Department of Economics and Finance

Altruistic Sanctioning and Altruistic Rewarding Effect in Stochastic Bargaining Experiment

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1 INTRODUCTION

This thesis will focus on the altruistic sanctioning and altruistic rewarding effects in a stochastic bargaining experiment. Altruistic Sanctioning occurs when participants in an experiment punish noncooperators at own cost, while altruistic rewarding occurs when participants reward others for their altruistic behaviour, again at own cost. In this thesis, I will analyse how framing (that is, the way a game is presented to participants) influences these two effects in a stochastic bargaining experiment performed by Güth et al. (2019) at CESARE Lab at LUISS Guido Carli. In this experiment, Player 1 (the proposer) decides how much money demand for him/herself before that the total amount to be shared is randomly determined. Player 2 (the responder), aware of the realization of the total amount to be shared, will accept or reject the residual, i.e. the total amount minus the demand of Player 1. The game is also framed as a market exchange in which Player 1 (the seller) chooses a take-it or leave-it price offer and confronts just one customer whose random value for the sales item is distributed in the same way as in the other frame. The data analysed in this thesis constitute a subsample of the data obtained in the experiment run by Güth et al. (2019); in particular, they correspond to 49 observations of altruistic sanctioning and 69 observation of altruistic rewarding.

The thesis is structured as follows: chapter 2 illustrates some theorical issues relative to bargaining games and describes the gives a theorical description of the altruistic sanctioning and altruistic rewarding effect. Chapter 3 discusses some possible effects of different framings on the experimental results. The experiment is described in chapter 4, while chapter 5 contains the main analysis of the experiment. The concluding comments are presented in chapter 6.

2 THEORY

The term "bargaining" refers to a socioeconomic phenomenon involving two parties, who can cooperate towards the creation of a commonly desirable surplus, over whose distribution the parties have to agree, (Serrano, 2008). There are many types of bargaining games which are used in experimental analysis. In what follows, we will describe the characteristics and the equilibrium predictions of some of the most popular ones. In this section we are going to look at the three experiments analysed in typical bargaining experiments (Ultimatum game, Dictator game and Impunity Game), describing the games and the theory behind it from a Microeconomic and Game Theory point of view. Then, we will analyse the causes behind altruistic sanctioning and altruistic reward, describing their application in the various games.

2.1 ULTIMATUM GAME

In the Ultimatum Game an amount of money M is to be divided between two subjects (Güth et al. 1982). One subject (the proposer) announces a proposal X to the proposer and $M - X$ to the responder. After the proposal is made, the responder either accepts or rejects it. If accepted, the proposal determines how M is shared; if it is rejected, both the proposer and the responder get zero. From a theoretical point of view, if both subjects (the proposer and the responder) are rational and non-satiated in money, the proposer will leave only the smallest residual $M - X = \varepsilon > 0$ to the responder, since the responder will accept any positive offer. Therefore, the rational prediction is for the proposer to offer ε and for the counterpart to accept it. We can understand this better with a practical example in which the proposer demands an amount X and leaves an amount M-X for the responder. In this example the payoffs are the positive integer going from 0 to 10.

The payoff for the ultimatum game is:

	X=0	X=1	X=2	X=3	X=4	X=5	X=6	X=7	X=8	X=9	X=10
Accept	0,10	1,9	2,8	3,7	4,6	5,5	6,4	7,3	8,2	9,1	10,0
Reject	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

Figure 1: Payoffs Structure for Ultimatum Game

The first number in each square represents the payoff for player 1, while the second number in each of the square represents the payoff for player 2. Solving the game by backward induction, we see that the equilibrium offer in this particular game is for the proposer to demand 9 ($X = 9$), and for its counterpart to accept it, giving a total utility of 9 for the proposer and 1 for the counterpart (this assumes that the Responder, if indifferent, decides to reject the proposal).

2.2 DICTATOR GAME

In the dictator game, the proposer decides how to split of money the total amount of money M, where X represents the amount of money take he/she takes for him/herself and $M - X$ represents the amount of money left to the responder, which is final since he/she cannot reject the offer (Bolton et al. 1998). The term "game" does not really apply to this situation as it actually captures the decision of one single player. Theory predicts that a self-intrested, non satiated, dicator will take M, leaving nothing to the counterpart. Hoffman et al. (1994) found in their study that proposers in the dictator game take significantly more than the proposer in the ultimatum game.

The payoff structure in a dictator game is:

X=0	X=1	X=2	X =3	X=4	X=5	X=6	X=7	X=8	X=9	X=10
0,10	1,9	2,8	3,7	4,6	5,5	6,4	7,3	8,2	9,1	10,0

Figure 2: Payoff structure of Dictator Game

In this example, the theory predicts that the proposer will choose $X = 10$, which, being final, will give 10 to the proposer and 0 to the responder. Again as for the Ultimatum Game, in the Dicator Game the first number in each box is the payoff of player 1, while the second number is the payoff of player 2.

2.3 IMPUNITY GAME

The “Impunity Game” is a game created by Bolton and Zwick (1998) which has the same structure as the ultimatum game, except that player 2’s rejection does not affect player 1’s payoff. In fact, as one can see from *Figure 3*, player 1 gets his/her share independently of player 2 actions. Consequently, player 2 receives either the offered amount in case of acceptance or zero in case of rejection. The main difference from the Dictator game relies on the fact that the responder can decide whether to accept or reject the offer, while in the dictator game the responder is forced to accept. We can see that accepting for player 2 is the weakly dominant strategy since all payoffs are equal or higher than the payoffs if player 2 decided to reject.

The payoff structure of the “Impunity game” is:

	X=0	X=1	X=2	X=3	X=4	X=5	X=6	X=7	X=8	X=9	X=10
Accept	10,0	9,1	8,2	7,3	6,4	5,5	4,6	3,7	2,8	1,9	0,10
Reject	10,0	9,0	8,0	7,0	6,0	5,0	4,0	3,0	2,0	1,0	0,0

Figure 3: Payoff Structure for Impunity Game.

The Nash Equilibrium of this game is for the proposer to offer $X = 0$, the responder in this case is indifferent to accept or reject the offer. They will in the Nash Equilibrium receive a payoff of 10 for the proposer and 0

for the respondent. Also in this case, the first number represents the payoff for player 1, while the second number represents the payoff of player 2.

2.4 ALTRUISTIC SANCTIONING AND REWARDING

Altruistic sanctioning is an effect that occurs when a positive offer of the proposer is rejected, i.e. the responder loses by rejecting, in order to punish unfair proposes. This phenomenon is a key part of my thesis. In the Ultimatum Game, one of the reasons why this might happen is Player 2's desire to punish Player 1 for an inequitable or unfair division. As one can see in *Figure 4*, this mostly applies for $X < 5$ (The underlined part of the table), in particular for $X = 0, 1, 2, 3$. This reason does not apply to offers greater than 5 ($X > 5$). However, one may argue that when the split is in favour of the Player 2 ($X > 5$) and that Player 2 might feel that the offer is too unfair for Player 1 and therefore reject it.

	X=0	X=1	X=2	X=3	X=4	X=5	X=6	X=7	X=8	X=9	X=10
Accept	0,10	1,9	2,8	3,7	4,6	5,5	6,4	7,3	8,2	9,1	10,0
Reject	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

Figure 4: Payoff Structure for Ultimatum Game which shows the Altruistic Sanctioning Effect.

How much the punishment mechanism (altruism sanctioning effect) influences the decision-making process of the proposer is what Bolton and Zwick (1998) tried to study with the Impunity Game experiment. By asserting that the absence of punishment strongly affects game performance as it incentivizes selfish behaviours. In the Impunity Game sanctioning cannot occur even though the responder might want to punish the proposer for an unfair division, the game prohibits him/her from doing so. In fact accepting or rejecting an offer does not affect the proposer payoff, so for example if the proposer demand for him/herself 9 ($X = 9$), leaving 1 to the responder, the responder cannot punish his behaviour: if he tried to do so he/she will only receive 0 without influencing the proposer's payoff, who still receives 9. Altruistic sanctions do not exist even in the Dictator game as the responder cannot reject the offer. Comparing the results for the Dictator Game and Impunity Game to the results of the Ultimatum Game we can understand the motivation behind the offers of the proposer. Suppose for example that proposers in the Ultimatum Game were motivated entirely by altruism, then the results of the Dictator and Impunity Games should be really similar to the ones of Ultimatum Game. But, if instead the proposers in an Ultimatum Game were motivated by fear of punishment, one would expect the results to be more oriented by the concerns for the responder's interests. Altruistic rewarding is described as the incurring of a negative payoff from the responder in order to reward the proposer for their altruistic behaviour. It applies to the analysis of the thesis since, in the experiment which we describe, it is possible to the proposer to ask for an amount which is larger than the actual available amount. This occurs since the proposer's own demand is formulated before the available amount is (randomly) determined. It does not apply to the previously explained games as there is no stochastic component, and because it is not possible to incur

a negative payoff. In the experiment, the responders incurred a negative payoff when the realization of the amount to be shared is lower the what the proposer's own demand. In this way, responder were penalized in their probability of getting a high price, as it will be explained more in detail later on. Overall, we will analyze 49 instances of altruistic sanctioning and 69 instances of altruistic rewarding.

3 THE ROLE OF FRAMING

The framing (the way a game is presented to the participants) of an experiment is an important issue in the design of an experiment and can affect the results in a way which must be carefully taken into account. In this chapter, we provide an overview of the main effects of framing, following closely the article by Gerlach and Jaeger (2016). We can divide framing effects into two categories: the "valence framing effects" and the "context framing effects".

3.1 VALENCE FRAMING EFFECT

Valence framing effect argues that gains and losses are evaluated in a differently by each player. Generally, players evaluate the same amount of money more heavily when it's lost than when it's gained. In the experiment conducted by Güth et al (2019) the sellers in the market frame (M and M+) might feel that he/she owns what they are offering for sale. This might influence the way that the seller (proposer) feels about his/her offers. For example, since the seller might associate his/her offer to a loss more easily than players in the bargaining frame and might consequently play in a more self-oriented manner.

3.2 CONTEXT FRAMING EFFECTS

In the following section, we briefly summarise some of the most popular theories that apply to the context framing effects explained by Gerlach and Jaeger (2016) and we will categorise them into three classes. Each class argues for a different psychological mechanism underlying context framing effects. Notably, the proposed theories may all hold at the same time and in some cases valence framing effects may be explained by them.

3.2.1 COORDINATION DEVICE THEORY

The coordination device theory assumes that some players not only take into consideration their own payoffs, but also the payoffs of others or the relation between their own and others' payoffs. Since social preferences are often expected to be constant characteristics of the players, they cannot directly account for context framing effects. However, they can indirectly account for context framing effects if the player's expectation about her partner's choices are considered (first-order beliefs). Hence, context frames can induce different choices among players, who choose according to their first-order beliefs. In the experiment conducted by Güth et al. (2019), the three different protocols influenced these context frames. In the Market frame (M and M+), Player 1 was referred to as the seller, Player 2 as the buyer and their payoffs were referred to as the price for Player 1 and the buyer's value for Player 2. While in the Bargaining frame (B), Player 1 was referred to as the

proposer, Player 2 and the Responder and their payoffs as payoff demand (for Player 1) and common reward for Player 2, thus using the bargaining frame rather than the market frame might increase the probability of cooperative player's first-order belief in the event that he/she believes that it will also raise the first-order belief of his/her partner.

