FAIRNESS IN THE LABORATORY:

A LITERATURE REVIEW

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ABSTRACT

In the last decades, quite a lot of experiments dealing with fairness have been published. This review summarizes the evidence. Our aim is to understand the importance of fairness on subjects' decision making process in some specific contexts. For that purpose, in this dissertation we review literature trying to find evidence of fairness motivations on subjects, and we decide to focus our attention on three groups of experiments, concretely bargaining, public goods and market experiments. As regards bargaining experiments, both in the ultimatum game and the dictator game subjects offer positive and significantly high shares of the available amount, around 30%-40% and 20%-30% respectively, even though in the dictator game proposals cannot be rejected. Subjects do not only care about their own payoff and situation, but also about their peers. In this sense, property rights are crucial for explaining subjects' decision making. In the case of public goods experiments, positive and substantial contributions to the public good are observed, which are on average between 40%-60% of the total endowment. However, repetition leads to a gradual reduction on contributions, which is clearly cut by introducing a punishment option, even if this is costly for subjects. As for market experiments, employers offer wages well above the market-clearing level and workers respond with high effort levels. Nonetheless, the way effort is determined (endogenously or exogenously) strongly affects fairness enforcement decisions on subjects.

Keywords: Fairness, experiments, ultimatum game, dictator game, public goods, market experiments.

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1. Introduction

This dissertation aims at reviewing and summarising the results and conclusions from several laboratory experiments in the field of economics related to fairness. In particular, we review experimental evidence of fairness motivations on subjects focusing on different groups of experiments, namely bargaining, market and public goods. We decide to focus our attention on the games previously mentioned because they are the most common and basic ones, and those in which fairness concerns can be more explicitly found.

Our review of literature is more extensive than previous ones, such as Fehr and Schmidt (1999), or Camerer and Thaler (1995) since we include a wider time span and variety of experiments. Therefore, this project may serve as a source of information for those willing to prove and understand the existence of concerns of fairness on subjects, as well as a tool to broaden the knowledge on this issue, through the replication and modification of the reviewed experiments.

The personal motivation to perform this work is to go a step further on the approach to experimental economics started when replicating and implementing an experiment in Doñate-Buendía (2017). This Bachelor's Degree thesis tried to prove the existence of gender differences on fairness and altruism in the context of a punishment game, based on the study by Eckel & Grossman (1996), which will be later on explained. For that purpose, a pilot experiment was carried out through a survey replicating the study by these authors, but adding an additional treatment to the original experimental design. Under this new setting, subjects had to give up a higher amount of money than in the original experiment so as to punish an unfair player and compensate a fair subject. In that way, subjects' willingness to punish unfair behaviour was analysed.

Since there is not a common consensus on what fairness[1] is, we will define it in the more appropriate way according to the analysis that is going to be carried out in this dissertation.

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[1] Fairness can be defined in several different ways. For instance, according to the acceptations found in some dictionaries fairness is: "the quality of treating people equally or in a way that is right or reasonable", "impartial and just treatment or behaviour without favouritism or discrimination", or even "the property of being fair or equitable".

For that reason, we need to talk about John Rawls, an American philosopher who, in his book *A Theory of Justice* tried to solve the problem of distributive justice, that is, the socially just distribution of goods in a society. The theory he developed is known as "Justice as Fairness", and the basic idea is that justice is based on two main principles, liberty and equality. Thus, Rawls (1958, p.164) considered that: "the fundamental idea in the concept of justice is fairness".

According to Rawls (1958), the concept of fairness is relevant when a group of people participate in a common activity and need to establish the basic rules defining it and determining the rights and duties of each one of the members of the group. Moreover, the activity in question is fair when no one feels that any other person may take advantage of others, or that someone may be forced to accede to illegitimate petitions of others. Furthermore, each person has a perception of reasonable and legitimate claims that should be commonly recognised.

Having that in mind, we define fairness as a concept based on two main ideas: justice and equity. Thus, fairness means that everything is equal, that is, there is no favouritism or discrimination, no biases exist and everyone has the same rights and duties. Moreover, people obtain what they merit, according to their effort and their behaviour towards others.

Hence, we will now review the experimental literature on fairness trying to understand and explain the different settings authors have used until now in order to analyse this issue, as well as the different results and conclusions they have found. My hope is that this dissertation helps researchers by providing them with a summary of what has already been done and thus, what else could be examined to this respect.

Quite a lot of research has been done on social preferences, on fairness in particular, and mainly in the last three decades, when experimental economics took off with the regular publication of economic experiments in mainstream economic journals, the establishment of the Economic Science Association and the launch of the journal *Experimental Economics*. And most importantly, with the Nobel Prize awarded to Vernon Smith and Daniel Kahneman in 2002 "for having established laboratory

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[1] As the last meaning says, fairness is undoubtedly the attribute of being fair, but regarding this last concept, there is also a wide range of possible definitions. From the simplest ones, such as "proper under the rules", "just or appropriate in the circumstances", "free from bias, dishonesty, or injustice", or "reasonable, right and just" to the more complex, like "if something is fair, it is reasonable and is what you expect or deserve" or "treating someone in a way that is right or reasonable, or treating a group of people equally and not allowing personal opinions to influence your judgment".

experiments as a tool in empirical economic analysis, especially in the study of alternative market mechanisms" and "for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty", respectively.

The data used in the dissertation is economic experiments carried out in the laboratory. We analyse and compare the different settings and results which can be derived from them. Concretely, we include a broad range of articles, from the 1940s to 2018, and the method we use for their selection is to start from seminal papers and then deal with the relevant references in them for the objective of our work.

