RISK AND AMBIGUITY IN FIRST-PRICE SEALED-BID AUCTIONS: AN EXPERIMENT

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BACHELOR'S DEGREE IN ECONOMICS

CURSO 2021/2022

ABSTRACT

It analysed how risk and ambiguity attitudes influenced the decision-making in the context of first-price sealed-bid auctions. An experiment was conducted, eliciting risk and ambiguous attitudes and utilising the ex-ante information to compare the bids made. It used the degree of information in an object's valuation to measure bids in uncertain environments. In the existing literature, the general opinion of academics is that risk and ambiguity-averse individuals tend to bid more than other behaviour paths. The results of this experiment suggest that behaviour toward risk attitudes is not a significant factor in order to explain bids. However, behaviour toward ambiguous attitudes could explain bid differences in auctions with an uncertain degree of information on an object's valuation, being ambiguity-averse bidders prone to bid more.

KEY WORDS: Risk, ambiguity, auctions, behaviour.

JEL classification

C91;D44;D81;D83

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1. INTRODUCTION

This paper aims to analyse how subjects' decision-making behaviour is influenced by risk and ambiguity in an auction environment. Other objectives are to study how the degree of information regarding valuations impacts the bids made. Finally, we examine whether there are gender differences concerning the offers.

The academic motivation of the work is the approach to behavioural sciences in the field of economics. Specifically, how decision-making is affected has recently attracted scientific interest in different areas, including market analysis and marketing—the paper analyses, from another perspective, how attitudes towards risk and ambiguity affect the auction environment. Finally, the results are compared with the conclusions obtained in the existing literature.

The methodology used to carry out this paper has been an experimental methodology; for this reason, an experiment has been created. The starting point where the research began is the study by Salo & Weber (1995) on ambiguity in first-price sealed auctions. All subsequent literature has been drawn from this source. For the creation of the experiment, elements from Sabater & Georgantzis (2002), Baillon & Placido (2019) and Chen, Y., Katuščák, P., & Ozdenoren, E. (2007) have been used. Furthermore, an experimental approach allows the partial or total modification of the experiment, which gives flexibility when carrying out further research related to the subject studied here.

One characteristic that differentiates this experiment from the majority of studies is that the analysis of behaviour in most of the literature is carried out ex-post, i.e. a behavioural model is used. The aim is to observe whether this model adjusts to the bids made. In this experiment, an ex-ante analysis is carried out where the subjects' behaviour is collected beforehand and the bids made are analysed without assigning a specific model. In this way, it tries to compare the theoretical behaviour given the existing literature with the results obtained in the experiment.

Another relevant question is that the experiment is a computer-assisted survey that has been shared and conducted online. Hence, there is no direct interaction between the experimentalist and the subject. Another essential feature is that contrary to what is desirable[1] In experimental economics, this experiment is conducted using hypothetical payments. These issues can be a limitation when it comes to obtaining reliable results. However, it has been carried out this way because of the ease and the zero cost compared to programming an experiment and carrying it out in a laboratory where the experimental subjects are paid.

The use of auctions to measure subjects' behaviour is not new, and extensive literature has been carried out in this respect. For example, Vickrey (1961) already proposed a model of subjects' behaviour concerning their decision-making under risk using bids as a variable Cox, Robertson & Smith (1982) and Salo & Weber (1995) are later works of relevance in the field that also study this interaction.

Some of the conclusions reached by the authors about decision-making in risk and ambiguity environments applied to the auction environment are as follows. Firstly, it is observed that risk and ambiguity are significant in explaining differences in the bids made by the subjects. Specifically, risk-averse and ambiguity-averse subjects tend to bid higher than more seeking subjects. Gender differences have also been observed for bidding, showing that women tend to bid higher than men. Finally, it is also observed that an increase in bidding uncertainty leads to lower bids and a reduced efficiency concerning whether uncertainty is lower or absent.

A list of basic definitions in order to understand the paper for those unfamiliar with the subject of study are the following:

Definitions

First-price bid-sealed auctions:

First-price sealed bid auctions have two defining characteristics. The first is that they are sealed auctions, i.e. where the bidder places a bid without knowing what the other participants' bid has been, i.e. a blind bid is placed. The second characteristic, first-price auctions, Cox in the book "Handbook of Experimental Economics Results"

[1] Kahneman & Tversky (1979) discuss the possibility that hypothetical payments do not reveal the true preferences of subjects in the absence of incentives to do so.

(2008), defines them as "A market institution in which the highest bidder acquires ownership of the auctioned object and pays the price equal to the amount of the highest bid". (p.92).

Expected Value:

The expected value is the mean of all values of a random variable weighted by the probability of the occurrence of the values.

Decisions under Risk:

Decision-making in risky environments, as defined by Wakker in "Prospect Theory: For Risk and Ambiguity" (2010), is: "an objective probability P is given in S, assigning to each event E a probability P(E)." (p.45), where S is the probability space.

Decisions under Ambiguity:

Decision-making under ambiguity (uncertainty) differs from decision-making under risk in that the probability P is not an objective probability but is unknown.

The remaining part of the paper is organised as follows: Section 2 takes a bibliographical review where the conclusions obtained by the authors are used to realise the starting hypotheses. Section 3 deals with the experimental design, the possible limitations of the experiment and finally, the starting hypotheses are shown. Section 4 shows the analysis and treatment of the data using statistical and econometric methods. Finally, section 5 sets out the conclusions drawn. Two extra appendices are included. Appendix A displays the survey conducted for the experiment. Appendix B is a different version of the experiment adapted to real payments and designed without the limitations of the survey experiment.

2. LITERATURE REVIEW

This section reviews the existing literature on first-price sealed auctions, decision-making in environments of risk and ambiguity, how bids are related to the subjects' behaviour and the relationship between how gender differences may influence bids is presented.

The model developed by Vickrey (1961) considered agents as risk-neutral and expected utility maximising agents. Subsequently, Cox, Robertson & Smith (1982) and Cox, Smith & Walker (1988) argued that contrary to the results obtained by Vickrey, the prices obtained do not correspond to those obtained using a model of risk-neutral agents but that the bids were higher than expected. This result is consistent with models of bidding for risk-averse individuals. Other more recent papers such as Campo, Guerre, Perrigne and Vuong (2011), Gentry, Li & Lu (2015) and Li, Lu & Zhao (2015), among others, also consider that the models that best fit the behaviour are those where the subjects conform to averse-risk behaviour.

Harrison (1989), contrary to the authors above mentioned, considers bidding behaviour too heterogeneous to fit a single risk-averse model. He argues that the results obtained by Cox, Robertson and Smith (1982) do not present a sufficiently wide range for the payoffs obtained.

In measuring decisions under risk, it is common to use the test developed by Holt & Laury (2002). In their study, they conclude that about 2/3 of subjects exhibit risk-averse behaviour even at the low-payoff level for hypothetical payoffs. However, for real payments, risk-averse behaviour increases sharply with increasing payoff. For this experiment, It uses the lottery test created by Sabater-Grande & Georgantzis (2002) instead of the one developed by Holt and Laury. That is because it is a multidimensional test that allows us to capture the subjects' behaviour in a vector of 4 panels instead of the single choice made in the H-L test, which allows for a greater understanding of the subject's behaviour.

One of the experimental field's first approaches to the field of ambiguity is in Ellsberg (1961). He exposes his famous paradox, showing that most people prefer to bet on catching a ball where the composition of the ball is known rather than on one where it is not known. That is, most subjects present ambiguity aversion. This fact is

also supported in other recent works such as Etner, Jeleve & Tallon (2009) and Baillon & Placido (2019).

In the study of first-price sealed auctions, the degree of ambiguity has also been incorporated as a variable. Salo & Weber (1995) conducted one of the most relevant studies. They concluded that the overbidding observed in auctions concerning risk-neutral models could be attributed not only to risk-averse behaviour but also to ambiguity-averse behaviour, which causes the bidders to underestimate their chances of winning the auction. The overbidding relationship with ambiguity-averse subjects has also been found in the work of Bodoh-Creed (2012), among others.

