation on garage demand, Transport Policy, 47, 160-168.

Inci, E. (2015) A review of the economics of parking, Economics of Transportation, 4(1-2), 50-63.

Inci, E. & Lindsey, R. (2015). Garage and curbside parking competition with search congestion, Regional Science and Urban Economics, 54, 49-59

Inci, E.; van Ommeren, J. & Kobus, M. (2017) The External Cruising Costs of Parking, Journal of Economic Geography, 17(6), 1301–1323.

Jensen, B.B. & Grunert, K.G. (2014) Price knowledge during grocery shopping: What we learn and what we forget, Journal of Retailing, 90(3), 332-346.

Karaliopoulos, M.; Katsikopoulos, K. & Lambrinos, L. (2017) 'Bounded rationality can make parking search more efficient: The power of lexicographic heuristics', Transportations Research Part B, 101, 28-50.

Kobus, M.B.W.; Guitiérrez-i-Puigarnau, E.; Rietveld, P. & Van Ommeren, J.N. (2013) The on-street parking premium and car drivers' choice between street and garage parking, Regional Science and Urban Economics, 43, 395-403.

Kokolaki, E.; Karaliopoulos, M. & Stavrakakis, I. (2012) Opportunistically assisted parking service discovery: Now it helps, now it does not, Pervasive and Mobile Computing, 8(2), 210-227.

Lee, J., Agdas, D. (2017) Cruising for parking: New empirical evidence and influential factors on cruising time addition, *The Journal of Transport and Land Use* 10(1), 931-943.

Litman, T. (2006) Parking Management Best Practices, Planners Press.

Mägi, A.W. & Julander, C.R. (2005) Consumers' store-level knowledge: Why are some consumers more knowledgeable than others? Journal of Retailing, 84(4), 319-329.

Mingardo, G.; van Wee, B. & Rye, T. (2015) Urban parking policy in Europe: A conceptualization of past and possible future trends, Transportation Research Part A, 74, 268-281.

OECD (2007) 'Managing urban traffic congestion', European Conference of Ministers of Transport – Transport Research Centre, OECD Publishing.

OECD (2014) 'The Cost of Air Pollution: Health Impacts of Road Transport', OECD Publishing, DOI:10.1787/9789264210448-en.

Park, C.W.; Mothersbaugh, D.L. & Feick, L. (1994) Consumer Knowledge Assessment. Journal of Consumer Research, 21, 71–82.

Polak, J., & Axhausen, K. (1990). 'Parking search behaviour: A review of current research and future prospects'. University of Oxford, Transport Studies Unit.

Shin, J. & Jun, H. (2014) 'A study on smart parking guidance algorithm'. Transportation Research Part C, 44, 299–317.

Raju, P.S.; Lonial, S.C. & Mangold, W.G. (1995) Differential effects of subjective knowledge, objective knowledge, and usage experience on decision making: An exploratory investigation, Journal of Consumer Psychology, 4(2), 153- 180.

Shoup, D.C. (2005) The High Cost of Free Parking, Chicago: Planners Press.

Stigler, G.J. (1961) 'The economics of information', The Journal of Political Economy, 69(3), 213-225.

Stiglitz, J.E. (1989) 'Imperfect information in the product market', In Schamalensee, R. and Willing, R.D. (ed.) Handbook of Industrial Organization, Elsevier Science Publishers B.V.

Stiglitz, J.E. (2000) ‘The Contributions of the Economics of Information to Twentieth Century Economics’, Quarterly Journal of Economics, 115(4): 1441-1478.

Stiglitz, J.E. (2002) ‘Information and the change of paradigm in economics’, The American Economic Review, 92(3), 460-501.

Thompson, R.G. & Richardson, A.J. (1998) A Parking Search Model, Transportation Research Part A: Policy and Practice, 32(3), 159-170.

Wang. H. & He, W. (2011) ‘A reservation-based smart parking system’, in Proc. IEEE 5th International Workshop Cyber-Physics Network Systems INFOCOM, 690–695.

Tables and Figures

Table 1. Descriptive statistics of covariates employed in the empirical models.