The remaining part of the dissertation is organised as follows. Section 2 presents several studies and their results on bargaining experiments concerning fairness. In section 3 the main public goods experiments on fairness are explained. Section 4 consists of a review of the literature on how fairness is dealt with in market experiments. Section 5 shows the summary and discussion of the reviewed literature.

2. Fairness in bargaining experiments

Bargaining is one of the main areas of study in experimental economics, of which several experiments have been carried out over the years, and which implies a huge range of everyday life situations. Some examples which illustrate a bargaining process are the following ones: the decision of a labour market reform between employers and unions, the negotiation of the wage between employers and employees for the latter, the divorce agreement of a couple, or even simpler, the bargaining process between an individual and a telecommunications company.

This concept refers to a situation in which two or more subjects must reach an agreement on the issue at stake. In the broad definition of bargaining experiments we find two games which are the most representative ones of this kind of interaction between subjects, the ultimatum game and the dictator game. Although the second one does not actually follow a bargaining process, it is included in this classification because it can be considered a restricted version of the other game.

The ultimatum game is the interaction between two players who have to decide on the distribution of a given initial endowment. The first player, the proposer, makes a choice on the allocation for both subjects, and the other player, the responder, can accept or reject that proposal. If the offer is accepted, the money is split as agreed, whereas if the offer is rejected, none of the players gets any amount from the endowment.

The dictator game is a kind of interaction in which two subjects participate, but only one of them makes a decision; that is, the dictator, who has to decide on the division of a determined amount of money between him/her and the other player, who cannot reject the offer.

In the following subsections we will review the literature concerning fairness and which is based on either ultimatum or dictator game experiments.

2.1. Fairness in the ultimatum game

This game is firstly introduced by Güth, Schmittberger and Schwarze (1982). In their basic setting, the subjects are divided into two groups, being each one assigned the role of proposer or responder. The proposers have to divide a certain amount of money, which varies between 4 and 10 currency units, and the responders have to decide whether to accept the offer or not. The game is repeated with the same sample of subjects one week later.

The main results are that proposers offer significantly high amounts of money, but many subjects reject these proposals. And when the game is repeated, proposers demand greater amounts and responders continue rejecting positive offers. So, this is a clear example of people behaving differently from what it is expected from rationality. And it is the first evidence of fairness motivations on subjects' behaviour.

In this line, Kahneman, Knetsch and Thaler (1986a) implement an ultimatum game in which each subject has to choose among a range of allocations of $10, from $9.5;$0.5 to $5;$5, with variations of $0.5 each time, deciding the ones that are acceptable and unacceptable for them. Later on, they have to make the decision of the division of the given amount of money between them and another subject. The results show that many subjects consider positive offers unacceptable, and the distributions are generous, contrary to the theoretical prediction, suggesting that subjects are concerned about fairness enforcement.

Ochs and Roth (1989) use another setting, in which the roles of subjects are alternatively exchanged. Therefore, if the responder rejects the offer made by the proposer, their roles change and a new decision is made. It is important to highlight that a discount factor is applied to the available amount of money. In particular, in each period subjects have to divide 100 chips, and the discount factor can be the same for both players or different for each one of them.

The main observations are, according to related literature, that substantial positive amounts are offered and in many cases they are rejected. Moreover, a great number of

counterproposals are disadvantageous, that is, the proposer keeps a lower amount than the one the responder has previously offered him/her. Hence, it is concluded that subjects' concerns about fairness do exist and are highly relevant on their decision making process.

Prasnikar and Roth (1992) conclude in their study, through the analysis of several experimental results on ultimatum games that fairness plays a fundamental role in subjects' preferences and/or expectations. In fact, it determines the observed outcomes in this kind of game.

In this context it is also important to name the main conclusions stated by Falk, Fehr and Fischbacher (2003). They examine the effect of fairness considerations by the sensitivity of subjects to the distribution of income and find that identical offers in an ultimatum game steadily generate diverse rejection rates depending on the other available alternatives for the proposer. The authors implement four mini-ultimatum games, being the role of proposers and respondents randomly assigned to subjects. The proposer can choose between two allocations; the first one is the same in the four games, and the other one differs from game to game. Each respondent has to indicate his/her response in both decision nodes without knowing the choice of the proposer.

The main result of this study is that subjects are more willing to reject an uneven offer when the proposer has more equitable alternatives to choose than if the other possible options are more uneven, since identical actions may indicate different facts about the intention of the proposer. For that reason, the authors state that the utility of an action is very much related to the other disposable options. In this sense, a good fairness model should include both intentions and distributional concerns as key elements to explain this kind of behaviour.

Ho and Su (2009) run two independent ultimatum games, played sequentially by a leader and two followers. The leader has to divide 100 points between him/herself and the first follower. After this decision, the same interaction is repeated with the second follower, who receives a public signal of the offer made to his/her peer, and therefore can infer the corresponding payoff.

As in related literature, the main finding is that positive offers are made (around 30-40% on average) and the rejection rate is substantial. Moreover, in this context, it emerges what the authors call peer-induced fairness, that is, the fact that the second follower is not willing to get a lower amount than the one the other follower receives. Additionally, the leader is found to adapt the second offer to the inference that can be

made by the second follower, that is, the offer changes according to the corresponding signal.

Hence, the authors prove that peer-induced fairness takes place and is important when analysing this kind of interaction.