Ambiguity and risk can be measured by the subjects' behaviour and the distribution of the value of the auctioned object to the other bidders. Assuming that each participant has an independent private value, one can compare treatments in which the distribution of bidders' valuations is known or unknown. In Aryal, Grundl, Kim & Zhu (2018), bidders face ambiguity about the valuation distribution. The results show that bidders tend to be more aggressive in the presence of ambiguity. Conversely, Chen, Katuščák & Ozdenoren (2007) reported that in their experiment, in the presence of ambiguity, bids tended to be lower, consistent with ambiguity loving in a model that allows for different ambiguity attitudes. It seems to contradict the theory that most subjects are ambiguity-averse. An explanation given by the authors is that "This, in turn, implies that a bidder is pessimistic in thinking that his valuations are more likely to be low, but optimistic in thinking that his opponent's valuations are also more likely to be low. Conversely, in an Ellsberg urn experiment, a love of ambiguity implies a preference for the unknown urn when choosing between known and unknown urns or a pessimism when information is missing".

Dyer, Kagel & Levin's (1989) paper on uncertainty about the number of bidders shows that when the number of bidders is unknown, bidding is higher than when the number of bidders is known. Levin and Ozdenoren (2004) found that in first-price auctions, bidders prefer the number of bidders to be revealed.

Whether bidders' valuations are common or private, it first needs to know what differences exist. When valuations are common, it is usually due to external information that may be of a certain quality known to all auction participants. In the case of private valuations, they are only known to each bidder individually. Common information can be combined with private valuations. Goeree & Offerman (2002) found that an increase

in uncertainty about common information leads to an increase in the winning bidder's profit, a decrease in the seller's profit, and a reduction in efficiency. They also found that an increase in the number of participants led firstly to a higher degree of efficiency and secondly to a reduction in the importance of common information in favour of private information.

The vast majority of the literature considers women more risk-averse than men[2]. Borghans et al. (2009) find that, in an initial range, women do not need more compensation for introducing ambiguity, but men do. At higher levels of ambiguity, women have the same marginal aversion to increased ambiguity as men. Regarding bidding behaviour, Chen, Katušcák & Ozdenoren (2007) find that women bid significantly more and win significantly less than men in the first-price auction.

Regarding the influence that hypothetical payoffs may have, Etchart-Vincent & l'Haridon (2011) find that real monetary incentives generate more risk aversion than hypothetical ones. Barreda et al. (2011) also find significant differences between real and hypothetical payments, but contrary to Etchart-Vincent & l'Haridon (2011), their results find that real payments make subjects less risk-averse. Finally, Blumenschein et al. (1997) conducted a second-price auction in which they compared bidding behaviour between two groups, one with hypothetical payments and one with real payments. The results show that the average willingness to pay was almost four times higher in the hypothetical auction than in the real auction.

In summary, it is observed that the subjects' decision-making behaviour concerning risk and ambiguity indicates that most subjects are risk-averse and ambiguity-averse. These factors influence the amounts bid, with risk-averse and ambiguity-averse subjects tending to overbid. The effect of uncertainty on valuations, whether private or public, also causes bidding to increase. Another variable that influences efficiency in bidding is the number of participants in the auction; the higher the number of bidders, the higher the degree of efficiency of the auction. Regarding gender, a large body of literature points out that women tend to be more risk-averse than men and tend to bid more than men. To conclude the literature review, the role of hypothetical payoffs, higher risk-taking tendencies on the one hand and higher realised bids, on the other hand, have been observed.

[2] Although most of the literature considers women to be more risk-averse, there are some studies that do not see such a direct relationship. For more information, see Schubert et. al. (1999).

3. METHODOLOGY

In order to carry out the study, the methodology used in Experimental Economics has been followed. To this end, after reviewing the literature, an experiment has been designed to answer the questions in this paper. The next step after the experimental design was to survey to collect the data used for the subsequent analysis.

This section first explains the limitations of the experimental design, then dissects the three sections of the experiment and analyses their meaning within the experiment. On the other hand, how the data collection process was carried out and the elaboration of the survey used in the experiment. Finally, the starting hypotheses are established.

Limitations

First of all, it must take into account that payments are hypothetical. In the previous literature review, several papers such as Etchart-Vincent & l'Haridon (2011), Blumenschein et al. (1997), and others show significant differences in experiments conducted with real and hypothetical payments. Kahneman, D., & Tversky, A. (1979) also comment on the lack of incentives to show genuine preferences in the context of hypothetical payments.

The experimental design has been developed so that the experiment can carry it out using a survey through google forms. The most important consequence is the necessary modifications the experimental setup has undergone to adapt to the online survey format. In addition, as the experiment is computer-assisted, if the experimental subject has any doubts, they cannot consult the experimentalist to help him, with the is a risk of not understanding some section of the experiment, distorting the resulting results and the subsequent analysis.

Since recruitment software is not available, the number of subjects who have taken part in the experiment and their personal characteristics cannot be controlled. For the proper conduct of the experiment, it is necessary to have a sample where the number of men and women is equal, as gender is one of the study variables, so that comparisons are made with the same number of observations. Experimental subjects with basic statistics knowledge are another requirement, so it is more likely to ensure

that participants understand what they are doing. Unfortunately, neither of these two elements could be controlled.

Appendix B presents an experimental design without the limitations previously presented. It is developed using software such as zTree, which allows experiments to be programmed in a controlled space where the subjects are assigned specific characteristics.

Experimental design

The experimental design has been designed in accordance with the questions that the study seeks to address as well as the limitations of the study itself.

The experiment comprises three sections, the first two of which aim to elicit observed behaviour of subjects ex-ante concerning their decision-making under risk and ambiguity.

The last section consists of three auctions, each differing from the other in various components, the most important being the degree of information given to the subjects to make the bid decision. Finally, respondents completed a socio-demographic questionnaire in which they were asked about their gender, age and level of education attained or in progress.

Section 1

The first section of the experiment elicits subjects' behaviour in risky decisions. For this purpose, the S-GG lottery test developed by Sabater-Grande & Georgantzis (2002) is used. This test is characterised by its two-dimensional nature, which allows, on the one hand, to capture the average value of the subjects when taking risky decisions, and on the other hand, their sensitivity to risk variations (the authors estimate that through these two variables, can capture around 85% of the observed behaviour). Furthermore, it exhibits this two-dimensional nature because it uses four panels of lotteries with different reference points that collect a more significant amount of information per observation; one of the advantages of using this lottery test is the adaptability to different decision theories such as Prospect Theory.

There are alternatives to this lottery test, the most common one developed by Holt & Laury (2002) HL. Although this test is widely used in academic papers as a measure of risk-averse decision making, unlike the S-GG test, HL has a unidimensional character as only one decision is made, from a safe option to a riskier one.

The S-GG test is composed of 4 panels of lotteries. In figure 1, the subject must choose his preferred option in each panel. All panels have a safe option corresponding to the parameter c = 1€. As the subject moves toward riskier options in each of the panels, the expected payoff increases linearly according to a t-coefficient, which also increases as one moves between panels:

Figure 1

Panels of lotteries to elicit attitudes towards risk

Panel 1										
Prob.	1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
€	1.00	1.10	1.30	1.50	1.70	2.10	2.70	3.60	5.40	10.90
Panel 2										
Prob.	1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
€	1.00	1.20	1.50	1.90	2.30	3.00	4.00	5.70	9.00	19.00
Panel 3										
Prob.	1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
€	1.00	1.70	5.50	3.60	5.00	7.00	10.00	15.00	25.00	55.00
Panel 4										
Prob.	1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
€	1.00	2.20	3.80	5.70	8.30	12.00	17.50	26.70	45.00	100.00

Source: Barreda et. al. (2020)

The calculation of the expected value of each election is realised according to the following expression:

Equation 1

EV of each panel

$$p \times X = c + t \times (1 - p)$$

Source: Barreda et. al. (2020)

Two variables are derived from the lottery tests: In equation 2, the average value of the subjects' choices. The second, in equation 3, is their sensitivity to variations towards riskier preferences. Equation 2 tells us what the average value of the choices of the four panels has been.

The calculation of this average value follows this expression:

Equation 2

Mean of the four panels

$$\bar{p} = \frac{\sum_{i=1}^{4} pi}{4}$$

Source: Barreda et. al. (2020)

The second variable is sensitivity to variations toward riskier options across panels, according to García-Gallego et al. (2012), defined as "A measure of a subject's sensitivity to variations in risk returns in the "counterintuitive" direction of lower risk-taking in the presence of higher risk returns".

The calculation of this value follows the expression:

Equation 3

Sensitivity toward riskier options across panels

$$\Delta\bar{p} = 0.6(p1 - p4) + 0.3(p2 - p3)$$

Source: Barreda et. al. (2020)

Section 2

The second task aims to capture subjects' behaviour in ambiguous decisions, i.e. where probabilities are unknown. To achieve this goal, It uses the design described in Baillon & Placido (2019) to elicit ambiguous choices based on a variation used by Ellsberg (1961).