3.2.2 GROUP IDENTITY THEORY

Group identity theory assumes that players categorise all players into groups, and that this may influence their behaviour towards other players. For example, if players in a game have a social preference for maximising joint payoffs, a series of incompatible goals can prompt players to change their social preferences down and cause them to maximise their own payoffs rather than joint payoffs, behaving in a more self-oriented manner.

3.2.3 SOCIAL NORMS THEORY

The third class of theories argues that context frames induce players to associate games with various social contexts which are associated with their respective social norms. This is because a player might categorise the game as an example of social situations and then associates behavioural rules that are associated to it. In the experiment conducted by Güth et al. (2019), frame B represent a bargaining situation between a proposer and a responder, while frame M and M+ represents a market situation between a buyer and a seller. Participants might change their behaviours based on the social norms associated to the respective social situation.

4 DESCRIPTION OF THE EXPERIMENT

4.1 THEORY

Let $V \in (0,1]$ denote the (uniformly distributed) random value of the customer who may buy exactly one unit at price $x \in [0,1]$, which means that trade only trade should only occur when $V \geq x$, for otherwise the buyer would incur in a negative payoff.

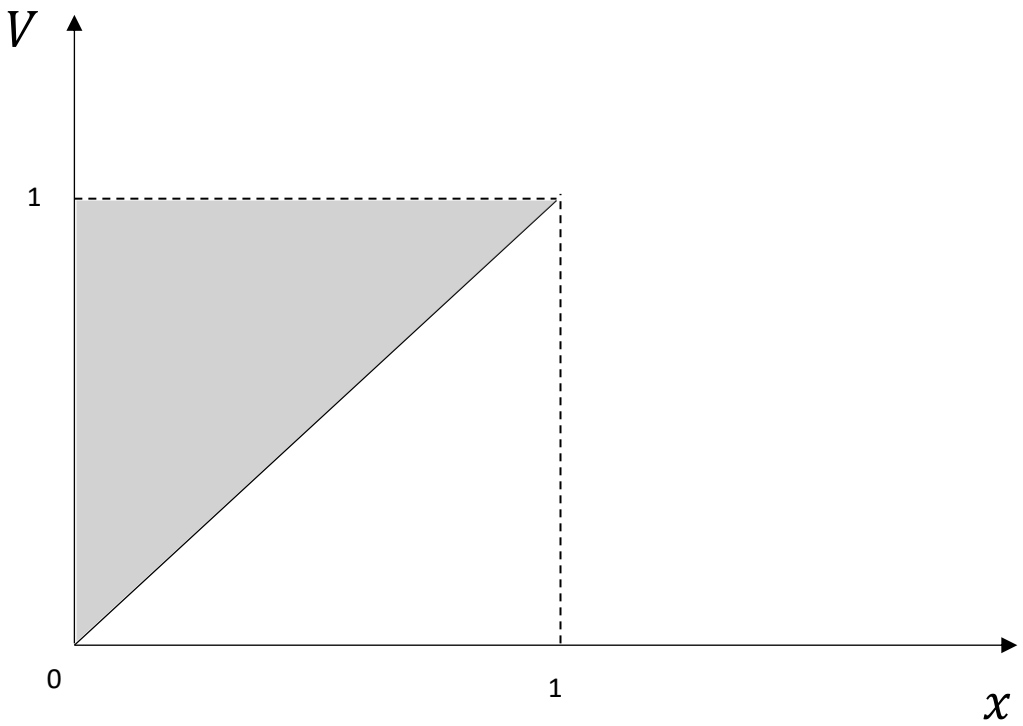

Figure 5: Graph showing the uniformly distributed random value of the customer (V) who may buy exactly one unit at price x ∈[0,1].

In Figure 5 the shaded area of the graph is the section for which $V \geq x$ and is the one in which trade occurs. On the x-axis we have the price offered by the seller, and on the y-axis we have V, which we defined previously as the uniformly distributed random value of the buyer. The risk neutral seller set the price $x \in [0,1]$ and expects to earn:

$$x \int_{x}^{1} dV = x(1-x)$$

This is because when the price is *x* there is a probability equal to $(1-x)$ that the buyer accepts to trade since V is uniformly distributed. The seller will choose *x* in order to maximize the expected earnings. Differentiating the above expression with respect to *x* gives the following first order condition

$$-2x + 1 = 0,$$

which can be solved for *x* to obtain:

$$x^* = \frac{1}{2}$$

Thus, the optimal price the seller should ask is $\frac{1}{2}$. Therefore, the solution play (which prescribes price acceptance only if $V \geq x$ and the price offered by the seller is x^*) predicts that price of the seller will be accepted with probability $\frac{1}{2}$ and, therefore, that it will result in an expected payoff equal to $\frac{1}{4}$.

Furthermore, when $V \geq \frac{1}{2}$ the customer buys and earns $V - \frac{1}{2}$, and abstains from buying when $V < \frac{1}{2}$. This yields in expectation for the buyer:

$$\int_{1/2}^{1} \left(V - \frac{1}{2}\right) dV = \frac{1}{8}$$

Observe that $x^* = 1/2$ does not result in equal expected payoff for the seller and the buyer. However, it can be focal, since it corresponds to the midpoint of the possible choices of the seller. Indeed, equality of expected payoff requires that the offered price is $x = \frac{1}{3}$ for which

$$\frac{1}{3} \int_{1/3}^{1} dV = \int_{1/3}^{1} \left(V - \frac{1}{3}\right) dV = \frac{2}{9}$$

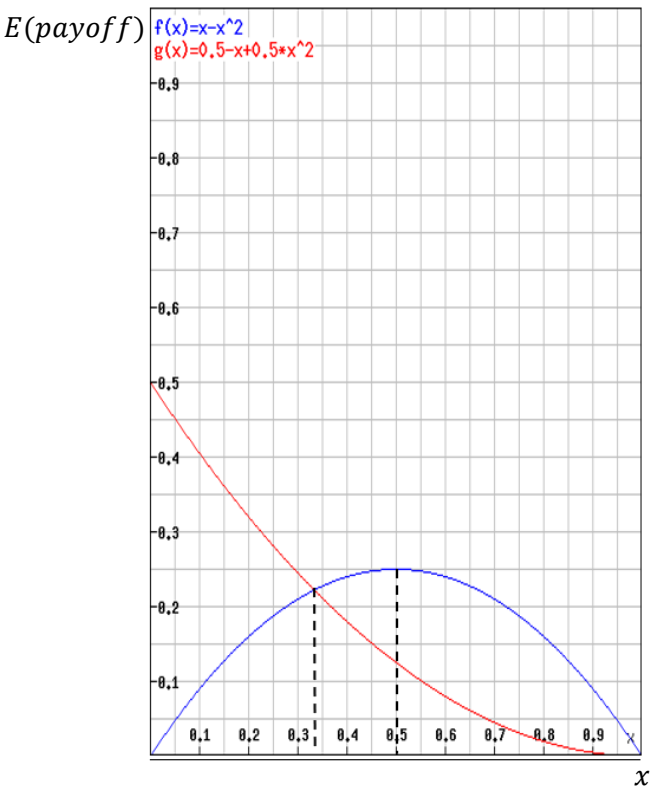

Figure 6: Players' expected payoffs (graph realized with https://rechneronline.de/function-graphs/)

As one can see from *Figure 6*, in which the blue line is the expected payoff of Player 1, or the seller, and the red line is the expected payoff of Player 2, or the buyer, payoffs are equalized at $\frac{1}{3}$. Furthermore, one can see that offering $x > \frac{1}{2}$ actually reduces the expected payoff of the seller, and also that of the buyer. When $0 \leq x \leq \frac{1}{3}$, the expected payoff of the responder is higher than that of the proposer. However, as x gets closer to $x = \frac{1}{3}$ the proposer's payoff increases while the responder's payoff decreases. At $x = \frac{1}{3}$ the payoffs between the two players are equal, while in the range $x > \frac{1}{3}$. the proposer expectedly earns more than the responder reaching the peak at $x = \frac{1}{2}$.

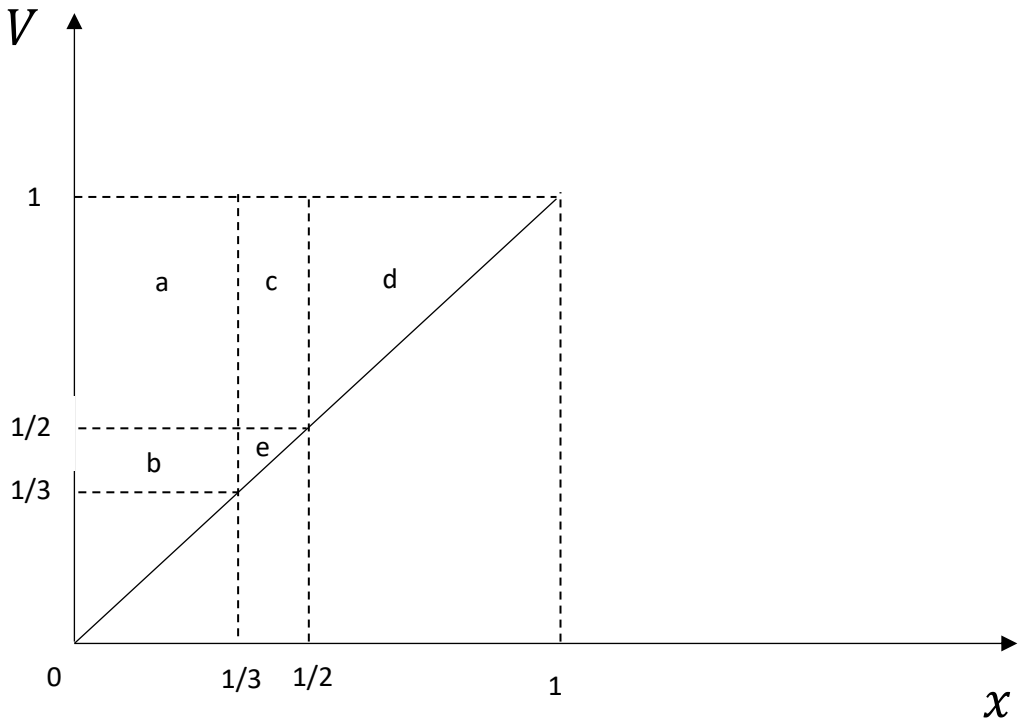

Figure 7: Graph showing the differences in payoffs for Player 1 and Player 2 for two different prices.