Hoffman et al. (1994) try to understand the underlying motives of the preferences for fairness observed by other authors. For that purpose, they carry out one-shot ultimatum and dictator games, which are framed as a market exchange. The authors use two treatments in which the roles of buyer and seller are randomly assigned (first treatment) or assigned by the results of a contest in which subjects have to answer to 10 questions (second treatment). In all cases, the amount to be divided between the participants is $10.

The main conclusions from this work are that property rights are one of the driving elements of subjects' behaviour, since first, they assume the money belongs to them and, second, those who score highest in the quiz think they deserve that money. And this leads to lower offers. Therefore, in the random assignment treatment offers are greater than in the contest treatment. And the key element behind the commonly observed preferences for fairness is anonymity, with respect to other subjects, to the experimentalists, and to everyone else.

In this sense, Bolton and Zwick (1995) test the anonymity hypothesis together with a punishment hypothesis, which states that subjects are willing to punish those who treat them unfairly. They implement an ultimatum game in order to analyse the accurate explanation for the observation of fair outcomes. And what they find is that the punishment hypothesis explains much more of the deviation from the perfect equilibrium than the anonymity hypothesis.

Kagel, Kim and Moser (1996) use an ultimatum game in which players bargain with 100 chips that have different monetary payoffs to each type of subject within the pairs. Additionally, the information they have regarding the corresponding returns varies. In fact, in some cases only one player knows both payoffs, and in the rest both of them are aware of that information. Nevertheless, players always know their own payoffs and there is common knowledge on whether other players know each other's payoffs. The game is repeated 10 times.

The results they find are that when only the proposer is fully informed, the mean offer is below 50, and when the corresponding payoff is low, this amount is even smaller. Therefore, no concerns for fairness are found in this case. But, when it is the responder who has all the information, rejection rates substantially increase. Finally,

when both subjects are fully informed, proposers offer on average half of the pie, but rejection rates are really high (52%), so that the proposals increase until reaching nearly the mean of 64 chips in the last period. This shows that proposers are not worried about fairness; in fact they show a selfish behaviour, whereas responders have fairness motivations, and want to get an equal split of the total amount, rejecting any other proposal.

2.2. Fairness in the dictator game

Forsythe et al. (1994, pp.361-362) implement the dictator game in its one-shot version without the opportunity for subjects to see or meet their opponents, thus dividing them into two separate rooms, and they find that the majority of subjects playing the role of the dictator renounce to important shares of the available amount of money in order to give it to the other player. Nonetheless, when they test the "fairness hypothesis" that the distributions of offers are the same in the ultimatum and dictator games, they find no evidence supporting it, since players are more generous in the ultimatum game than in the dictator game.

Karni, Salmon and Sopher (2008) try to find evidence of subjects' willingness to renounce to a higher own probability of winning a prize in order to reach a fairer allocation procedure. For that purpose, they implement a three-player dictator game in which one of them, randomly selected, has to decide on the lottery that will be used for choosing the winner of $15. Therefore, under this setting, the dictator has to choose the distribution of probabilities of getting the prize.

This is the innovative element of the study, since subjects decide on the procedure rather than on the ultimate allocation of money. Thus, fairness is analysed from a different perspective than in most related literature.

From the work it can be concluded that many subjects are willing to sacrifice their own probability of getting a prize so as to achieve a fairer allocation among the three participating subjects in the group. Hence, subjects clearly show fairness concerns under this context.

Through two additional[2] experiments, Kahneman, Knetsch and Thaler (1986a) obtain evidence of altruism and fairness motivations on subjects, who are willing to give up a higher payoff for themselves in order to punish a player who has been selfish or unfair when deciding the distribution of the initially available amount of money. The first

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[2] By additional we are referring to the previously presented ultimatum game by the same authors, since the study included three experiments. This study is the first one in which the dictator game is introduced and examined.

one consists in a dictator game divided in two parts; firstly, subjects have to divide $20 with just two possible allocations: $18 for them and $2 for the other person, or $10 for each one, and then they have to share an amount of money with two other subjects. One of the possible situations in the second part of the experiment, and which is the most interesting case, is the one in which the player is paired with two subjects who behaved in a different way in a previous experiment, one was fair and the other one unfair. The decision the subject has to make is to give $5 to subject E, $5 to himself/herself and nothing to subject U, or $6 to subject U, $6 to himself/herself and nothing to subject E. The main results are that the majority of the subjects divide the $20 evenly in the first part, and that they are willing to give up $1 in order to punish an unfair subject.

The second experiment is the replication of the second part of the previous one, and the results are similar to the previously obtained.

The main conclusions then are that fairness assumptions are relevant to subjects, and that there exist a willingness to punish subjects which behave unfairly even if this implies lower own payoffs.

In this sense, and regarding gender, Eckel and Grossman (1996) find that the behaviour of men is more stable when deciding whether to punish or not regardless of the relative price of punishment. Their study tries to test the existence of gender differences in the willingness to pay for punishing unfair subjects. For that purpose, they use a punishment game, that is to say, a restricted adaptation of the dictator game. Their framing follows that of the second part of the dictator game in Kahneman, Knetsch and Thaler (1986a), previously described, with the difference of subjects being matched with just one player, of the type chosen by the own subject.

The main conclusions derived from this study are that for men fairness is a principle, so that they will behave in the same way when facing a determined situation (in this case of unfairness) regardless of the price, whereas women vary their actions depending on the circumstances, so that they are concerned by fairness motivations, but regarding the price attached. So, if social norms or concerns of women differ from men, their behaviour in economic contexts may be different. Thus, modifications to some market models should be applied in order to get more accurate behaviour predictions.