The design consists of a choice by subjects between two alternatives, one of which has known probabilities of success while the other represents an unknown chance of success. The alternative to known probability is a panel of lotteries where different possibilities of obtaining a payoff are presented. These probabilities range from a value of 30% to 70%.

The second alternative, unknown probability, is represented by an urn of coloured balls. The urn contains balls of 4 colours (red, black, orange and green); this urn includes a total of 20 balls, of which five are known to be red, five are black, one is orange, one is green, and the remaining eight balls are of an unknown colour being either orange or green. The proportion of orange and green balls is unknown. One is extracted from these 20 balls, after which the following argument is presented: "if it is ORANGE or RED, you get X€; if, on the other hand, the ball is BLACK or GREEN, you get nothing".

Once the two alternatives are known, subjects are asked to choose when they would switch from the alternative of unknown probability to the option of known probability.

Figure 2, showing the original design used by Baillon & Placido, is also part of the Google forms survey. It has been included to facilitate the understanding of the task. However, there is a difference between Baillon and Placido's version and the one used in this experiment. The difference between the two designs is that in Baillon and Placido's experiment, subjects are asked to make multiple choices between the alternative of known and unknown probability. For example, the statement is the following: "Prefer between the ball-box option or a 30% chance of winning €10", then "Prefer between the ball-box option or a 32% chance of winning €10", and so on until the choice of "Prefer between the ball-box option or a 70% chance of winning €10" is reached. However, this experimental design requires only one choice to be made, the moment at which one would like to switch from one alternative to another.

Figure 2
Setup to elicit ambiguous attitudes.

Source: Baillon & Placido (2019)

It defines the probability equivalent or PE as the midpoint between the lowest possible preferred option and the highest possible preferred option. In this case, that point is Getting a payment X€ with a probability of 50%. Furthermore, It use PE as the point at which a subject qualifies as ambiguity neutral. Those subjects who choose the alternative of unknown probability above the PE qualify as ambiguity-loving, while those who choose the alternative of unknown probability below the PE to qualify as ambiguity-averse.

Section 3

The last part of the experiment corresponds to the performance of three first-price sealed auctions. The inspiration of this section of the experiment corresponds to the experiment conducted by Chen, Y., Katuščák, P., & Ozdenoren, E. (2007), specifically to the treatments comparing when subjects bid according to known vs unknown value distributions. This experiment also compares differences between prices achieved between first and second-price auctions in the presence of ambiguity. However, as it is not the focus of this analysis, this component has not been included.

The three auctions have common characteristics, the first of which is the type of information provided to the auction participants. In all three auctions, the information provided is public, and they do not receive private information. Regarding the number

of individuals participating in each auction, they form groups of six people that are randomly assigned at the beginning of each auction. As it is a first-price sealed-bid auction, all bidders bid without knowing the bids of the others, and the winner of an auction is the one who bids the highest.

However, there are differences between each auction. The first and most relevant difference is the degree of information subjects receive between treatments. In the first treatment, subjects are given complete information about the object valuation. The second treatment shows information about the value preferences in the form of a known probability distribution. Finally, the third treatment gives information about the valuation in the form of a random probability distribution, which is assimilated into a situation of uncertainty.

Another difference between treatments is the amounts the subjects have to bid and the EV in each auction. The only variable desired to influence the auctions is the information differences between each treatment. In this experiment, subjects bid in three successive auctions, so there was a risk that repeating values such as the amount to bid or the expected value would influence the individuals' decision-making when bidding.

In the first auction, with complete information, the subjects are assigned €50 to bid for an object valued at €40. Therefore, in the first treatment, the EV of the object to be auctioned is €40; this conclusion is evident as the object has that value.

In the second auction, the information displayed is a known probability distribution where the object has a 30% chance of reaching a value of €20 and a 70% chance of reaching a value of €60, while the maximum amount they are allowed to bid is €70. Therefore, in this auction, the EV is €48.

In the third auction, the information displayed is that of a random probability distribution with values from 0 to 100, so the value that the object can have spans this spectrum of probabilities. Since it is a random distribution, the EV corresponds to the average value of this distribution, in this case, €50.

Testable Hypothesis

The experiment is designed to test the truth or falsity of the following hypotheses:

H1: As uncertainty about common information increases, subjects move away from expected values

There is no consensus on whether increasing uncertainty about the valuation of the object increases bidding. Aryal et al. (2018) concluded that bidders tend to be more aggressive in the presence of ambiguity. Conversely, Chen, Katuščák & Ozdenoren (2007) reported that bids tend to be lower in the presence of ambiguity. Finally, Goeree and Offerman (2002) found that an increase in uncertainty about common information leads to an increase in the bidder's profit, a decrease in the seller's profit and a reduction in efficiency.

H2: Subjects averse to ambiguity and risk will tend to bid more

According to Salo & Weber (1995), the overbidding observed in auctions concerning risk-neutral models could be attributed not only to risk-averse behaviour but also to ambiguity-averse behaviour. Bodoh-Creed (2012) has also found a relationship between ambiguity-averse subjects and overbidding. For risk attitudes, the consensus is that the overbidding observed in the auctions is at least partly due to the subjects' risk-averse behaviour.

H3: Women will tend to bid more than men

This hypothesis is drawn from the conclusions obtained by most authors, where women tend to be more risk-averse than men. According to Chen, Katuščák & Ozdenoren (2007), women bid significantly more and win significantly less than men in the first-price auction.

Subject recruitment process and data collection

The recruitment process of the experimental subjects was carried out through social apps such as Instagram or WhatsApp. A link redirected the subjects to a Google Forms survey.

As mentioned in the Limitations subsection, neither the number of participating subjects nor their characteristics can be controlled. However, given the hypotheses put forward, one of the desirable characteristics when recruiting is to achieve a gender-balanced sample, i.e. the same number of men and women. In this case, the sample consists of 20 men and 27 women, so the number of women in the sample is slightly higher than the number of men.

It has also been mentioned that another desirable characteristic is that the subjects know statistics and calculus. Therefore, all three sections of the experiment contain elements related to probabilities. In addition, in the auction section, there is also a component of strategic behaviour so that a subject with knowledge of statistics can make decisions easily.

Appendix A shows the experimental design in Google Forms and the instructions for carrying out the experiment.

As it is not necessary to keep a record of the subjects who have carried out this experiment, as it is not intended to be repeated, at least not in this format, it have sought to limit the information required from the subjects as much as possible, in this case, they were only required to provide an email address, gender, age and level of studies. Name, surname, DNI/passport or other personal information was not required. In addition, the number of responses was limited to one response per email. All sections of the questionnaire were marked as mandatory for subjects to answer, and they could not progress through the questionnaire if they tried to skip any section.

Given that the experimental design used and analysed in this paper has been created to be carried out in survey format, it follows the same guidelines as those set out in the Experimental design subsection with some added aspects:

At the beginning of the survey, subjects are asked if they would like to be notified of their hypothetical payment.

The experiment starts in the first section. Then, are presented four questions, each corresponding to the lottery panels of Sabater-Grande & Georgantzis (2002), the order of the questions corresponds to the order of the panels shown in the image above, i.e. the amount in € increases as one moves between panels.

In the second section, Google Forms does not allow the option of choosing between two alternatives in the same question several times. For this reason, and in order not to saturate the subject by answering the same question with minor alterations, it was considered that instead of making the subject choose between each pair of options, it was decided to make the subject choose at which point he/she would switch between the option related to uncertainty concerning the option where the probabilities are known.

In the third section, the three auctions are presented as three answers to be answered. After explaining how the auctions work, the first case is presented, and they are asked how much they would be willing to bid. The process is repeated until the three auctions have been carried out.

Finally, they are asked questions about their gender, age and current maximum level of education.

4. RESULTS

After the experiment elaboration and data collection through the survey in Google forms, data processing and data analysis have been carried out. Both statistical and econometric techniques have been used for this analysis. This section is structured as follows: An initial subsection is dedicated to data treatment where the variables used for the subsequent analysis are indicated. After this, the data analysis is introduced, and the statistical analysis and the econometric models are presented.

Data

The variables obtained are as follows:

- Quantitative Variables:

1. Mean lotteries: Corresponds to the mean of the choices made by each subject in Section 1 of the experiment. It measures a subject's response to risky choices. It can range from 1 to 10. A subject will be more risk-averse when this value is close to the values below the set range.