In Figure 7 we can see a visual representation of the payoff for each of the two players, the area of $a + b$ represents the payoff of the proposer with $x = \frac{1}{3}$, while the area $c + d + e$ of the graph represents the payoff for the responder when $x = \frac{1}{3}$, both areas $a + b$ and $c + d + e$ equal to $\frac{2}{9}$. We can also notice how the area representing the expected payoff of the proposer at $x = \frac{1}{2}, a + c$, gets larger than the area $a + b$, which we previously saw represents the area for $x = \frac{1}{3}$.

4.2 PROTOCOLS OF THE EXPERIMENT

The three different protocols implemented in the experiment are labelled M for "Market", M+ for "Market with common ownership" and B for "Bargaining. They feature the same stochastic game, however presented with a different verbal jargon. In the Market frame (M and M+), Player 1 was referred to as the seller, Player 2 as the buyer and their payoffs were referred to as the price for Player 1 and the buyer's value for Player 2. In the Bargaining frame (B), Player 1 was referred to as the proposer, Player 2 and the Responder and their payoffs as payoff demand (for Player 1) and common reward for Player 2. The "M+" frame has the same market jargon of frame "M" but specifies in a paragraph of the instructions that both seller and buyer collectively and equally own the commodity, which can only be used individually by the buyer. The Market frame M could let the sellers perceive that they own what they are offering for sale whereas the Bargaining frame B appeals to a common reward which proposer and responder can share. The three protocols are implemented between subjects. In all treatments participants are told at the beginning that they will play repeatedly for 20 rounds with randomly changing partners.

To induce risk neutrality of participants a random lottery incentive mechanism is introduced. The payoff of each player consists of probability points for gaining 14 € rather than only 4 € (in addition to the show up fee of 4 €). In the experiment one's probability of earning 14 € is:

$$\frac{125 + \alpha}{250}$$

α is the payoff, defined and analysed in section 4.1, times 100. Since one player can either gain and lose at most 1, the probability of winning 14 € is between $P(14€) = 25/250$ and $P(14€) = 225/250$, with strictly positive probability.

Participants are assigned randomly to the role of proposer or responder and this role is maintained throughout the experiment. The interacting successively with randomly changing partners and, after each round they are informed about the past choice of *x*, its acceptance or rejection and the probability to earn 14 € if the round is selected for payment. Random re-matching relies on groups with six participants, three for each role (without informing participants about restricted re-matching).

5 RESULTS OF THE EXPERIMENT

In this section we analyse the altruistic sanctioning effects and the altruistic rewarding effect. The experiment consists of more than 2000 observations, divided in three different treatments (B, M, M+) and only in 49 cases there is altruistic sanctioning effect, while the altruistic rewarding effect is registered 69 times.

In 5.1, we analyse in this section is the histogram of rejected offers in relation to the share of the total value offered for all the treatments. Secondly, we analyse the different results for the three different protocols (B, M, M+), starting from a bar graph representing the average percentage of the refused offer by the participants of the three treatments, and then we explore more in-depth each one of them. Then, we analyse the difference on the average share of refused the total pie for each gender and the difference for each of the frames recorded. Lastly, we make an in-depth analysis of the average share of the total pie rejected between "Economics students" and "Non-Economics student", showing also the data for each faculty and the difference for each protocol between the difference between "Economics" and "Non-Economics Students".

In 5.2, we analyse the number of subjects that accepted offers in each frame and the number of observations registered, to see in which of them this effect occurred most often. Then, we analyse the average payoff for the proposer in each frame for which we recorded altruistic rewarding and the average negative accepted payoff by the responder. Thirdly, we look at the differences in average ratio of proposer's payoff to the total value of the pie for all frames and then analyse it for each of the three frames studying their histograms. We finally study the average ratio between the proposer's payoff and the total value of the pie for men and women, and for economics and non-economics students.

5.1 ANALYSIS OF ALTRUISTIC SANCTIONING FOR EACH FRAME

5.1.1 ANALYSIS OF THE AVERAGE SHARE OF PIE REJECTED FOR EACH FRAME

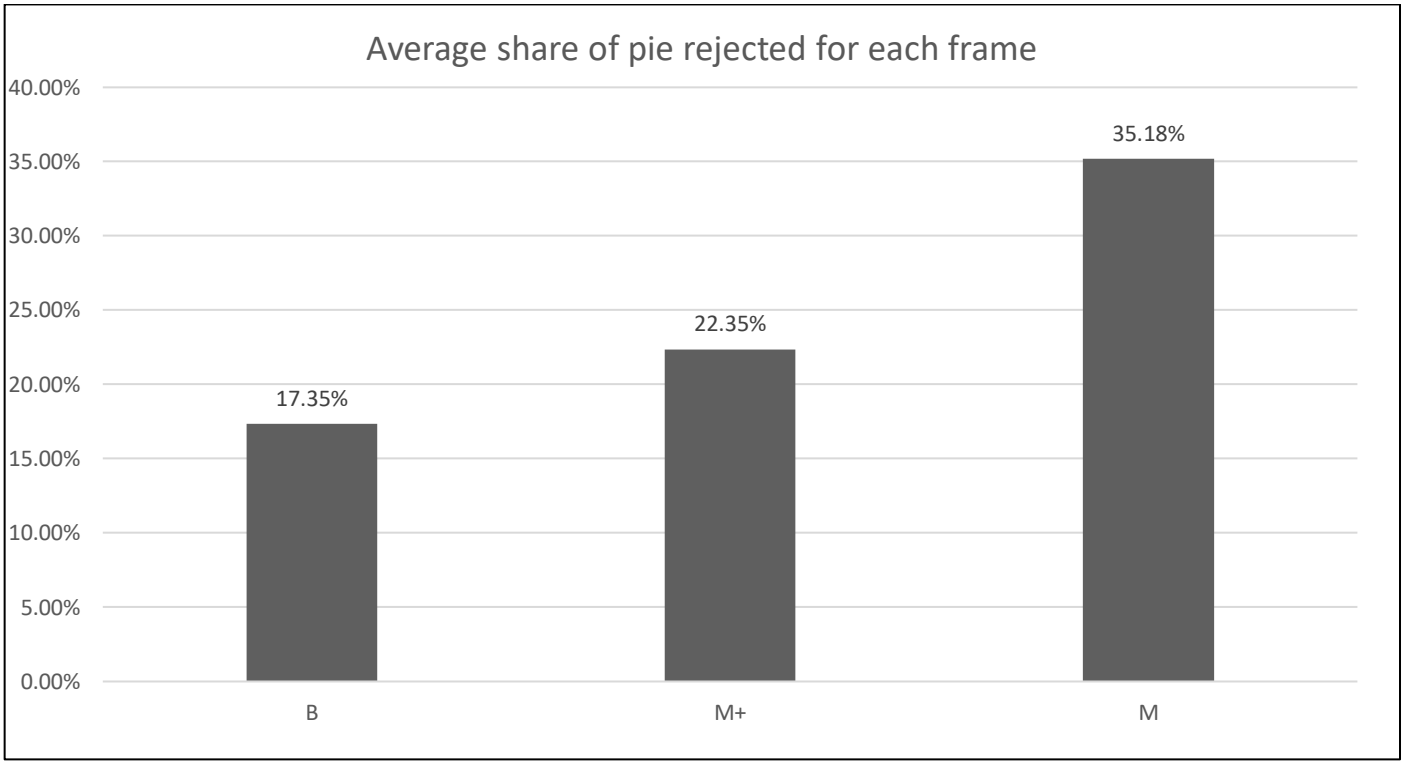

Figure 8: Average share of pie rejected for each frame.

First let's look to the average share of pie rejected by the participants of each of the three treatments. In this case I used a bar graph in order to represent visually the difference between the three framing protocols. As one can see from the graph, the participants that were studied using frame "B" are the ones that one average rejected the lowest offers, they rejected an average of 17,35% of the total value. While the group of participants which rejected on average the highest offers were the ones under treatment "M", which refused an average of 35,18% of the total value. Instead, participants under treatment "M" rejected an average of 22,35% of the total value. This tells results tell us a lot on how differences in framing can influence results and it can also help us predict how each of the treatments influenced the histogram for each frame. In fact, treatment "M" will most likely contain the rejected offers above 50% of the total value of the pie that we previously saw in *Figure 8*. Those results can be evaluated according to the type of protocol that the bargaining frame adopts. In fact, in the ultimatum bargaining, the players appeal to a common reward, suggesting that in the bargaining frame the responder might be more willing to accept lower offers than in the market frame, as they are collaborating in order to share a common reward.

5.1.2 AVERAGE DEMANDED PAYOFF BY PROPOSER FOR EACH FRAME

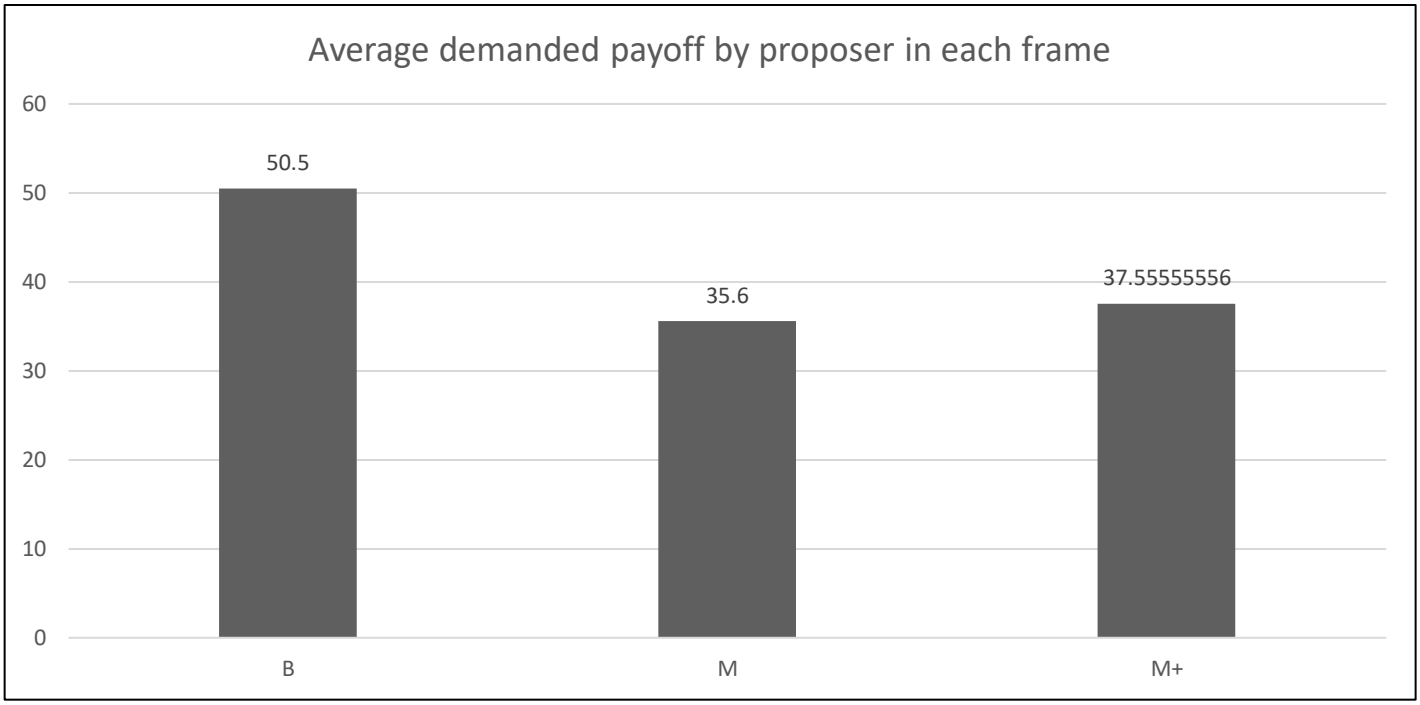

Figure 9: Average demanded payoff by proposer in each frame.