Recently, in their study, Brañas-Garza, Capraro and Ramírez (2018) conclude that women are more altruistic and also more expected to be so than men. They implement a dictator game for a sample of Amazon Mechanical Turk crowd workers in the US,

that is, a different sample from those of students commonly used in economic laboratory experiments. They find that women give significantly more than men. Moreover, expected altruism among women is much higher than that of men. Therefore, women might be more concerned about fairness enforcement than men.

Schurter and Wilson (2009) examine the similarities and differences between the social concepts of justice and fairness through four different treatments of a dictator game. The treatments differ on an entitlement stage, in which the assignment of the roles of players varies according to different rules. Subjects may accept those rules and participate or reject them and leave the experiment, after receiving their show-up fee. In one treatment subjects' roles are randomly assigned by the computer; while in another one they take a quiz with general questions about their university and the roles are determined according to the ranking of their scores. In the third treatment, the roles are assigned by playing a game of chance, in particular, a die roll game in which subjects choose even or odd. In the last treatment, subjects are ranked according to the number of credit hours they have completed and then paired according to that ranking. Thus, the treatments differ on the use or not of a deserving ranking and a fair procedure in the entitlement stage.

The main result is that offers in the treatment involving a quiz as well as in the last treatment are lower than in the treatment where the roles are randomly assigned and in the treatment with the die roll game. This shows that the existence of a deserving ranking is relevant for subjects, whereas the fair procedure is not. Then, the authors conclude that fairness and justice are different concepts in the context of a dictator game and that justice is the element that legitimizes a dictator's property right, that is, it makes the dictator believe he/she deserves a higher share of the endowment.

In their experiment, Cappelen et al. (2007) use a setting in which subjects are heterogeneous regarding both talent and effort, being the first characteristic inherent and the second one acquired. Effort is modelled as the money each subject wants to invest in production, whereas talent corresponds to the return on that investment (low or high, randomly assigned). After the production stage, subjects are paired with one player with low return and another one with high return, and they play a dictator game, that is to say, they decide on the distribution of the aggregate income. Authors assume subjects have a fairness ideal such that they obtain a greater disutility the more they deviate form that fair distribution. And their optimal proposal depends on that fairness ideal and on the relevance assigned to fairness considerations. In particular, three different fairness ideals are considered (strict egalitarianism, libertarianism, liberal egalitarianism).

They find, firstly, an average proposal of 27.1%, which may be due to higher concerns for fairness of subjects because of the existence of a production phase. And secondly, through several regressions, they observe that subjects demand almost all their own production but just two-thirds of the opponent's production, and ask for a higher share of the opponent's production if it is derived from a high rate of return rather than a high investment. These observations show that for some subjects the distinction between effort and talent actually matters and that a hypothesis of pluralism of fairness ideals does hold in reality.

Güth, Kliemt and Ockenfels (2003) conduct an experiment based on the setting of a standard dictator game but in which subjects' efficiency, measured by the sum of individual payoffs, can rise through the giving of gifts (understood as positive amounts to the recipient). The gift is then doubled or not with a certain probability. They implement two different treatments, in the first one just the subject playing the role of the dictator has the possibility to do it, while in the second treatment both of them can give a gift to each other, that is, both play the role of the dictator simultaneously. And each subject making the decision is allowed to condition it on whether the gift is doubled or not.

The results the authors find are: firstly, when just one of the players can decide whether to give a gift to the other one or not, fairness appears to be more relevant for dictators than efficiency, since they never provide the recipient with a higher payoff than to themselves. Secondly, according to the answers of subjects playing the role of recipients on their hypothetical choices if they were playing the role of the dictator (that is, a measure of expectations regarding gifts) they obtain almost identical values for real and expected choices. Additionally, they observe that: "generous donors expect generosity to prevail in general" (p.469). Finally, and regarding the second treatment, in which there is mutual gift giving, different behaviours are found, in particular, selfish or distrustful subjects and trustful or efficiency-minded players.

All in all, they conclude that gift giving is strongly influenced by the interactive relationship with the other subject (unilateral or two-sided). Moreover, the amount of the gift is restricted by fairness constraints, since dictators are not going to put themselves at a disadvantage with respect to the other subject. And, at last, they affirm that: "efficiency gains may further gift giving only when reciprocal fairness is expected" (p.472).

Dana, Weber and Kuang (2007) carry out a dictator game experiment with four different treatments, in which the main varying feature is transparency, that is to say,

the common knowledge of the actions that the dictator can take and their subsequent consequences. Thus, in the four treatments there is a gradual reduction of transparency or, in other words, increasing uncertainty, in that respect.

Subjects are randomly assigned to one treatment and are anonymously and by random matched in pairs. They play a dictator game with two possible actions, either to choose and even allocation of the endowment or an uneven one. The first treatment is a standard dictator game. In the second treatment dictators are, in principle, not aware of the consequences of their choices for the recipient, but have the option of getting that information by clicking a button. The third treatment differs in the addition of a new dictator, that is, subjects are matched in groups of three, playing two of them the role of dictators and the third one the role of recipient. And in the fourth treatment, dictators are allowed to leave their decision to chance, thus avoiding responsibility for their choices. In fact, they have a limited time period to make a decision, and if they do not do it, the software chooses one of the two possible options with the same probability.

Therefore, with the setting they use, the authors create a "wiggle room" for selfish behaviour. And what they observe is that in the first treatment fairness prevails, since most dictators choose the even allocation. In the other treatments, they find that subjects act in a way in such they keep uninformed about the consequences of their choices, and they take advantage of that uncertainty to make an unfair choice. Moreover, many of them delay making a decision in order to leave that responsibility to the computer.