2. Sensitivity: A measure of a subject's sensitivity to variations in the return to risk in the "counterintuitive" direction of lower risk-taking in the presence of higher returns to risk. The calculation corresponds to equation 3.

3. Ambiguity: This value is derived from the value that subjects indicate as their switching point between Option 1 and Option 2 in Section 2 of the experiment. It measures a subject's response to uncertain decisions. It can range in value from 30 to 70. A subject will be more averse to ambiguity when this value is close to values below the set range.

4. Auction Values: These correspond to the amount that subjects decided to bid in the three auctions conducted in Section 3 of the experiment.

5. Age

6. Differences: The difference between the EV and the actual bids made for each auction.

- Qualitative Variables:

1. Education: Measures the educational level of the subjects. Equals 1 if "Primary" 2 if "ESO" 3 if "GCE[3]" 4 if "VET[4]" 5 if "University".

2. Gender: Sex of subejcts. Equals 0 if "Male" 1 if "Female".

[3] GCE is the Spanish equivalent of Bachillerato.
[4] VET is the Spanish equivalent of Formación Profesional/FP.

3. Lower, Middle, Upper: These are dummy variables indicating whether a subject is below, above or at the EV for each treatment.

4. t: This is the variable that indicates each of the treatments. These treatments differ in the degree of information the subjects receive about the value distribution of the object. Equals 0 if "Complete information" 1 if "Partial information" and 2 if "No information".

Descriptive statistics

In this subsection, some descriptive statistics are shown. The socio-demographic characteristics of the sample are analysed, and primary data of the quantitative variables of interest such as mean and standard deviation are also presented. Finally, hypothesis tests prior to the econometric model are realised.

Concerning the socio-demographic variables, "Education", "Gender", and "Age" are reflected in the frequency distributions in Figures 2, 3 and 4. Figure 2 shows the educational level of the sample. Most of the subjects have completed or are completing higher education (University or VET), while only two subjects have not completed at least GCE. Figure 3 shows the number of males and females in the sample. The number of women is higher (27) than that of men (20), with women accounting for 57% of the sample. Finally, figure 4 shows the sample's distribution by age, the average age of 26.5 years, std. deviation is 9.76 years; the age range is between 16 and 56. Finally, the mode is 21.

Figure 3

Frequency distribution by level of education

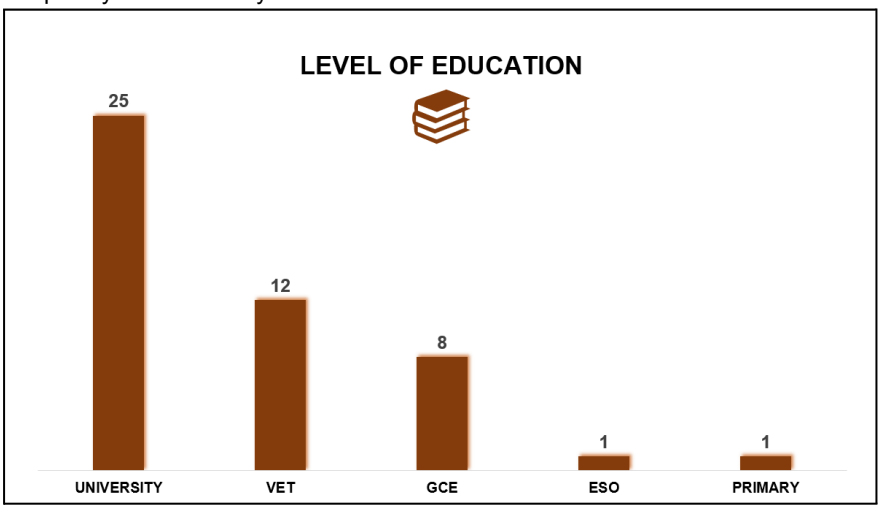


Figure 4

Gender distribution (Number and percentage)

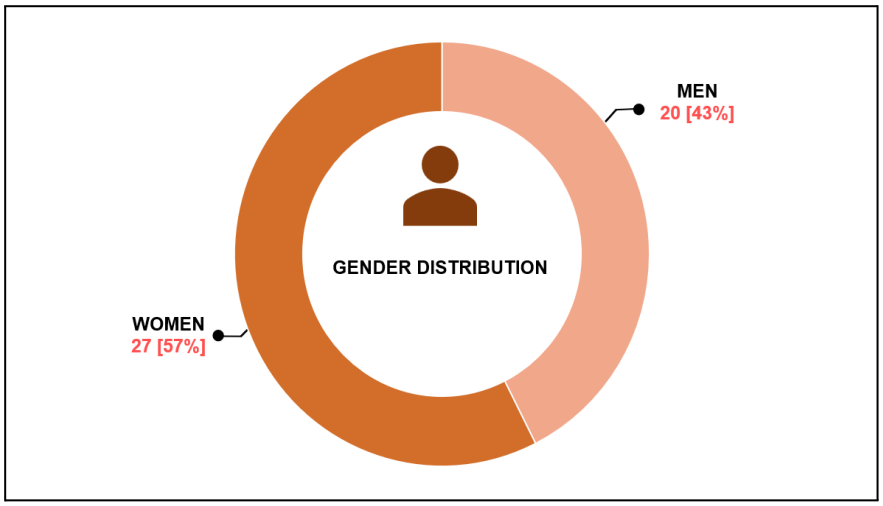
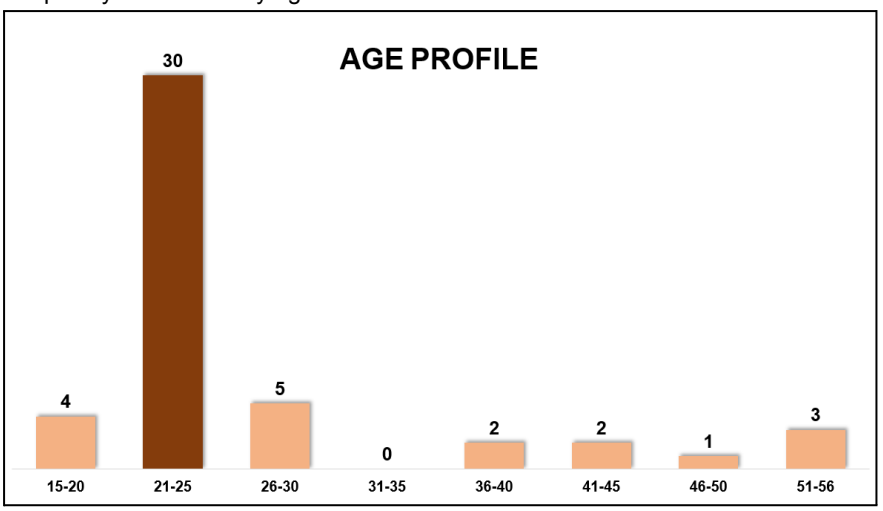


Figure 5

Frequency distribution by age



The mean and the standard deviation have been obtained for the quantitative variables. The results can be found in Table 1. In addition to presenting the results in general, they are also presented with respect to gender. Contrary to most existing literature, the results obtained reflect a priori that women are less risk-averse and ambiguity-averse than men. In order to verify that this behaviour is present in this particular sample, parametric tests have been carried out to verify these differences, which will be analysed later.

Table 1

Mean and Std.Error of quantitative variables

Descriptive Statistics						
	Mean			*Std. Error*		
	Overall	*Female*	*Male*	*Overall*	*Female*	*Male*
Mean Lotteries	*5.819*	*6.083*	*5.462*	*2.504*	*2.712*	*2.163*
Sensitivity	*-.068*	*-.222*	*.14*	*2.063*	*2.432*	*1.416*
Ambiguity	*48.978*	*51.037*	*46.2*	*11.208*	*12.251*	*8.994*
Differences	*-11.120*	*-11.839*	*-10.15*	*15.701*	*15.013*	*16.664*
Age	*26.489*	*26.296*	*26.75*	*9.769*	*9.450*	*10.258*

The variables "Auction Values" as "Differences", presented in tables 2 and 3, show the average value for both variables divided by treatments.