Figure 9 shows a bar graph which represents the average proposed price for each frame, that has subsequentially been rejected after the total value of the pie has been shown. As one can see, proposers in frame B generally offered less to the responders than players in frames M+ and M. On average participants in the bargaining frame proposed price x=0,51, while for frames M+ and M they offered respectively on average prices x=0,38 and x=0,36.

5.1.3 Analysis of number of subjects and positive rejected offers for each frame

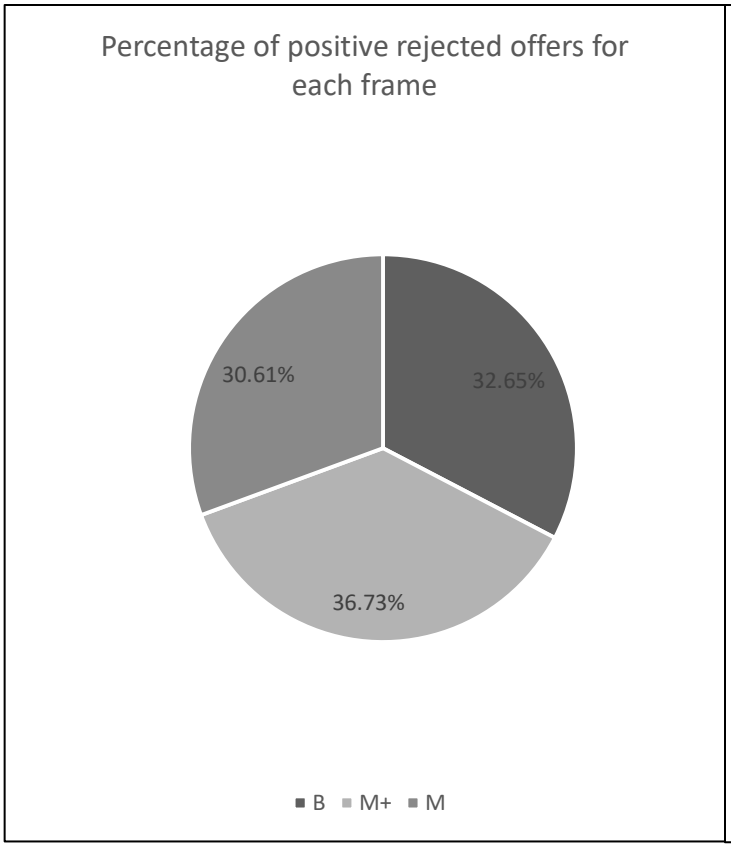

Figure 10: Percentage of positive rejected offers for each frame.

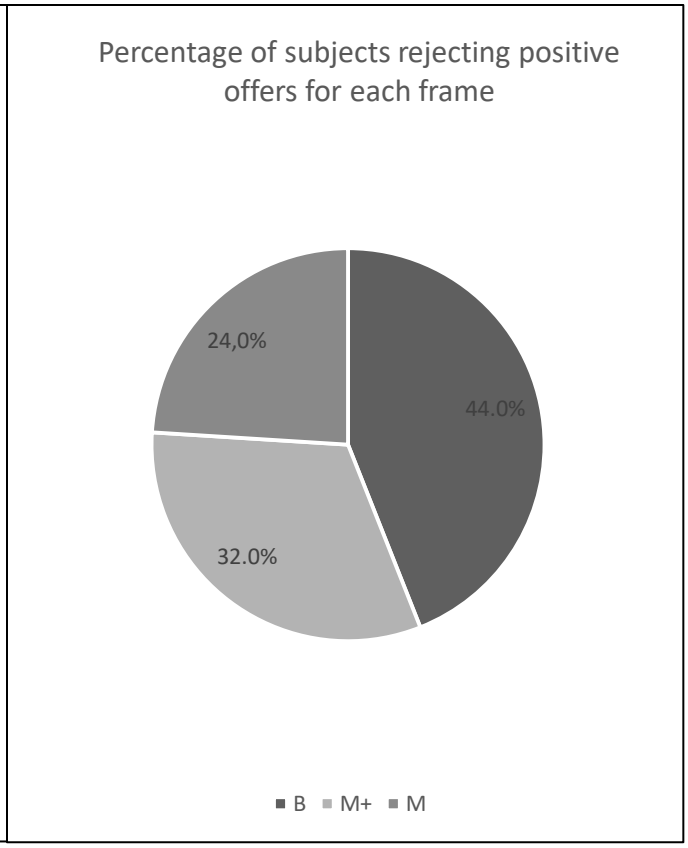

Figure 11: Percentage of subjects rejecting positive offers for each frame.

In Figure 10 we can see the average number of rejected offers for each of the three frames (B, M and M+). We can notice that the split between them is really similar, meaning that we nearly have the same number of rejected offers for each of them. Frame "B" contains 32,65% of all the rejected offers, this percentage is 36,73% for frame "M" and 30,61% for frame "M+".

However, it is important to analyse this data with the information we receive from Figure 11. Figure 11 shows us the percentage number of subjects who rejected at least one offer for each frame. We can clearly see that this pie graph shows completely a different scenario. In fact, the graph does not look equally split between the three frames. The number of subjects who rejected at least one offer for the "B" frame is 44,0%, 32,0% for the "M+" frame and 24,0% for the "M" frame.

Combining the data of the two pie graphs in Figure 9 and in Figure 10, we can calculate the average ratio of rejected offers per subject given that he rejected at least one offer, we can see the visual representation for this in Figure 12.

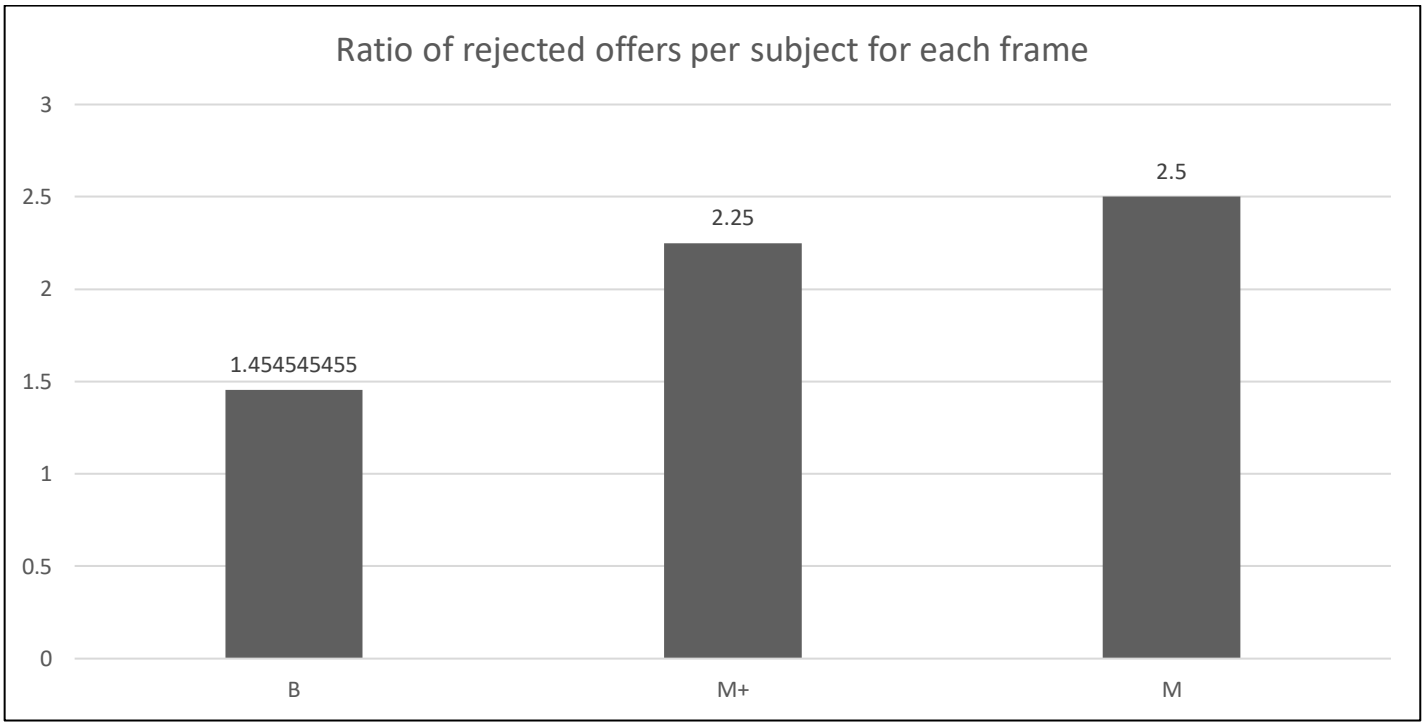

Figure 12: Ratio of rejected offers per subject for each frame.

In *Figure 12* we can see in fact the ratio of rejected offers per subject given that he/she has already rejected one offer for each frame. We can notice that on average the studied subjects in Frame "B" rejected fewer offers per person than the subjects in Frames "M" and "M+". Subjects that refused at least one offer in the experiment that were participating in Frame "B" rejected on average 1,45 offers each, while for frame "M+" and Frame "M" is respectively 2,25 and 2,5.