To sum up, if fairness is a principle for subjects, the reduction in transparency in the additional treatments should have no effect on their decisions. However, they find that dictators are more selfish and less fair as the level of transparency is reduced. The conclusion derived from these findings is that transparency is a relevant element on dictator game experiments when trying to analyse fairness motivations and that depending on its level, subjects will show a more or less fair behaviour.

3. *Fairness in public goods experiments*

The literature on this issue is not very extensive. However, in this section we will include studies that deal with fairness in the context of public goods experiments.

The basic public goods game consists of a group of subjects who are endowed with a number of tokens and have to decide on the share of that total amount to be invested in a public good. The tokens which are not invested are kept.

An important element of this game is the return for each subject from the investment in the public good, which is lower than the return derived from no investing. Therefore, since the return from the private good exceeds the one of the public good, the dominant strategy for each player and the rational Nash equilibrium is to free ride, that is, to invest zero on the public good.

However, and according to Chaudhuri (2011), the general result on public goods experiments is that contributions are on average around 40%-60%, but repetition leads to a decay towards the 0 provision, since more subjects start choosing to free ride. Therefore, the observations of positive and substantial contributions to the public good and the gradual reduction on them suggest that considerations about fairness or altruism, as well as other social preferences are essential when analysing this kind of game.

In fact, the first evidence of fairness concerns of subjects in this kind of game is found by Marwell and Ames (1981). They run a series of public goods experiments among which the setting characteristics vary, and they observe that, regardless of those variations, average contributions to the public good always range between 40 and 60 percent of the total endowment.

Additionally, when asked about what is considered fairness for them in this situation, most subjects refer to half or more of the players' endowment as a fair contribution, and those who declare that they consider fairness when making their decisions and define as fair high contribution levels, are the ones that contribute more.

Hence, the authors prove that fairness is crucial in any interaction of this type, and needs to be considered when analysing the results of any public goods experiment.

In his study, Andreoni (1988) tries to analyse the phenomenon of free-riding. In particular, why it is rarely observed in single-shot games but generally found in finitely repeated settings (decay phenomenon). For that purpose, two hypotheses are examined: the learning hypothesis, which states that subjects cannot learn their incentives by a single-shot, and need repetition to attain such learning; and the strategies hypothesis, which maintains that repetition allows subjects to indicate future actions to each other and therefore there is room for rational strategic play in repeated games.

The experiment consists of a standard public goods game iterated 10 times. Additionally, there is an unexpected restart at the end of these periods. Each repetition includes groups of 5 subjects, where each one of them is given a budget of 50 tokens. Tokens can be invested either in a private good (Individual Exchange) or in a public

good (Group Exchange). The return on the private good is 1 cent, whereas the return on the public good is 0.5.

Moreover, there are two treatments, *Partners* and *Strangers*. In the first one subjects play the game always with the same group members, and in the second one, after each repetition of the game, the groups are reassigned.

The results are: subjects in the *Partners* treatment contribute less to the public good and free ride more frequently. *Strangers* are momentarily affected by the restart, whereas *Partners* are significantly and permanently affected by it. Thus, strong evidence against the strategies hypothesis is found (subjects who cannot play strategically (*Strangers*) contribute more), and also against the learning hypothesis (subjects under both conditions are affected by the restart).

Therefore, there are other motives explaining the observations found, namely fairness motivations of subjects which lead to positive contributions to the public good, and even higher by subjects playing under the *Strangers* treatment, and to not reaching the Nash equilibrium of free-riding even with repetition of the game.

Andreoni, Brown and Vesterlund (2002) use three slightly different versions of a two-subject public goods game. The first one is a simultaneous version of the game, whereas the second one is sequential, and in the last one the supply of the public good is determined by the maximum of the two contributions to it (best-shot game).

What the authors find is that the common free-riding equilibrium prediction holds neither in the simultaneous nor in the sequential game, but it is approached in the third version of the game. Moreover, when comparing the sequential and simultaneous games, subjects' behaviour is found to be really similar.

All in all, the selfish equilibrium prediction cannot be sustained and fairness models need to be used in order to explain these findings.

To our knowledge, the first attempt to evaluate the effect of including the possibility of punishing in the context of a public goods experiment can be attributed to Fehr and Gächter (2000a). For that purpose, the authors implement four different treatments, which combine the conditions of punishment and no punishment option, with both the strangers and partners situations. The punishment option is included by a second stage in the game, in which each subject is informed about the individual contributions of the other group members. Then, they can punish each other by assigning punishment points, and the cost of that decision is a reduction of 10 percent of their payoff (from the first stage), which cannot become negative.

As for the results, in the conditions in which punishment is not allowed, contribution levels show a gradual decay towards very low provision levels, whereas in the treatments with punishment average contribution rates are above 50 percent of the endowment. And they are higher in the partners treatment (95%) than in the strangers condition (58%).

Therefore, the authors find a high willingness to punish free-riders among those subjects who contribute to the public good, even though punishment is costly for them. And the punishment is higher the greater is the deviation from the groups' average contribution. This provides strong evidence of fairness motivations, since subjects are willing to undertake an important cost in order to punish those who free ride, who are unfair.