Table 2

Mean of Auction Values by t

Auction Values			
	Mean		
t	*Overall*	*Female*	*Male*
Total info	*36.62*	*35.78*	*37.75*
Partial info	*37.04*	*34.44*	*40.55*
No info	*30.98*	*32.26*	*29.25*

Table 3

Mean of Differences by t

Differences			
	Mean		
t	*Overall*	*Female*	*Male*
Total info	*-3.38*	*-4.22*	*-2.25*
Partial info	*-10.96*	*-13.56*	*-7.45*
No info	*--19.02*	*-17.74*	*-20.75*

"Auction Values", unlike the other quantitative variables (except "Differences"), are not fixed in each treatment; for each treatment/auction, the experimental subjects bid an amount that differs between treatments. As are variations in the EV and the value that subjects have to bid at each t, the coefficients of the regressions in t treatments are different.

A Chow test was performed to test the existence of structural changes between treatments to test the above statement. A value $F(2,132)= 14.88$ indicates that the null hypothesis that the coefficients of the regressions are equal for each t is rejected. Therefore, the hypothesis of structural changes in each treatment is corroborated.

It has also been tested whether the variable "Auction Values" follow a normal distribution. The Shapiro-Wilk test was used as the number of observations was less than 50. For each treatment indicates that the auction values for each t follow a normal distribution in the three treatments. Finally, it has been subjected to the t-student test to check if there are gender differences in the amounts bid in each treatment. No differences were found between men and women in the bids placed except for t=2, where, with a p-value= 0.0895, men tended to place higher bids than women.

Before checking whether there are significant differences between men and women in decision-making under risk and ambiguity, a normality hypothesis test was performed. The Shapiro-Wilk test indicates that "Ambiguity" and "Mean Lotteries" variables follow a normal distribution, with p-values (0.892 and 0.322) respectively. Therefore, as they follow a normal distribution, parametric tests are applied.

Regarding the "Ambiguity" variable, as it follows a normal distribution, the t-student test was used as a hypothesis test to analyse significant differences between men and women for decision-making in uncertain environments. The results suggest that men are more averse to ambiguity than women, p-value= 0.0742. However, no significant differences are observed between men and women in decision-making in risky environments. The t-student test for significance between the "Mean Lotteries" variable and gender shows a p-value= 0.2051.

In addition, it is analysed whether there are gender differences in whether subjects are below, at or above the EV for each treatment. The results show significant differences in the first treatment, where women tend more often to be at the EV than men and men tend to be above the EV. Both results are significant at 5%.

Table 4

Position respect to EV by gender and t

		Gender	
t		*Female*	*Male*
	Lower	*56%*	*50%*
1	***Middle***	***22%***	***0%***
	Upper	***22%***	***50%***
	Lower	*85%*	*75%*
2	*Middle*	*0%*	*5%*
	Upper	*15%*	*20%*
	Lower	*89%*	*80%*
3	*Middle*	*4%*	*10%*
	Upper	*7%*	*10%*

Finally, a Kruskal-Wallis test was performed to determine whether there are significant differences between the differences in EVs and the actual bid value for each treatment. In this way, it can determine whether the degree of information in the auction varies and influences the bids placed. With a χ^2= 24.83 and a p-value= 0.0001, it conclude that the degree of information given influences the bid value.

Econometric model

The estimation of the regressions has been carried out using the following variables:

- ***Dependent Variable:***

  Differences

- ***Independent Variables:***

  Mean lotteries *Education*
  Sensitivity *Age*
  Ambiguity *Gender*

"Differences" are used as the dependent variable and not "Auction Values". The reason is that the results obtained in each regression cannot be compared using "Auction Values", whereas the variable "Differences" allow the regressions for each treatment to be compared. It is because different values in each treatment for the "Auction Values" variable do not mean anything as there are different EVs in each treatment. On the other hand, the "Differences" variable indicates a trend depending on whether this value is higher or lower.

The results obtained in the regressions are shown in tables 5, 6 and 7. Table 5 shows the regression results for t=1, with a statistic F(6,40)=0.89. The joint significance statistic indicates that the coefficients are not jointly significant. Regarding the individual significance of the coefficients, the variables "Education" and "Age" are significant at 10% with p-values (0.096 and 0.084) respectively. The sign of the coefficients is negative, which means that the higher the level of education and the older the age, the less the subjects will tend to bid. The variables "Mean lotteries", "Sensitivity", "Ambiguity", and "Gender" show no statistical significance.

Table 5

Regression with complete information (t=1)

t = Complete information	*Obs=47*	*F(6,40)= 0.89*	*R-squared= 0.117*	*Adj R-squared= -0.015*
Differences	*Coef*	*Std. Err*	*t*	*P>|t|*
Constant	*17.578*	*11.759*	*1.49*	*0.143*
Mean lotteries	*.263*	*.594*	*0.44*	*0.660*
Sensitivity	*.551*	*.782*	*0.70*	*0.485*
Ambiguity	*-.030*	*.133*	*-0.23*	*0.819*
Education	***-2.858****	***1.676***	***-1.70***	***0.096***
Age	***-.285****	***.161***	***-1.77***	***0.084***
Gender	*-2.139*	*3.019*	*-0.71*	*0.483*

* Statistically significant at 10%

The second regression (Table 6) shows at F(6,40)= 2.34 supporting that the coefficients are jointly significant at 5%. Regarding individual significance, no statistical evidence has been found that the coefficients of the variables "Mean lotteries", "Sensitivity", and "Ambiguity" are significant. On the contrary, the sociodemographic variables "Education", "Age" and "Gender" are significant, the first two have a p-value=

0.01 while "Gender" is only significant at 10%, p-value= 0.086. As in regression with complete information, the sign of the coefficients is negative. Therefore the interpretation of the sign for the variables "Education" and "Age" is equivalent to the previous one. As for the variable "Gender", since it has a negative coefficient, it indicates that women tend to bid less than men in the presence of partial information.

Table 6

Regression with partial information (t=2)

t = Partial information	*Obs=47*	*F(6,40)= 2.34*	*R-squared= 0.260*	*Adj R-squared= 0.148*
Differences	*Coef*	*Std. Err*	*t*	*P>|t|*
Constant	*25.822*	*16.911*	*1.53*	*0.135*
Mean lotteries	*.969*	*.594*	*1.14*	*0.263*
Sensitivity	*1.325*	*.782*	*1.18*	*0.246*
Ambiguity	*.128*	*.192*	*0.67*	*0.507*
Education	***-6.480******	***2.411***	***-2.69***	***0.010***
Age	***-.628******	***.231***	***-2.71***	***0.010***
Gender	***-7.638****	***4.342***	***-1.76***	***0.086***

***Statistically significant at 1%

* Statistically significant at 10%

Regression 3 (Table 7), as in Table 5, does not show the joint significance of the estimators F(6,40)= 1.05, but differences are found for the other two regressions to the individual significance of the estimated coefficients. Only the variable "Ambiguity" is significant at 10%, p-value= 0.082. The negative coefficient shows that the more a subject dislikes ambiguity, the more he/she will tend to bid in larger quantities than an ambiguity-loving subject. The rest of the explanatory variables do not show statistical significance.

Table 7

Regression with no information (t=3)

t = No information	*Obs=47*	*F(6,40)= 1.05*	*R-squared=0.136*	*Adj R-squared= 0.006*
Differences	*Coef*	*Std. Err*	*t*	*P>|t|*
Constant	*22.523*	*20.557*	*1.10*	*0.280*
Mean lotteries	*-.423*	*1.038*	*-0.41*	*0.685*

Sensitivity	*.068*	*1.367*	*0.05*	*0.961*
Ambiguity	***-.415****	***.232***	***-1.78***	***0.082***
Education	*-3.056*	*2.930*	*-1.04*	*0.303*
Age	*-.322*	*.281*	*-1.14*	*0.260*
Gender	*4.924*	*5.278*	*0.93*	*0.356*

* Statistically significant at 10%

Once the descriptive analysis and the economic models have been carried out, the initial hypotheses can be tested.

Testing the baseline assumptions

H1: As uncertainty about common information increases, subjects move away from the expected values

The K-W test, which examined the relationship between the differences to t, indicates that when subjects bid with a higher degree of uncertainty about the value of the auctioned object, the differences with respect to the EV increase. Therefore this initial hypothesis is accepted.

H2: Ambiguity-averse and risk-averse subjects will tend to bid more

The analysis of the three regressions did not find sufficient statistical evidence to determine that the risk-averse behaviour of subjects influences their bidding decisions. Therefore, it cannot be determined. For ambiguity attitude, the regression results where no information on the object's value is provided indicate that subjects with a higher degree of aversion to ambiguity tend to bid more than those less averse to ambiguity. However, the degree of significance in the case of the variable "Ambiguity" is only 10% significant in the auction where there is no information. Therefore, although evidence supports the hypothesis, it cannot be stated categorically that ambiguity-averse subjects tend to bid more.