Variable	Mean	Std.Err.	Min	Max
Age	47.36	12.87	20	91
Age18	0.08	0.26	0	1
Age65+	0.20	0.40	0	1
Gender	0.64	0.48	0	1
Frequent	0.77	0.41	0	1
Frequency	2.71	5.53	0	30
Vehicle_Price	18.81	12.53	7.49	107.88
VP10K-20K	0.39	0.49	0	1
VP20K+	0.43	0.49	0	1
Discount	0.016	0.13	0	1
Teletac	0.41	0.49	0	1
Time	169.31	97.36	5	600
Search_Garage	0.07	0.26	0	1
Search_Curb	0.17	0.38	0	1
Search_Info	0.04	0.19	0	1
Leisure	0.37	0.48	0	1
Personal	0.27	0.44	0	1
Admin	0.16	0.36	0	1
Facility	0.21	0.41	0	1
Franchise	0.72	0.44	0	1
Saliency	0.31	0.46	0	1
Complexity	38.65	27.99	12	172
Eco_activity	6.23	2.68	1.34	10.81
N_Garages	1.00	0.801	0	3

Table 2. Logistic regression results on misinformation.

	Info_Options Eq.(5) Odds Ratio	Info_CurbFee Eq.(6) Odds Ratio	Info_GarageFee Eq.(7) Odds Ratio
Sociodemographic			
Age	1.016 (0.008)**	-	-
Age 18-30	-	1.557(0.756)	3.819 (1.469)***
Age 65+	-	1.798 (0.714)	0.894 (0.344)
Gender	1.067 (0.228)	1.246 (0.378)	0.975 (0.256)
Frequent	3.625 (1.075)***	1.621 (0.617)	5.589 (2.654)***
Vehicle Price	1.018 (0.010)**	-	0.987 (0.009)
VP10K-20K	-	1.599 (0.674)	-
VP20K+	-	1.054 (0.452)	-
Discount	0.858 (0.566)	-	18.774 (15.84)***
Teletac	0.654 (0.165)*	0.812 (0.304)	0.245 (0.114) ***
Time	-	1.000 (0.000)	1.001 (0.000)*
Search activities			
Search_Garage	3.08 (1.359)**	-	1.892 (0.977)
Search_Curb		1.999 (0.729)*	-
Search_Info	1.335 (0.703)	0.138 (0.127)**	1.456 (0.974)
Trip purpose			
Leisure	1.168 (0.304)	0.487 (0.178)**	0.705 (0.238)
Personal	0.787 (0.299)	0.859 (0.402)	1.563 (0.676)
Administrative	0.836 (0.271)	0.831 (0.340)	0.530 (0.210)
Garage features			
Facility	0.439 (0.121)***	1.552 (0.656)	1.809 (0.621)*
Franchise	-	-	2.238 (0.849)**
Complexity	-	-	0.987 (0.006)**
Saliency	-	-	1.266 (0.466)
Area features			
N_Garages	-	0.958 (0.191)	0.757 (0.129)*
Economic_activity	1.066 (0.044)	1.178 (0.072)***	0.970 (0.057)
N. Observations	436	274	433
Log pseudolikelihood	-274.94	-165.46	-206.97
Wald chi2	41.9***	25.01**	68.28***
Pseudo R2	0.09	0.08	0.17

Note: In parenthesis standard errors robust to heteroscedasticity. ***significance at 1%, ** at 5% and * at 10%.

Table 3. Correlation matrix of guessed and real fees.