4. Fairness in market experiments

Market experiments have been used for many years in the economic literature. In fact, according to DeYoung (1993), the first article based on the results of a laboratory market experiment was a study of imperfect competition carried out by Chamberlin (1948). After that, other authors also used this kind of experiments in order to find evidence of the Cournot model [Hoggatt (1959), Sauermann and Selten (1960)] and of the working of the laws of competitive supply and demand in the laboratory [Smith (1962)].

As DeYoung (1993) states, there are several advantages of carrying out market experiments in the laboratory. For instance, the controlled environment allows for the design of the specifically desired market structures. And the possibility of replication of the same experiment or a modified version of it permits obtaining enough data to extract useful conclusions.

And that is why market experiments have been and are important tools in experimental economics, and they are widely used to test diverse theories and hypotheses.

In what follows we will include the most relevant examples of literature in which laboratory market experiments are used in order to test fairness motivations and concerns.

Kahneman, Knetsch and Thaler (1986b) use a survey in order to infer rules of fairness in the market. Therefore, they make a first approach to the identification of community standards of fairness and their implications on market outcomes. In particular, subjects are asked a set of 18 questions framed in the context of firms

making a decision on the price of a product or setting the wage of workers. Under this framework, subjects have to evaluate the fairness of the corresponding actions.

What the authors conclude from this study is that practices which are profitable and not clearly dishonest are likely to be considered unfair exploitations of firms' market power. However, in some cases there are actions initially seen as unfair that slowly spread until they become fair for subjects. Moreover, a relevant framing effect is found, so that firms are highly motivated to frame their decisions in a way in which they appear to be fair. Finally, a relevant conclusion the authors find is that the rules of fairness that apply to prices, rents and wages are very similar.

Fehr, Kirchsteiger and Riedl (1993) design an experiment in order to analyse the impact of fairness on market prices. Their experiment consists of two stages; in the first one, wages are determined in a one-sided oral auction, which lasts three minutes, with employers as bidders who make wage proposals to workers. When an offer is accepted a binding contract is made and, in the second stage, workers choose their effort level.

Under this setting, it is assumed that workers do not have any incentive to increase their effort above the minimum possible level. Then, if employers expect this to happen, they will not pay wages above the market-clearing level.

Nonetheless, the results are contrary to this prediction. In fact, employers offer prices substantially above the market-clearing level, and expect workers to respond with high effort levels, that is to say, they await them to be fair and reciprocate their behaviour. And, on average, this is what happens. Moreover, repetition does not lead to the convergence of prices towards the market-clearing level. Therefore, the authors conclude that fairness plays an important role in this type of negotiations and it prevents wages from reaching the market-clearing level, remaining always above it.

Similarly, Fehr and Falk (1999) carry out a double auction experiment with incomplete contracts[3]. They implement two treatments, one in which effort is exogenously given and another one in which workers decide their effort level.

There are two stages, in the first one wages are determined through a double auction, in which both workers and firms interact. If there is an agreement, a labour contract is made. In the second stage, the worker decides the effort level. In the treatment with exogenous effort the second stage is not included in the design.

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[3] The obligations of the employer and the employee are not specified in each possible state of the world.

The main results are: first, workers make low offers, which firms reject; second, even though firms know that workers are willing to work for lower wages, their offers are on average greater than those of workers; third, workers reciprocate firms' wages, that is, low wages lead to low effort levels and high wages to high effort levels; and fourth, when effort is exogenously determined, firms offer lower wages, being significantly smaller in that treatment.

In sum, firms do not enforce low wages when effort is endogenously determined because they predict that they will have a strong impact on workers' effort and performance, but they do so when effort levels are exogenous. Therefore, this study shows limited or non-existent concerns of fairness on firms whereas workers are clearly motivated by fairness enforcement.

Abeler et al. (2010) carry out an experiment in which a principal is matched with two agents; in the first stage of the game, the agents decide simultaneously and independently on their effort level, and in the second stage, being aware of this decision, the principal chooses the wages for both. There are two treatments, in the first one just one wage level can be chosen, which is paid to the two agents, and in the second one the principal can choose a different wage for each one. After each period, principals and agents are randomly rematched.

The results which are obtained are that greater effort levels are rewarded by higher wages, and agents who are paid equal wages show significantly lower effort levels than agents that are paid individually. Therefore, strong evidence of fairness motivations on subjects is found. Specifically, it is shown that equal wages often lead to unfair situations in the view of workers, who are importantly heterogeneous in their performance.

Also under the framing of a principal-agent experiment, Fehr and Schmidt (2004) find evidence of fairness motivations on subjects. Their setting involves two tasks the principal offers the agent to engage simultaneously, and the agent decides on the effort used in each one of them.

The best situation for the principal is one in which the agent expends the same amount of effort in both tasks. This effort is perfectly observable by the principal but, while in the first task this is easily verifiable in court, in the second one it is not, so that it cannot be contracted in this case.

Two are the types of contract that can be offered. The first one is a piece-rate contract, which pays a fixed base wage and a piece rate for each unit of effort spent on

task one. The other one is a bonus contract, which again specifies a fixed wage and a completely voluntary bonus based on the agent's performance.

The results show that bonus contracts outperform piece-rate, that is, most principals offer the first type of contract. Additionally, many principals give considerable bonuses as a reward for high efforts in the two tasks. Moreover, many agents decide to put great effort in both tasks. Finally, a great number of agents with a piece-rate contract put no effort on the second task and instead fully concentrate on the first one. Therefore, the basic conclusion from this study is that fairness concerns matter, and they are capable of inducing some principals to pay a bonus and encourage agents to reciprocate by increasing their effort.