H3: Women will tend to bid more than men

A t-student test has been used in addition to the regressions to test this hypothesis. The results of the t-student test indicate significant differences in the bids

made between women and men, where men tend to bid more than women. Significant differences are also found in the second regression in the bids made between women and men, contrary to the starting hypothesis. In addition, a test of proportions has also been carried out to determine differences between the proportion of men and women bidding above, below or at the EV for each treatment. In this case, differences can be seen in the first treatment, with men having the highest proportion of bids above the EV, and therefore, given the evidence found, the hypothesis that women tend to bid more than men is rejected.

5. CONCLUSIONS

Over the last decades, behavioural science has made significant progress, although it remains a relatively unexplored field. The study of behavioural science has become very relevant at a general level and, more specifically, decision-making under risk and ambiguity in economic science. Given my particular interest in this branch of economic science, I decided to carry out an experiment where these elements could be analysed. The instrument used, auctions, specifically sealed auctions at the first price. The existing literature on these two concepts suggests that risk aversion and ambiguity-averse influence subjects' behaviour, causing them to bid higher. Uncertainty about an object's valuation also influences bids, reducing the efficiency of the auction and increasing the variability of observed bids. It is observed that gender differences are one of the factors affecting the bidding behaviour of subjects, with women tending to bid more than men.

By conducting this experiment, I have tried to analyse how subjects' bidding behaviour is influenced by risk and ambiguity as explanatory variables. In this way, the experiment was constructed in two ways, one by eliciting ex-ante behaviour in the face of risk and ambiguity, the other by using the information available on the valuations of the object as a way of simulating different situations of uncertainty. In addition, I also sought to analyse whether or not gender influences bidding.

The conclusions I have drawn from the experiment are as follows:

I. There is a relationship between the degree of information received by the subjects about the object's valuation to be auctioned and bidding behaviour. Specifically, as the uncertainty in the object's value

increases, the mean differences in the EV of each auction increase. This conclusion is consistent with the results of Goeree & Offerman (2002), where a decrease in efficiency was observed.

II. The behaviour of subjects in risky environments is not found to significantly influence their bidding behaviour regardless of the degree of information they receive about the object, which is inconsistent with the majority of the literature, where significant differences are found between risk-averse and non-risk-averse subjects.

III. In contrast to the previous finding, I did find significant results regarding how decision-making in ambiguous environments can affect bidding behaviour, particularly in auctions where the valuation of the object to be auctioned is uncertain. The way it affects bidding is consistent with Salo & Weber's (1995) paper, where ambiguity-averse subjects tend to bid more. The fact that there is an influence of ambiguity-averse subjects' behaviour in the uncertain auction environment would indicate that the tools used to test subjects' behaviour, such as in this case, Ellsberg's paradox, is consistent with more realistic environments where uncertainty is part of decision making. However, it is important to note that although statistical evidence has been found to support this, it is only significant at 10%.

IV. Gender influences decision-making when it comes to bidding. However, it has not been found that women bid more than their male counterparts, but rather the opposite. It is essential to highlight that contrary to what has been found in most academic articles, the resulting sample of women shows a lower aversion to ambiguity than men, and no differences were found for decision-making under risk. This anomaly may be due to the limitations that existed when conducting the experiment.

The limitations I have encountered in conducting the experiment are the following:

First of all, the experiment is conducted utilising a survey and not in a laboratory where the environment can be controlled. One of the consequences of doing an online

survey is that there exists a lack of control over which subjects conduct the experiment. In this particular case, the number of observations is forty-seven which is a small enough number that no solid conclusions can be drawn. Finally, the fact that the payments are hypothetical may mean that the preferences of the subjects are not what they would actually show with real payments.

This experiment can be used as a concept by applying modifications that allow for a deeper analysis. Among these modifications is the use of utility functions that model the behaviour of the sample instead of using the EV as a measurement, applying the prospect theory perspective. Other possible modifications are shown in appendix 2, which shows how I would have liked to conduct the experiment if the limitations mentioned above did not exist.

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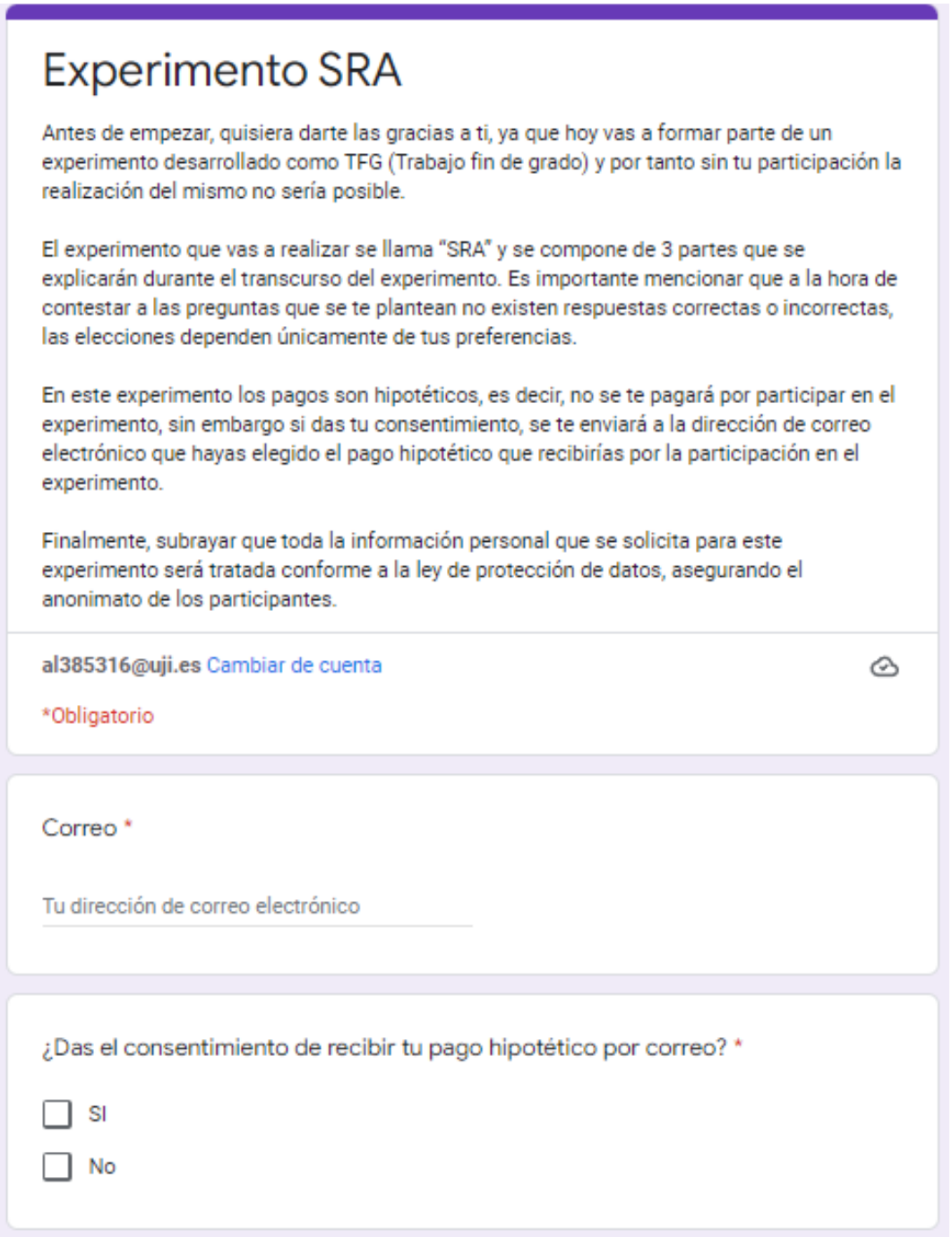
APPENDIX A

The questionnaire follows the structure explained in the Subject Recruitment and Data Collection Process subsection. As it is addressed to a Spanish audience, the questionnaire is in Spanish.



Experimento SRA

Antes de empezar, quisiera darte las gracias a ti, ya que hoy vas a formar parte de un experimento desarrollado como TFG (Trabajo fin de grado) y por tanto sin tu participación la realización del mismo no sería posible.

El experimento que vas a realizar se llama "SRA" y se compone de 3 partes que se explicarán durante el transcurso del experimento. Es importante mencionar que a la hora de contestar a las preguntas que se te plantean no existen respuestas correctas o incorrectas, las elecciones dependen únicamente de tus preferencias.