5.1.4 HISTOGRAM OF REJECTED OFFERS FOR ALL FRAMES

In this part of the analysis we will analyse the amount of observation recorded and a percentage of the total number of rejected offers to the percentage value of the offer in relationship to its total value. The percentage value of the offers to its total value (X-Axis) is divided in 10 intervals of 10%, the first bar represents the percentage of rejected offers which were between 0% and 10% of the total value and the second bar includes all the rejected offers between 10% and 20%, not including offers which were exactly 10%. This will repeat for other 9 intervals, ending at rejected offers which were between 90% and 100% not including offers that were exactly 90% of the total value. We expect the graph to have a downward sloping trend, because lower the offer from the proposer, the higher incentives for the respondent to reject it

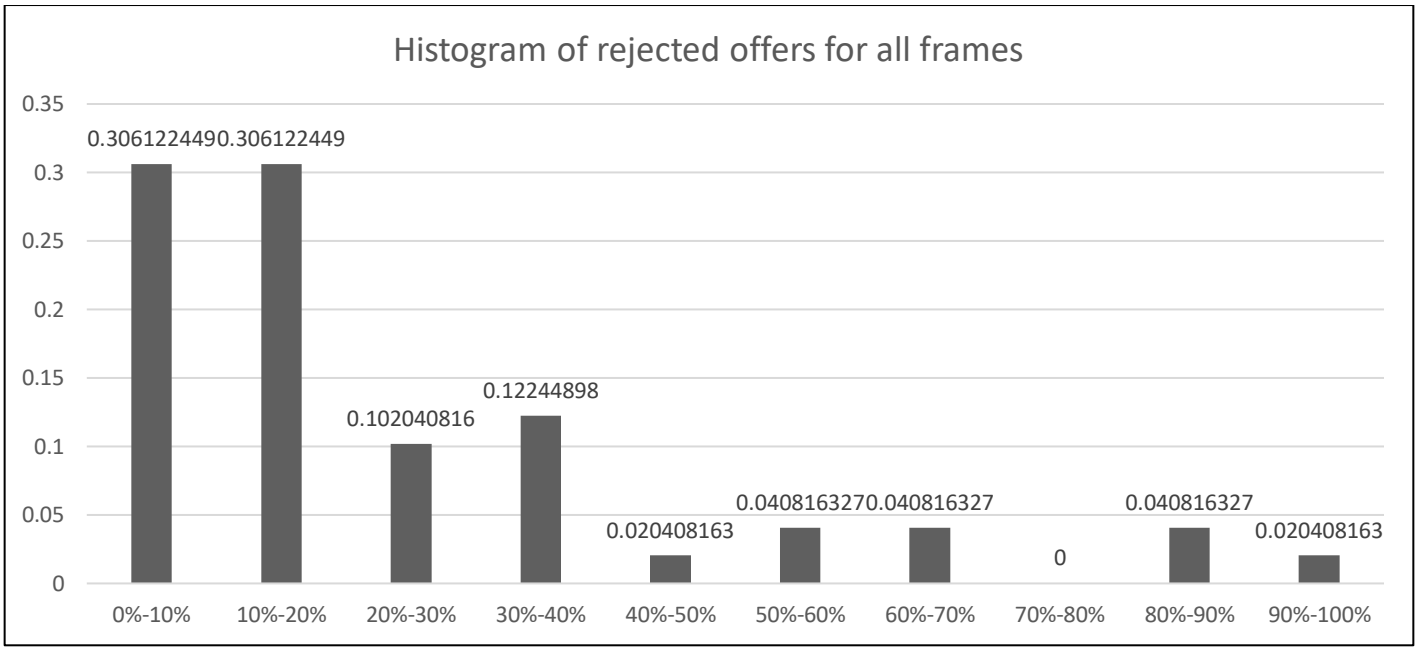

Figure 13: Histogram of rejected offers for all frames.

As the percentage of the value offered increases the amount of rejected offers decreases, as we can see from *Figure 13*. Of all the rejected offers, around 61,2% were offers below or equal to 20% of the total value. We can also see that around 14,3% of the rejected offers were above 50% of the total value and that 6,1% of them were included between 80% and 100%. This graph includes the results of all the framing protocols (B, M and M+).

5.1.4.1 FRAME “B”

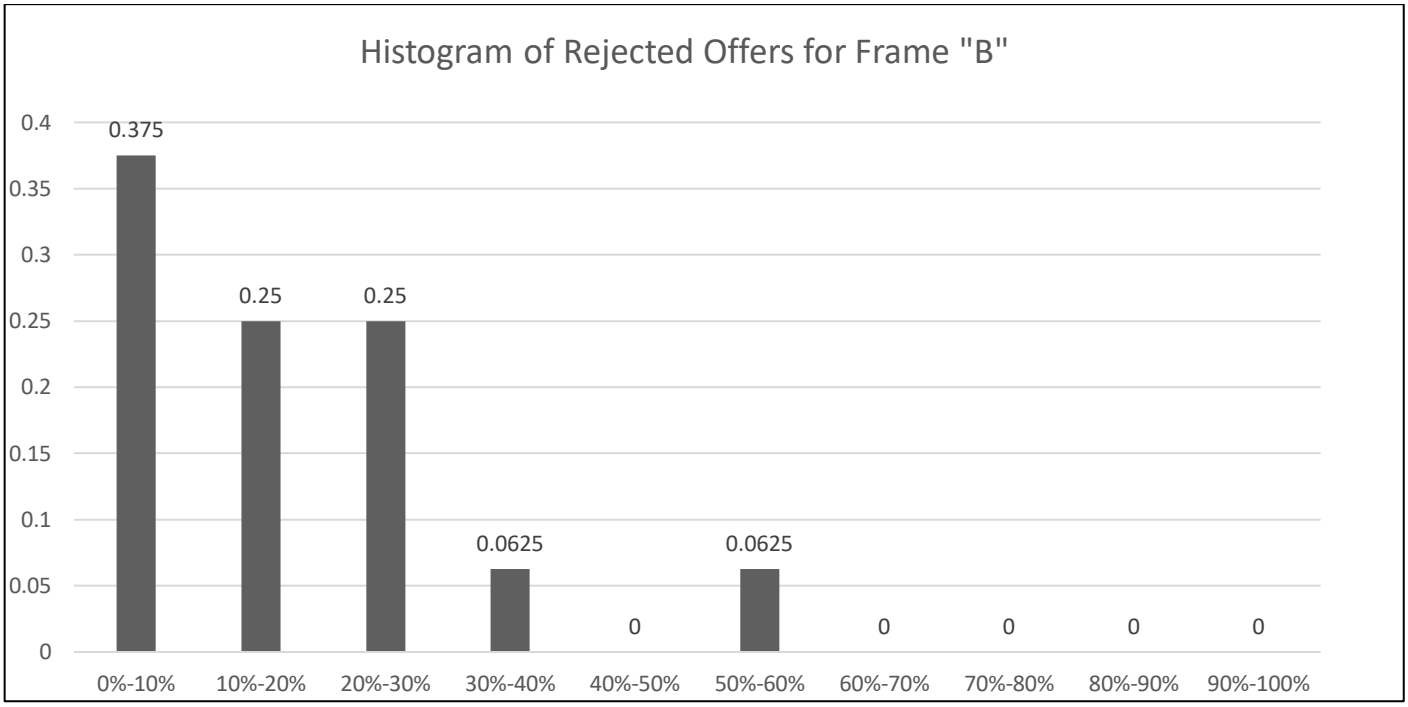

Figure 14: Histogram of rejected offers for frame “B”.

Rejected offers for the Bargaining frame (B) were on average the lowest if compared to those of participants in the Market frame. This is reflected also on the histogram of the of the rejected offers above. As we can see around 37,5% of rejected offers were 10% or less of the total value. On the histogram for all frames this percentage is 31,25%, which is 6,25% less compared to the one for “B” frame.

50% of the registered observations were in between 10% and 30% of the total value, which leaves only 6,25% of the rejected bargains from offers which were above 50% of the total value, and those observation only occur in the 50%-60% interval, while for the histogram for all frame this percentage is about 12,3% and it also includes rejected offers between 70% and 90% of the total value, which are completely missing from frame “B”.

5.1.4.2 FRAME “M”

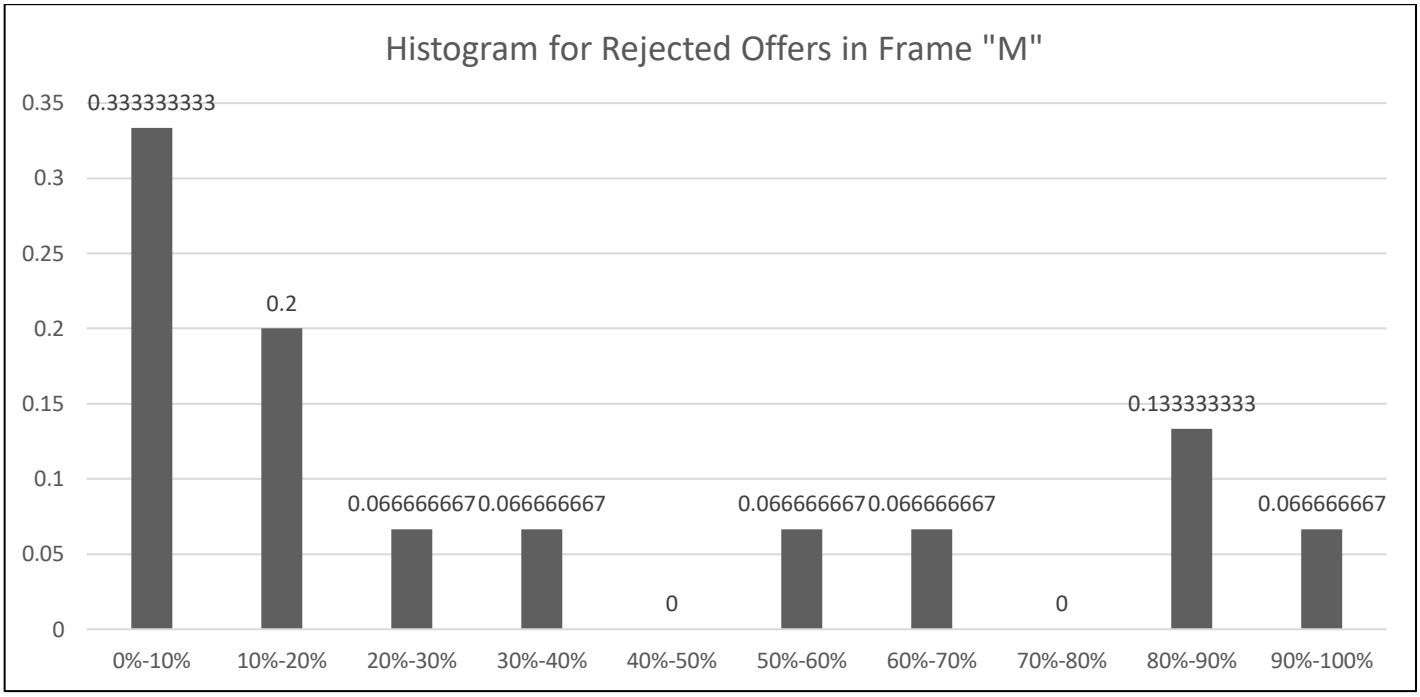

Figure 15: Histogram of rejected offers for frame “M”.

Rejected offers for the market frame “M” were on average the highest for percentage value if compared to those of participants in the bargaining frame “B” and the market frame “M+”. This is reflected also on the histogram of the of the rejected offers above. As we can see that around 33,3% of rejected offers were 10% or less of the total value. On the histogram for all frames this percentage is 31,25%, which is 2,05% less compared to the one for “M” frame.