With a similar setting, Anderhub, Gächter and Königstein (2002) run a principal-agent experiment. In its first stage, the principal decides on a contract consisting of a fixed wage and a return share and offers it to the agent, who accepts or rejects it. Then, the worker decides on the effort level.

The authors observe that in most cases (70%) principals offer negative fixed wages as well as incentive-compatible return shares. And these are rejected in 20% of the cases. Moreover, effort changes according to the offered contracts, that is to say, the more generous are the contracts, the higher is the effort level chosen by the agent.

All in all, the authors conclude that agents care about fairness, and fair sharing is a relevant element influencing subjects' behaviour. Therefore, fairness should be taken into account when examining this type of interaction as it significantly affects the outcomes of it.

Fehr, Tougareva and Fischbacher (2014) run an experiment in order to find evidence against the possible criticism on the relevance of fairness concerns that in real life the involved stakes are much higher than in laboratory experiments.

For that purpose, they replicate the work by Fehr, Kirchler, Weichbold and Gächter (1998). The difference between these studies is that the first one is carried out with an Austrian sample, whereas the second one is run with Russian people. The authors implement a series of competitive labour market experiments in which subjects have the possibility to reciprocate favours. They use two treatments, in one of them the stake is equivalent to other experiments, whereas in the other one it is much higher (between two and three times the average monthly income of participants). The kind of market they define is a gift-exchange, in which wages are determined in a competitive market and then workers choose their effort level, once the labour contracts are established.

The main findings are: under both conditions wages are higher than they should be in equilibrium; in particular, they are three times greater than the prediction of the competitive model. Moreover, workers' decisions on their effort are not significantly affected by the increase in the size of the stake, that is, there are no important differences between the observations under each of the treatments. Additionally, at different stake levels no differences in wages are found. Finally, under both conditions workers reciprocate through their effort choices the non-competitive wage offers made by employers.

All in all, the authors conclude that fairness concerns are sufficiently powerful so as to outbalance competitive forces and lead to wage levels well above the equilibrium ones. And even more, fairness plays a relevant role even when stake levels are relatively high.

In their study, Engelmann, Friedrichsen and Kübler (2018) go a step further and provide an attempt to directly test the relationship between market behaviour inside and outside the laboratory.

The authors implement an experiment with three differentiated parts. The first one is carried out before entering the laboratory, and it consists in measuring the willingness of subjects to pay for fair trade chocolate bars, instead of larger conventional chocolate bars. Then, subjects participate in a market game in the laboratory. And in the third part, the authors elicit the premium participants are willing to pay for fair trade, through an incentive compatible random price mechanism.

What they find is that there exists a high correlation between the results from the first and third part, that is, fair trade preferences outside the laboratory. On one side the choice of the preferred kind of chocolate bar made before the experiment, and on the other side the willingness to pay a premium for the fair product. Moreover, regarding the second part, that is to say, the market game, it is observed that those subjects choosing the fair trade chocolate bar in the first part are more likely to act fairly in the experiment. And the same happens with those who show a positive fair trade premium in the third part.

In sum, subjects' choices regarding fair trade are closely related to real preferences on fairness. In other words, fairness preferences are relevant for consumption choices outside the laboratory.

5. Discussion

This dissertation has reviewed literature on fairness concerns in bargaining, markets and public goods experiments. The general finding is that subjects are aware of and care about fairness motivations when making their decisions.

In particular, in the ultimatum game proposers offer positive and significantly high shares of the available amount (30%-40%) and responders reject many of these proposals. And in the dictator game subjects offer positive and important shares (around 20%-30% on average), even though their proposals cannot be rejected. In public goods experiments, concerns for fairness are found in the form of positive and substantial contributions to the public good. In fact, average contributions are between 40%-60% of the total endowment. And market experiments provide further evidence of fairness motivations, as employers offer wages well above the market-clearing level, and workers respond with high effort levels.

There are different elements which help explaining and reinforce fairness on subjects, and these have been analysed in the three different contexts. Nonetheless, in some cases fairness could have been examined with different designs which best isolate this phenomenon. Therefore, in this section we propose new ideas and alternative designs for treating fairness in these differentiated but related contexts.

A crucial element connecting the three groups of experiments is punishment. Punishment to unfair subjects is found to be relevant for explaining the deviation from perfect equilibrium [Bolton and Zwick (1995)], and it its effect is so strong that players are observed to be willing to punish subjects which behave unfairly even if that implies lower own payoffs [Kahneman, Knetsch and Thaler (1986a)]. Even though punishment is not explicitly analysed in market experiments, it is implicit in the framing of the reviewed articles, since the worker has the possibility of "punishing" the firm by choosing a low effort level as the response to a low wage offer. However, it would be interesting to run an experiment in which under a principal-agent framing, the employee has the choice of punishing the employer. For instance, a possible design is one in which both subjects reach an agreement in the first stage, through a double auction, in which wages are determined. After a labour contract is made, the agent decides the effort level. In the second stage, the agent becomes aware of all the relevant information concerning the corresponding company (size, revenues, etc.) and can then decide whether to renounce or not the job. Under this setting, if agents are concerned about fairness enforcement, and they believe the principal has been unfair, they are expected to renounce so as to punish that behaviour.