En este experimento los pagos son hipotéticos, es decir, no se te pagará por participar en el experimento, sin embargo si das tu consentimiento, se te enviará a la dirección de correo electrónico que hayas elegido el pago hipotético que recibirías por la participación en el experimento.

Finalmente, subrayar que toda la información personal que se solicita para este experimento será tratada conforme a la ley de protección de datos, asegurando el anonimato de los participantes.

al385316@uji.es Cambiar de cuenta

*Obligatorio

Correo *

Tu dirección de correo electrónico

¿Das el consentimiento de recibir tu pago hipotético por correo? *

SI

No

Parte 1

Para esta primera parte del experimento se te presentan 4 paneles de loterías y deberás que elegir una de las opciones. La elección viene determinada por dos variables, una de ellas es el dinero a ganar expresado en € y la otra es la probabilidad de obtener ese dinero.

En cada una de las 4 elecciones, solo podrás elegir una de las opciones presentadas. Debes responder a las 4 elecciones que se te presentan a continuación.

Como se te ha dicho anteriormente no existen respuestas correctas o incorrectas.

Elección 1. ¿Que prefieres? *

Dinero a ganar (€)	Probabilidad de éxito
1€	100%
1.10€	90%
1.30€	80%
1.50€	70%
1.70€	60%
2.10€	50%
2.70€	40%
3.60€	30%
5.40€	20%
10.90€	10%

- ◯ 1€ con 100% de probabilidades de ganar
- ◯ 1.10€ con 90% de probabilidades de ganar
- ◯ 1.30€ con 80% de probabilidades de ganar
- ◯ 1.50€ con 70% de probabilidades de ganar
- ◯ 1.70€ con 60% de probabilidades de ganar
- ◯ 2.10€ con 50% de probabilidades de ganar
- ◯ 2.70€ con 40% de probabilidades de ganar
- ◯ 3.60€ con 30% de probabilidades de ganar
- ◯ 5.40€ con 20% de probabilidades de ganar
- ◯ 10.90€ con 10% de probabilidades de ganar

Elección 2. ¿Que prefieres? *

Dinero a ganar (€)	Probabilidad de éxito
1€	100%
1.20€	90%
1.50€	80%
1.90€	70%
2.30€	60%
3.00€	50%
4.00€	40%
5.70€	30%
9.00€	20%
19.00€	10%

- ◯ 1€ con 100% de probabilidades de ganar
- ◯ 1.20€ con 90% de probabilidades de ganar
- ◯ 1.50€ con 80% de probabilidades de ganar
- ◯ 1.90€ con 70% de probabilidades de ganar
- ◯ 2.30€ con 60% de probabilidades de ganar
- ◯ 3.00€ con 50% de probabilidades de ganar
- ◯ 4.00€ con 40% de probabilidades de ganar
- ◯ 5.70€ con 30% de probabilidades de ganar
- ◯ 9.00€ con 20% de probabilidades de ganar
- ◯ 19.00€ con 10% de probabilidades de ganar

Elección 3. ¿Que prefieres? *

Dinero a ganar (€)	Probabilidad de éxito
1€	100%
1.70€	90%
2.50€	80%
3.60€	70%
5.00€	60%
7.00€	50%
10.00€	40%
15.00€	30%
25.00€	20%
55.00€	10%

- ◯ 1€ con 100% de probabilidades de ganar
- ◯ 1.70€ con 90% de probabilidades de ganar
- ◯ 2.50€ con 80% de probabilidades de ganar
- ◯ 3.60€ con 70% de probabilidades de ganar
- ◯ 5.00€ con 60% de probabilidades de ganar
- ◯ 7.00€ con 50% de probabilidades de ganar
- ◯ 10.00€ con 40% de probabilidades de ganar
- ◯ 15.00€ con 30% de probabilidades de ganar
- ◯ 25.00€ con 20% de probabilidades de ganar
- ◯ 55.00€ con 10% de probabilidades de ganar

Elección 4. ¿Que prefieres? *

Dinero a ganar (€)	Probabilidad de éxito
1€	100%
2.20€	90%
3.80€	80%
5.70€	70%
8.30€	60%
12.00€	50%
17.50€	40%
26.70€	30%
45.00€	20%
100.00€	10%

- ◯ 1€ con 100% de probabilidades de ganar
- ◯ 2.20€ con 90% de probabilidades de ganar
- ◯ 3.80€ con 80% de probabilidades de ganar
- ◯ 5.70€ con 70% de probabilidades de ganar
- ◯ 8.30€ con 60% de probabilidades de ganar
- ◯ 12.00€ con 50% de probabilidades de ganar
- ◯ 17.50€ con 40% de probabilidades de ganar
- ◯ 26.70€ con 30% de probabilidades de ganar
- ◯ 45.00€ con 20% de probabilidades de ganar
- ◯ 100.00€ con 10% de probabilidades de ganar

Parte 2

Esta segunda parte del experimento también se trata de un ejercicio de elección, en este caso se te muestran 2 opciones, una de ellas es una urna con bolas de colores y la otra una probabilidad.

OPCIÓN 1:

La urna contiene 20 bolas de 4 colores distintos: NEGRO, ROJO, NARANJA Y VERDE. Se conoce que en la urna hay 5 bolas de color NEGRO, 5 bolas de color ROJO, 1 bola de color NARANJA, 1 bola de color VERDE y 8 bolas de las que no se conoce el color pero que puede ser de color NARANJA o VERDE.

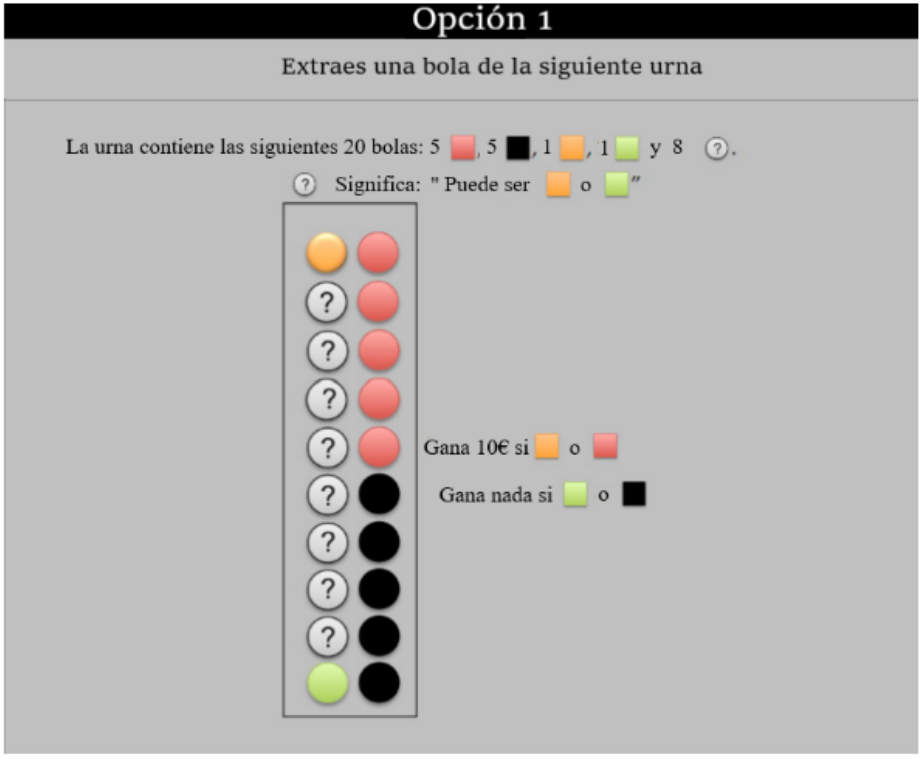
De esta urna se extrae una bola y si es de color NARANJA o ROJO obtienes 10€, si por el contrario la bola es de color NEGRO o VERDE no obtienes nada.

OPCIÓN 2:

Se muestran probabilidades de obtener un pago de 10€, es decir, indican cúan probable es obtener el pago de 10€ en caso de elegir la opción 2.

Lo que se te pide es que dentro de las posibilidades que se te presentan, elijas el punto en el que cambiarías de la opción 1 a la opción 2, tan solo podrás elegir una opción e indicará que para cualquier probabilidad inferior a la que marques, prefieres la OPCIÓN 1 y para esa probabilidad o superior prefieres la OPCIÓN 2.