Around 33,4% of the rejected bargains came from offers which were above 50% of the total value, which is a really high percentage, also considering that 13,3% of the rejected offers were between 80% and 90% of the total value and that we registered a rejected offer of 100% of its total value. It is the observation from subject 21, treatment M. We can consider this as a double error from both the proposer or the responder, due to the fact that it is really unlikely that the proposer offered the total value on purpose, leaving nothing to himself and that the respondent rejected it knowing that it still wouldn’t affect the value received by the proposer in any way. However, we could also consider that the responder decided to refuse the offer because he felt guilty from taking advantage of the too far generous offer of the proposer. We could have omitted this observation from the data, however in the same frame another two observation were recorded, rejecting 82,6% and 87,7% of the total value, from another two different subjects. Therefore, we decided to keep it and to analyse it in the conclusion.

All the discussed data formed the results we obtained for this frame and if we compare it with the other frames, we can see that the amount of rejected offers above 50% of the total value is far lower and includes rejected offers between 80% and 100% of the total value, which are completely missing from frames “B” and “M+”.

Due to the factors previously explained, in particular to the 20,0% of rejected offers between 80% and 100% of the total value, the mean of the refused offers is really high and as we saw previously reaches 35,2%. We could link those results to an error committed by both subjects 11, 14 and 21 of the "M" protocol.

If we omit the observations of rejected offers between 80% and 100% of the total value, the average percentage of rejected offers for frame "M" will fall to 21,4%, which is 13,8% less than previously calculated and changes completely the analysis of the results as Frame "M+" will now have a higher average percentage value of rejected offers (22,5%). We can see on *Figure 16* the histogram with the omitted observation. Their absence makes the trend line steeper than on *Figure 15*, looking a lot more similar to the histogram for frame "B".

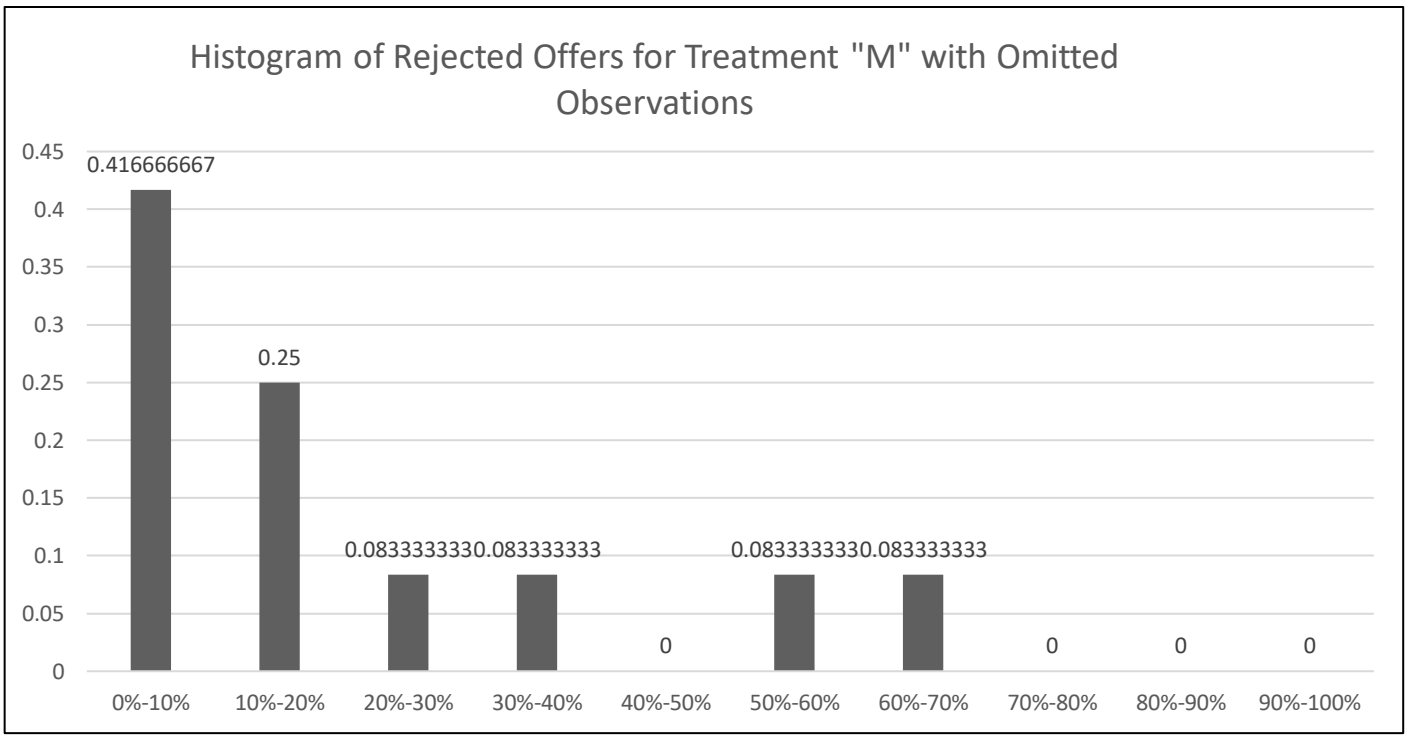

Figure 16: Histogram of rejected offers for frame "M" with omitted observations.

Around 41,66% of the total rejected offers came from offers lower than 10%. Only 16,6% of the registered observation came from offers higher than 50% and 84,4% of them came from offer equal or lower to 50% of their total value.

5.1.4.3 FRAME “M+”

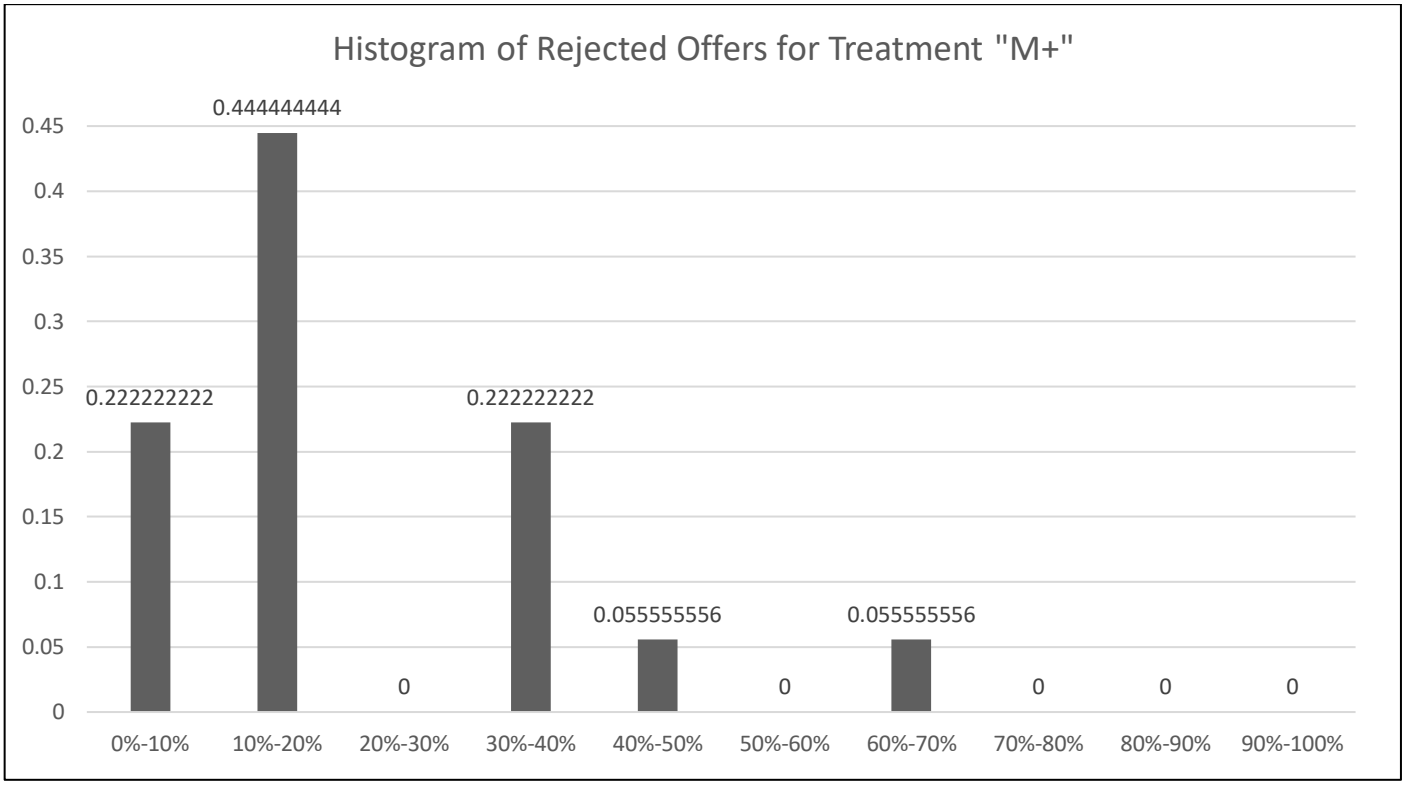

Figure 17: Histogram of rejected offers for frame “M+”.

Rejected offers for the market frame “M+” averaged 22,3% of the total value for rejected offers. This is reflected also on the histogram of the rejected offers above. We can notice that there is a really high percentage of rejected offers that were in the 10%-20% interval (44,4%) which is the highest recorded for all the different frames (25% for frame “B” and 21,4% for frame “M”). Furthermore, we can see that there is a really low percentage of rejected offers above 50% of the total value (5,6%) and that it is only included in the 60%-70% interval. In this aspect it is more similar to the “B” frame than to the “M” frame.

Around 66,6% of the registered observations were in between 10% and 30% of the total value, which leaves only 6,25% of the rejected bargains from offers which were above 50% of the total value, and those observation only occur in the 50%-60% interval, while for the histogram for all frame this percentage is about 12,3% and it also includes rejected offers between 70% and 90% of the total value, which are completely missing from frame “B”.