Information is also proven to be a relevant element when analysing fairness in these contexts [Dana, Weber and Kuang (2007), Kagel, Kim and Moser (1996)]. Therefore, we could test whether the combination of both elements (punishment and information) leads to stronger fairness effects on subjects, as it is expected. For instance, following the design by Kagel, Kim and Moser (1996), we could implement an ultimatum game in which, in a first stage proposers have complete information about the returns for both subjects, whereas responders face incomplete information in this respect. Proposers make their decision, and responders accept or reject it. In a second stage, responders get the previously unavailable information, and can then vary their decision, thus getting both players a payoff of zero. If subjects care about fairness, and the proposer has been unfair, they are expected to renounce to their own payoff so as to punish the other player. If either the proposer has been fair, or they are not concerned about fairness enforcement, they will keep the money.

Moreover, fairness motivations are reinforced when subjects gain the right of getting more money, that is, when their roles are assigned according to a deserving ranking. Therefore, property rights are a key element, since they provide players with the feeling that they deserve the money because they have gained the right to get it [Hoffman et al. (1994), Schurter and Wilson (2009), Cappelen et al. (2007)].

A common limitation in the three groups of experiments is the lack of a deeper analysis of the role of gender; its importance and possible gender differences regarding fairness. Therefore, future research must be done on gender differences regarding fairness, by carrying out several experiments in order to obtain evidence of their existence and to analyse them in depth. And a possible starting point is the work by Doñate-Buendía (2017), in which a pilot experiment is carried out through a survey replicating the study by Eckel & Grossman (1996), but adding an additional treatment to the original experimental design. Under this new setting, subjects have to give up a higher amount of money so as to punish the unfair player and compensate the fair subject, and gender differences on fairness can be analysed. Thus, this study could be broaden and replicated in a laboratory experiment, to test the existence of gender differences on subjects' fairness concerns.

All in all, several studies have given evidence that fairness is a key element when analysing subjects' behaviour in bargaining, public goods and market experiments. But further research is needed, and a good model of fairness has to take into account some elements we have previously named, such as, property rights, information, gender and punishment. As already explained, these are key factors for analysing and explaining subjects' fairness motivations in these contexts.

At last, we propose the design of a meta study on ultimatum game experiments. A meta study is a quantitative literature review, which is more objective and may provide more information and evidence than a qualitative review, as the one we have presented. In this kind of work, a set of studies concerning one specific topic is gathered, and the data from them is obtained in order to build up a large common dataset that allows for a joint analysis.

There exist a small number of meta studies on economic experiments, and then it would be interesting to create one concerning such an important issue as fairness.

In this sense, Engel (2011) presents a meta study on dictator game experiments, in which he assesses the effect of single manipulations on the parameters, controlling for many alternative explanatory factors. Moreover, the dataset he obtains allows for comparing alternative specifications of the statistical model used for examining the data from dictator games. In particular, the author calculates the overall average percentage of giving (generosity), and several factors that can help to explain it (framing, social distance, incentives, etc.).

Therefore, one option is to get the dataset from this study and use it for analysing the results from dictator game experiments and how fairness concerns are relevant when trying to explain them.

And another possibility is to do a meta study of public goods experiments, ultimatum experiments, or market experiments, and analyse the main outcomes from the corresponding literature and the factors which can explain them (fairness concerns, among others). Then, we should look for all the literature available and useful for the purpose of the analysis, get the data from the experiments, and build up our own dataset in order to examine it.

The usage of a meta study will provide us with some benefits, in particular, the accuracy of the estimations is improved thanks to the greater amount of data; the results derived from it can be generalised to a wider population; the statistical power increases and the inconsistency of results among different studies can be carefully analysed.

Therefore, we decide to propose a meta study on ultimatum game experiments since, as we have said, it is a good tool to get robust results which can be generalised to a larger population. We believe the ultimatum game is the more appropriate one because the literature on experiments of this game is really extensive, and from our point of view, it is the "basic game", that is, the most representative one of bargaining situations. Moreover, it shows the simplest possible design of interactions between

subjects; the dictator game is even simpler, in fact it is a restricted version of this game, but the interaction between subjects is nearly non-existent.

In the meta study we want to summarise the broad evidence from ultimatum game experiments which have been published over the last nearly 40 years, since the game was firstly introduced by Güth, Schmittberger and Schwarze (1982).

For that purpose and similarly to the design by Engel (2011), we propose the following model:

$$Y_i = \beta X_i + u_i + e_i$$

where Y_i is the the dependent variable, and is the mean percentage of acceptance of the corresponding offers; X_i is a set of explanatory variables; u_i is the error between studies, and e_i is the residual (within studies).

Contrary to Engel (2011), who analyses the dictator game, and uses as dependent variable the mean fraction of the pie dictators give recipients, we want to find the average percentage of acceptance, and therefore analyse the distribution of mean acceptance per treatment, and the different explanatory factors of it. This way, we will analyse the decisions of the responders, and their underlying motives. Another option would be to use as dependent variable the mean fraction of the total amount proposers offer to responders, and then study the behaviour of proposers.

In our case, we will compute the distribution of mean acceptance per treatment and then try to find the explanatory factors of the observed behaviour.

In this sense, we would like to give light to questions like whether repetition is a key element explaining the rate of acceptance of offers in ultimatum game experiments, and if it has a positive or a negative effect on this variable. Moreover, we would like to test if anonymity leads to substantial differences on the decision of accepting or not the offers. Additionally, it would be interesting to know whether responders are motivated by fairness concerns or their behaviour is driven by revenge motives instead. In other words, we would like to see if punishment is a relevant explanatory factor. We would also like to learn the role of information as regards the decision of responders in ultimatum game experiments, as well as if framing affects their choices. At last, we would like to test if there are gender differences in the decision of acceptance of the offers, therefore, if gender is a relevant factor for explaining responders' behaviour.

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