OPCIÓN 1



OPCIÓN 2

Opción 2 Obtienes 10€ con p% (nada con el resto)
30%
32%
34%
36%
38%
40%
42%
44%
46%
48%
50%
52%
54%
56%
58%
60%
62%
64%
66%
68%
70%

¿A partir de que % cambiarias de la OPCIÓN 1 a la OPCIÓN 2? *

- ◯ 30%
- ◯ 32%
- ◯ 34%
- ◯ 36%
- ◯ 38%
- ◯ 40%
- ◯ 42%
- ◯ 44%
- ◯ 46%
- ◯ 48%
- ◯ 50%
- ◯ 52%
- ◯ 54%
- ◯ 56%
- ◯ 58%
- ◯ 60%
- ◯ 62%
- ◯ 64%
- ◯ 66%
- ◯ 68%
- ◯ 70%

Parte 3

La última parte del experimento consiste en 3 subastas en las que participarás contra otras 5 personas, por tanto en la subasta participan un total de 6 personas. La asignación de los participantes es aleatoria, no se sigue ningún criterio a la hora de elegir los participantes de cada grupo.

Para cada subasta realizada, aparecerá un valor que corresponde con la cantidad por la que un participante de la subasta puede pujar, este valor es público e igual para todos los participantes. Por tanto todos tienen la misma cantidad de información.

Las subastas se diferencian entre si en el grado de información que vas a recibir en relación al valor del objeto sobre el que se puja, es decir, que en una subasta puedes conocer exactamente el valor del objeto y en otra conocer el valor del objeto pero solo de forma parcial o no conocer en absoluto su valor.

Las ganancias hipotéticas correspondientes a las subastas, resultan de la diferencia entre el valor pagado y el valor del objeto, es decir, la resta entre lo que se puja y lo que efectivamente vale el objeto. Estas ganancias solo serían para el ganador de la puja mientras que el resto no obtienen nada.

El ganador de una puja se determina mediante las pujas realizadas por todos los participantes que conforman el grupo, es decir, las 5 personas que a parte de ti participan en la subasta. Entre las 6 pujas que se realizan (1 por participante), aquella que sea de un valor mayor y por tanto haya realizado la puja más alta, será la ganadora, y por tanto la persona que haya realizado dicha puja será la ganadora de esa subasta.

En el caso de que el ganador de una puja, pujase por un valor superior al valor del objeto, se le descontará la diferencia de otras pujas ganadas en otras subastas, si al final la diferencia resultante entre las 3 subastas es negativa, no se descontará nada del pago hipotético que recibirían por esta parte del experimento.

Para esta primera subasta, supón que tanto tu como el resto de participantes de la subasta poseéis un total de 50€ para poder pujar por el objeto que se subasta.

Respecto al valor del objeto, supón que un tasador profesional ha medido el valor del objeto en 40€, este valor es conocido para los 6 participantes de la subasta, además el tasador esta completamente seguro que el valor del objeto se corresponde al 100% con su tasación.

Subasta 1

Para esta primera subasta, supón que tanto tu como el resto de participantes de la subasta poseéis un total de 50€ para poder pujar por el objeto que se subasta.

Respecto al valor del objeto, supón que un tasador profesional ha medido el valor del objeto en 40€, este valor es conocido para los 6 participantes de la subasta, además el tasador esta completamente seguro que el valor del objeto se corresponde al 100% con su tasación.

¿Cuanto estás dispuesto a pujar por el objeto? (Número) *

Tu respuesta

Subasta 2

Para esta segunda subasta, supón que tanto tu como el resto de participantes de la subasta poseéis un total de 70€ para poder pujar por el objeto que se subasta.

Respecto al valor del objeto, supón que un tasador profesional ha estado examinando el valor del objeto y cree que el objeto puede ser una figura falsificada pero no está seguro, en caso de que el objeto sea una réplica falsificada, le adjudica un valor de 20€, mientras que si es verdadero dice que su valor es de 60€.

El tasador afirma que existe una posibilidad del 30% de que el objeto sea falsificado y por tanto un 70% de que sea el objeto original.

¿Cuanto estás dispuesto a pujar por el objeto? (Número) *

Tu respuesta

Subasta 3

Para esta primera subasta, supón que tanto tu como el resto de participantes de la subasta poseéis un total de 80€ para poder pujar por el objeto que se subasta.

Respecto al valor del objeto, supón que estamos ante una subasta a ciegas, es decir no se conoce cuál es el objeto a subastar y por tanto no existe la posibilidad de que un tasador le asigne un valor al objeto. La única información que ofrece el vendedor es un intervalo entre el cuál puede oscilar el valor del objeto, este intervalo indica que 0€ es el valor mínimo que puede recoger el objeto mientras que su valor máximo puede alcanzar los 100€, sin embargo puede recoger valores que estén entre medias de estos dos.

La distribución de probabilidad que sigue este intervalo es la misma en cada punto, es decir es igual de probable que el objeto valga 0, 17, 35 o cualquier otro valor hasta llegar a 100.

¿Cuanto estás dispuesto a pujar por el objeto? (Número) *

Tu respuesta

Cuestionario

Para finalizar se realiza un pequeño cuestionario.

Edad *

Tu respuesta

Sexo *

- ◯ Hombre
- ◯ Mujer
- ◯ Prefiero no decirlo
- ◯ Otro

Nivel de estudios máximo alcanzado o en curso *

- ◯ Educación Primaria
- ◯ Educación Secundaria Obligatoria
- ◯ Bachillerato
- ◯ Formación Profesional
- ◯ Universidad

Atrás | Enviar | Borrar formulario

APPENDIX B

The first two sections of the experiment remain unchanged from the version used in this paper and are therefore omitted. The auction section is changed to include private rather than public valuations and the possibility of purchasing information about the object's value. The number of treatments is reduced from three to two. However, each treatment consists of thirty rounds instead of a single round.

Section 3

The last part of the experiment consists of a set of first-price sealed envelope auctions with the following characteristics:

- The number of buyers N in each auction is known.
- Each bidder has a private value that he knows = Vi.
- This private value can follow two distributions, one of high value and one of low value, in either case following an interval (0,100).
- Bidders can also receive information at the cost of a higher or lower degree of accuracy, depending on the cost they are willing to assume.

High-value distributions follow the following structure:

75% chance of obtaining a private value that falls between the values (51,100).

25% probability of obtaining a private value that lies between the values (0.50).

Low-value distributions follow the following structure:

25% chance of obtaining a private value between the values (51,100).

75% probability of obtaining a private value that lies between the values (0.50).

This private value constitutes the balance bidders have to bid in each auction round and buy information on the object's value.

The cost information that bidders receive tells them the possible value of the object being auctioned, and the reliability of the presented source is determined by the probability that the object has a specific value. Therefore, higher-cost information sources are more specific in the probabilities that an object has a certain value than lower-cost information sources.

There is a possibility that a bidder would not want to buy any information at all, thus placing a bid with no reference to the object's value.

There are two treatments for this experiment. Each treatment has 30 rounds, in which the experimental subjects are divided into groups of N subjects. There is a fixed-equal time between rounds and treatments to place a bid.

In the first treatment, subjects are informed that each auction participant is randomly and independently assigned a high or low-value distribution according to a known and equal probability for all bidders. Subjects are informed of this at the start of each round. Each bidder's value is assigned randomly and independently of the others; each subject will also be informed of its private value but will not be told which distribution it has been assigned.

Regarding the information they receive, at the beginning of each round, bidders are asked to choose how much they are willing to pay for information on the object's value being auctioned from an interval (0,v). The cost of the information is directly proportional to the accuracy of the information provided; an increase in quality follows a linear function reaching the maximum point where the amount v is paid. For accurate information on the object's value auctioned, probabilities measure the degree of accuracy of the information. All bidders have access to purchase this information.

In the second treatment, subjects are informed that each auction participant is randomly and independently assigned a distribution of high or low value according to an unknown and equal probability for all bidders. Subjects are informed of this at the start of each round. Each bidder's value is assigned randomly and independently of the others; each subject will also be informed of its private value but will not be told which distribution it has been assigned.

In both treatments, at the end of a round, subjects will receive information on their private value, their bid, the winning bid, whether or not they got the object and their payment.

As the object's value is not known for sure, there is a possibility that it could be a loss for the winner on one of the rounds of an auction. It is because he may be bidding for a higher price than the actual value for one round. However, in case of a negative result, there is no real loss for the experimental subject in the form of discounted payments from other parts of the experiment. Therefore, the final result of this part of the experiment would be 0 in terms of profit.