5.1.5 ANALYSIS OF ALTRUISTIC SANCTIONING BY GENDER

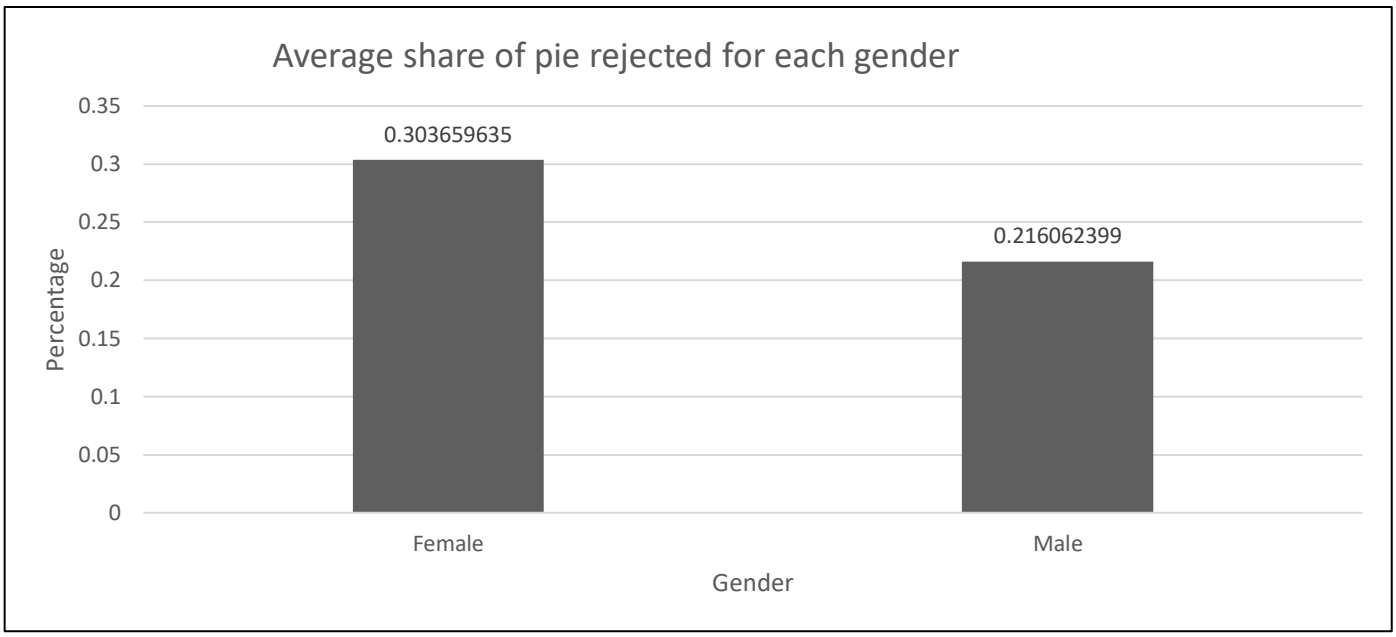

Figure 18: Average share of pie rejected for each gender.

The bar graph above shows the difference in the average share value of the total rejected pie of the two genders for all frames. As we can see the average share is much higher for the Female gender rather than the Male gender. On average, Female rejected 30,4% of the total value of the pie, while Male rejected 21,6% of its value. Those results consist of all the results registered for all treatments (B, M and M+).

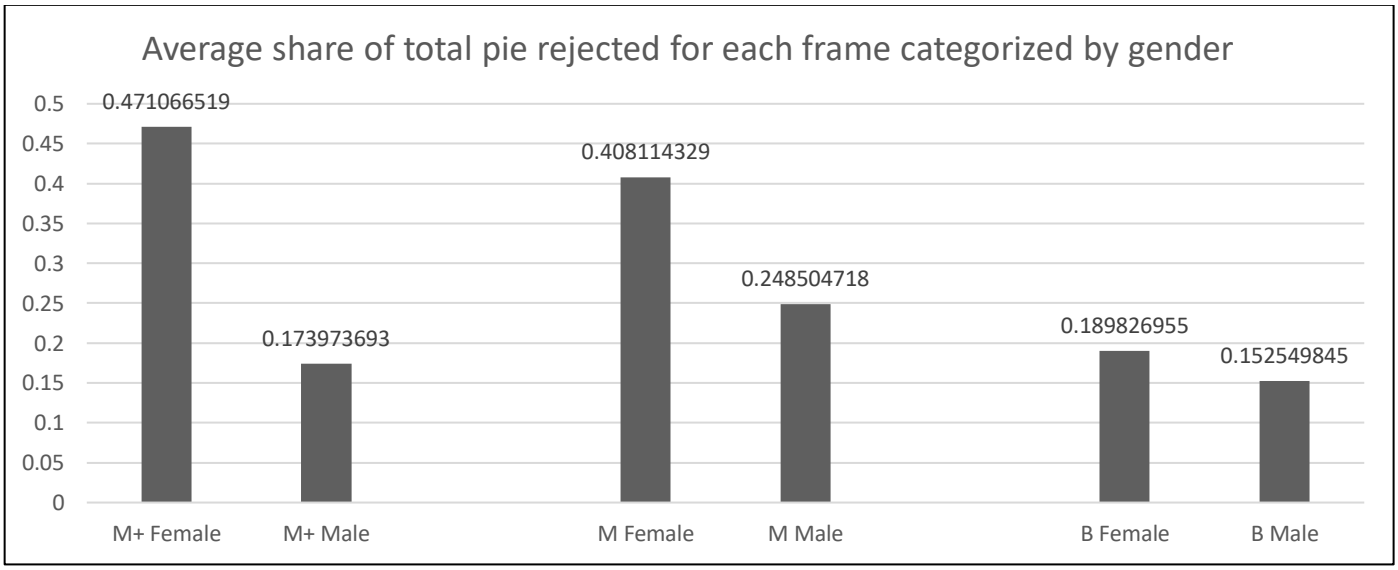

Figure 19: Average share of total pie rejected for each frame categorized by gender.

But if we analyse the results obtained for each of the different treatments, we can see that the female averages are always higher than their counterparts for any framing. The female averaged 47,1% for frame "M+", 40,8% for "M" and 19,0% for "B". while the male gender averaged 17,4% for frame "M+", 24,6% for "M" and 15,25% for "B". We can notice that he highest share value of the total pie for rejected offers for the female gender is "M+" with an average of 47,1% while for the male gender is frame "M" with an average of 24,8%.

5.1.6 Analysis of altruistic sanctioning for Economics and Non-Economics students

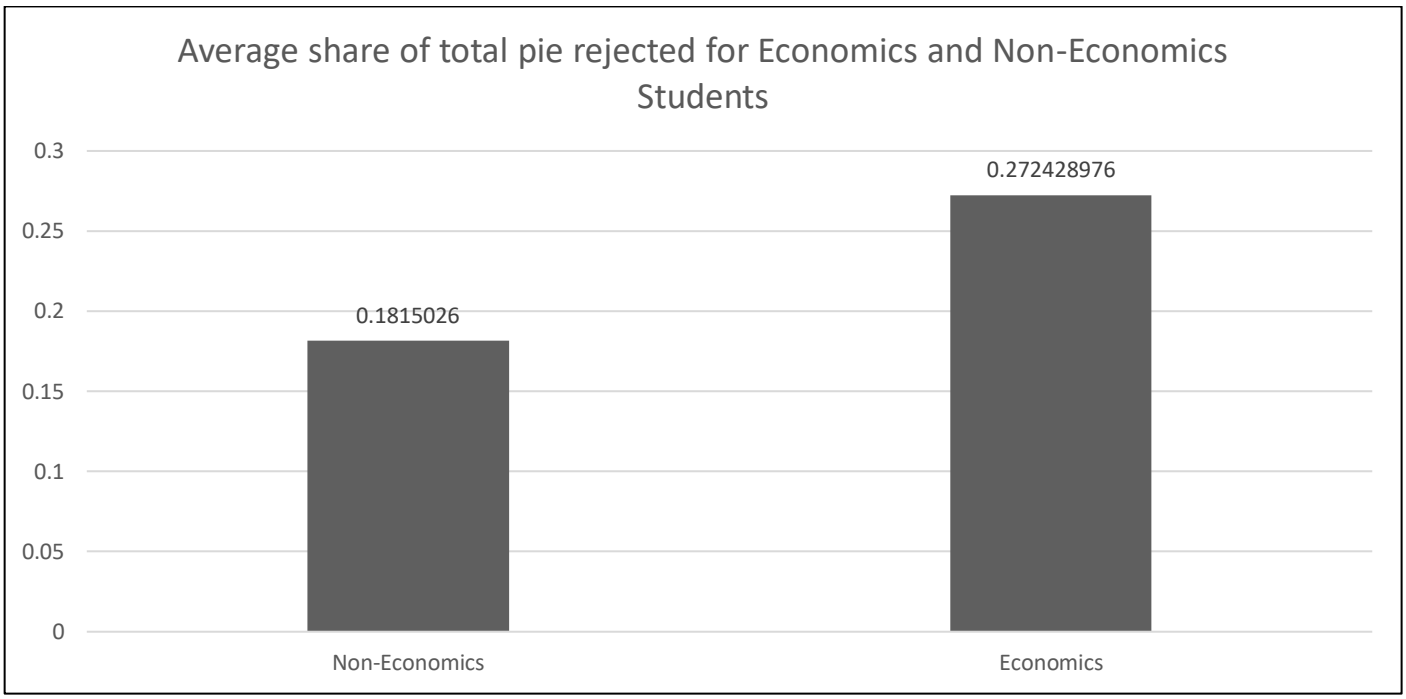

Figure 20: Average share of total pie rejected for economics and non-economics students.

In this final section of our analysis we analysed the average share of total pie rejected for Economics students and Non-Economics students. We can see from our bar-graph above that on average Economics students tend to reject higher offers made by the proposer compared to Non-Economics students which include Law students and "Politics, Philosophy and Economics" students. On average Economics students rejected 27,2% of the total value of the pie, while Non-Economics students rejected an average of 18,2% of the total pie.

5.2 ANALYSIS OF ALTRUISTIC REWARDING

Altruistic rewarding occurs whenever the responder decides to accept an offer from the proposer which results in a negative payoff, possibly recognising that the negative payoff is due to the low realization of the amount to be shared and not to a high demand by the proposer. In the experiment the participants incurred a negative payoff when V<x and they were penalized by having a lower probability of getting 14€ instead of 4€ (as we explained in section 4.2). This effect was registered 69 times throughout the experiments for all frames, which is more than the observations for altruistic sanctioning which only occurred 49 times.

In this section, the first thing that we are going to analyse is the number of subjects that accepted offers in each frame and the number of observations registered, to see in which of them this effect occurred the most. Then, we will analyse the average payoff for the proposer in each frame for which we recorded altruistic rewarding and the average negative accepted payoff by the responder. Thirdly, we will look at the differences in average ratio of proposer's payoff to the total value of the pie for all frames and then analyse it for each of the three frames studying their histograms. We will then study the average ratio between the proposer's payoff and the total value of the pie for men and women, and for economics and non-economics students

5.2.1 Analysis of number of subjects and accepted negative offers for each frame

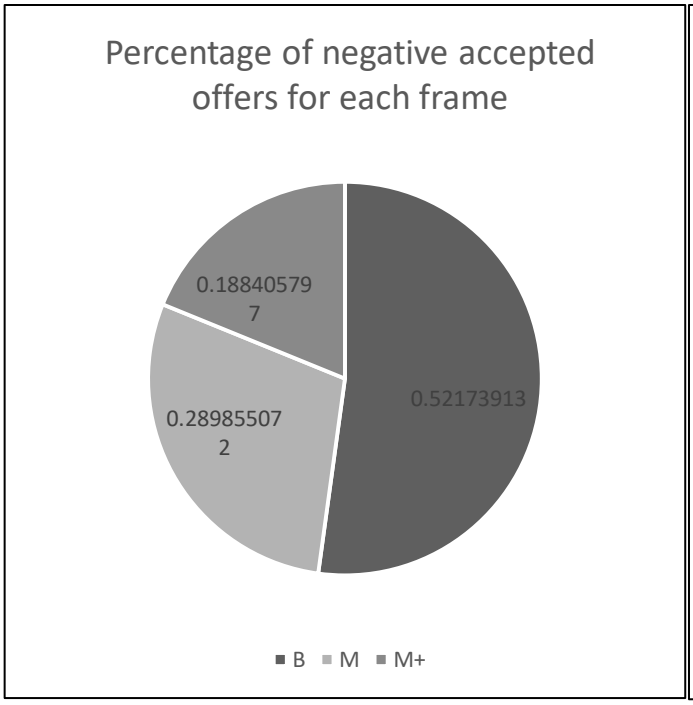

Figure 21: Percentage of negative accepted offers for each frame.