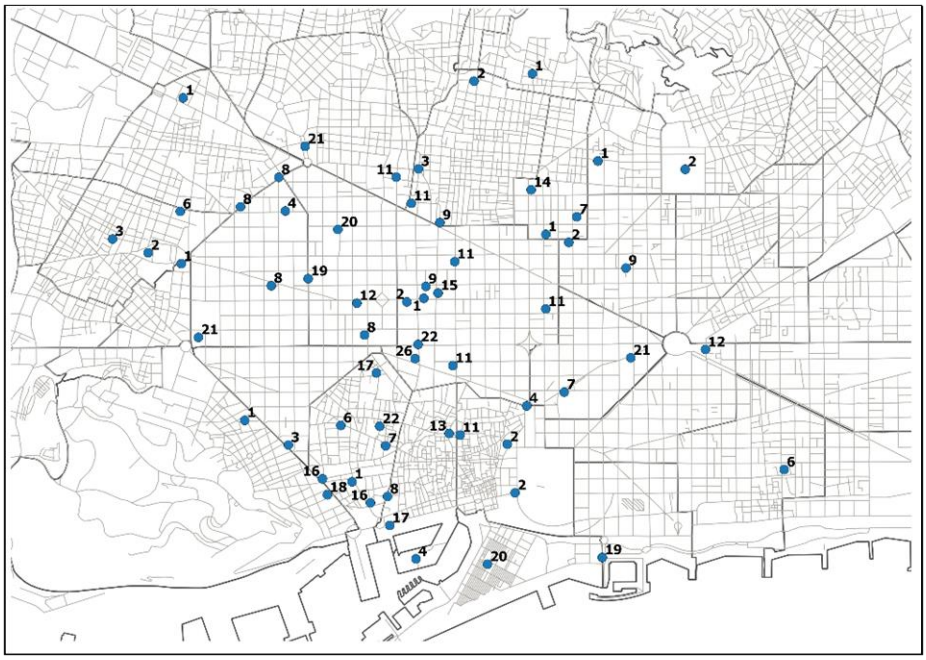
	Guessed GF	**Guessed CF**	**Real GF**	**Real CF**
Guessed GF	1	-0.1700	0.0235	0.0641
Guessed CF	-0.1700	1	0.0469	-0.1691
Real GF	0.0235	0.0469	1	-0.0735
Real CF	0.0641	-0.1691	-0.0735	1

Table 4. Least squares and logistic regression estimates on parking fee misperception.

	Log (Garage_Misp) Eq.(8) OLS	Log (Curb_Misp) Eq.(9) OLS
Sociodemographic		
Age	0.003 (0.005)	-
Age 18-30	-	-0.165 (0.419)
Age 65+	-	0.412 (0.229)**
Gender	0.087 (0.147)	-
Frequency	-0.039 (0.013)***	-0.636 (0.308)**
Vehicle Price	0.0005 (0.004)	-0.004 (0.006)
Teletac	1.035 (0.241)***	0.176 (0.279)
Time	-0.0002 (0.0003)	-0.0001(0.0004)
Search activities		
Search_Garage	0.164 (0.246)	-
Search_Curb	-	0.056 (0.348)
Search_Info	0.285 (0.353)	-
Trip purpose		
Leisure	-0.157 (0.176)	0.770 (0.231)***
Personal	-0.330 (0.223)	0.667 (0.375)*
Administrative	-0.064 (0.188)	0.593 (0.287)**
Garage features		
Facility	0.169 (0.228)	-
Franchise	-0.825 (0.248)***	-
Complexity	0.007 (0.003)**	-
Saliency	-0.403 (0.201)**	-
Area features		
N_Garages	0.146 (0.094)	-
Economic_activity	-0.080 (0.041)**	0.134 (0.074)*
District Fixed effects		
2	0.967 (0.268)***	-0.661 (0.437)
3	0.297 (0.454)	-1.043 (0.379)***
4	-0.221 (0.402)	-0.557 (0.530)
5	0.384 (0.237)*	-0.770 (0.429)*
6	0.002 (0.349)	-0.389 (0.373)
7	-1.867 (0.392)***	-
10	1.760 (0.267)***	-2.146 (0.545)***
N. Observations	303	89
F-Test	2.11***	2.25***
R2	0.15	0.37

Note: In parenthesis standard errors robust to heteroscedasticity. ***significance at 1%, ** at 5% and * at 10%.

Figure 1. Location of garage facilities and the total raw number of surveys conducted at each of them.



Source: Authors' own elaboration.

UB IREA
Institut de Recerca en Economia Aplicada Regional i Pública
Research Institute of Applied Economics
Universitat de Barcelona
Av. Diagonal, 690 • 08034 Barcelona

WEBSITE: www.ub.edu/irea/ • **CONTACT:** irea@ub.edu