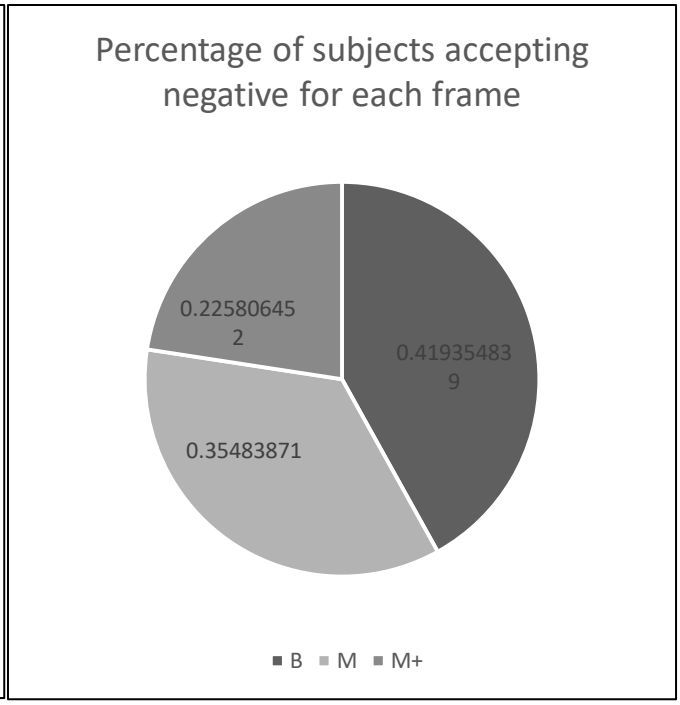

Figure 22: Percentage of subjects accepting negative offers for each frame.

In *Figure 21* we can see a pie graph for the number of accepted negative offers for each of the three frames (B, M and M+). One can notice that recorded observation of accepted negative offers in frame B is much higher than that for frame M and for frame M+. Frame "B" contains 52,2% of all the negative accepted offers, this percentage is 30,0% for frame "M" and 18,8% for frame "M+".

However, it is really important to analyse this data with the information we receive from *Figure 22*. *Figure 22* shows us the percentage number of subjects who accepted at least one negative offer for each frame. The number of subjects who rejected at least one offer for the "B" frame is 41,9%, 35,5% for the "M" frame and 22,6% for the "M+" frame.

Frame B has the highest number of subjects accepting negative offers and also the highest amount of observations registered, while frame M+ has the lowest percentage in both of the cases. Combining the data of the two pie graphs in *Figure 21* and in *Figure 22*, we can calculate the average ratio of negative accepted offers per subject given that he rejected at least one offer, we can see the visual representation for this in *Figure 23*.

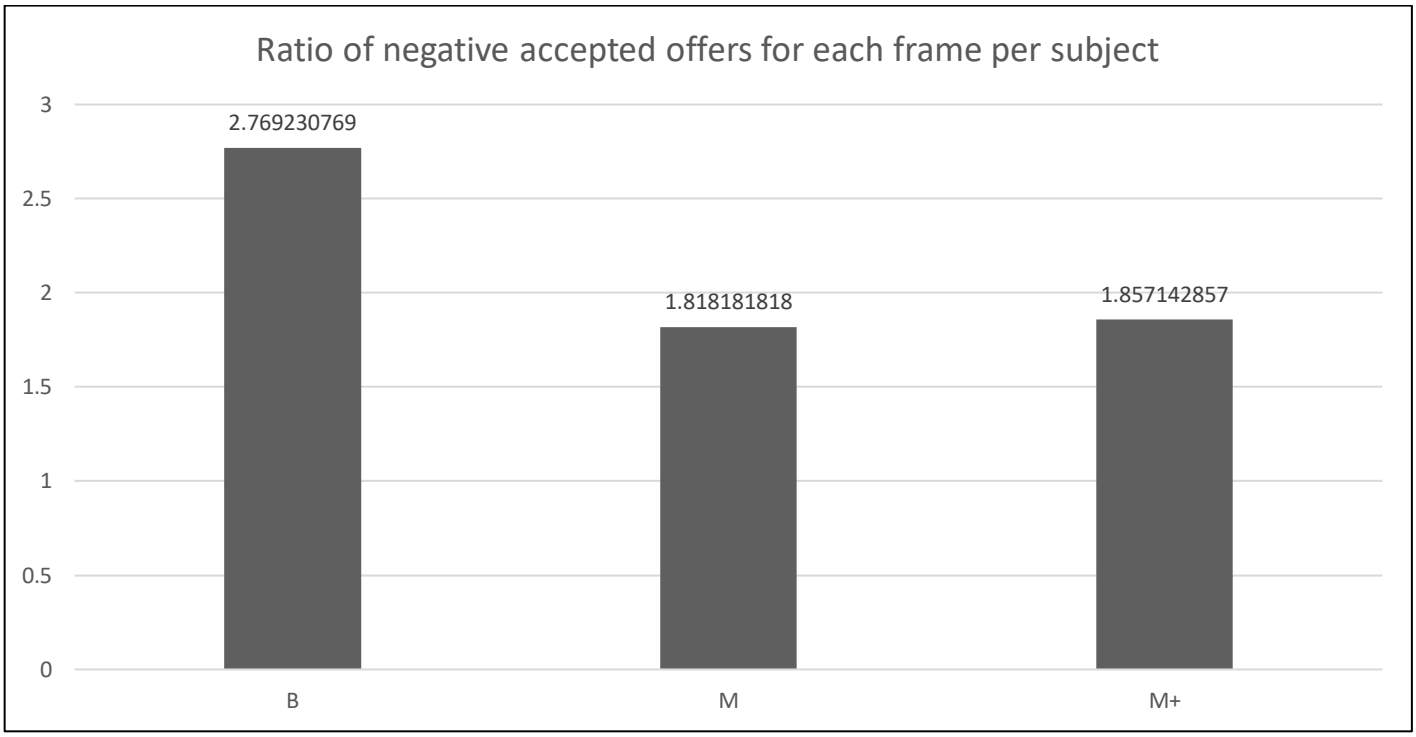

Figure 23: Ratio of negative accepted offers for each frame per subject.

In *Figure 23* we can see in fact the ratio of negative accepted offers per subject given that he/she has already accepted one offer for each frame. We can notice that on average the studied subjects in Frame "B" accepted more negative offers per person than the subjects in Frames "M" and "M+". Subjects that accepted at least one negative offer in the experiment that were participating in Frame "B" accepted on average 2,77 offers, while for frame "M+" and Frame "M" is respectively 1,86 and 1,82.

5.2.2 ANALYSIS OF AVERAGE PAYOFF FOR PARTICIPANTS OF EACH FRAME

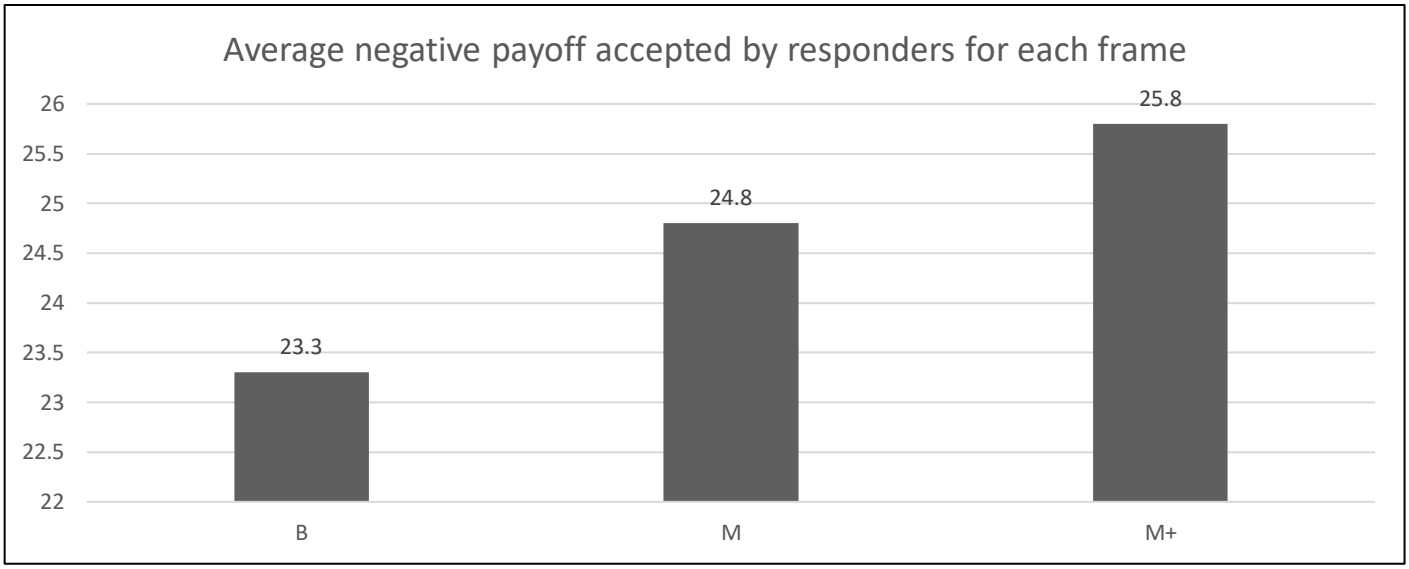

Figure 24: Average negative payoff accepted by responders for each frame.

In this section we are going to analyse the average negative accepted offer for each frame. As one can see from *Figure 24*, participants in frame B that altruistically rewarded their counterpart accepted on average the lowest negative payoffs (23,3), while participants in frame M+ registered the highest average (25,8). Subject in frame M accepted on average a negative payoff of 24,8. This means that on average subjects in frame M+ tended to accept higher negative payoffs in order to reward the counterpart. However, it is also useful to assess what is the average payoff received by proposers for each frame so that we can better understand how proposers and responders interact with each other in each frame.

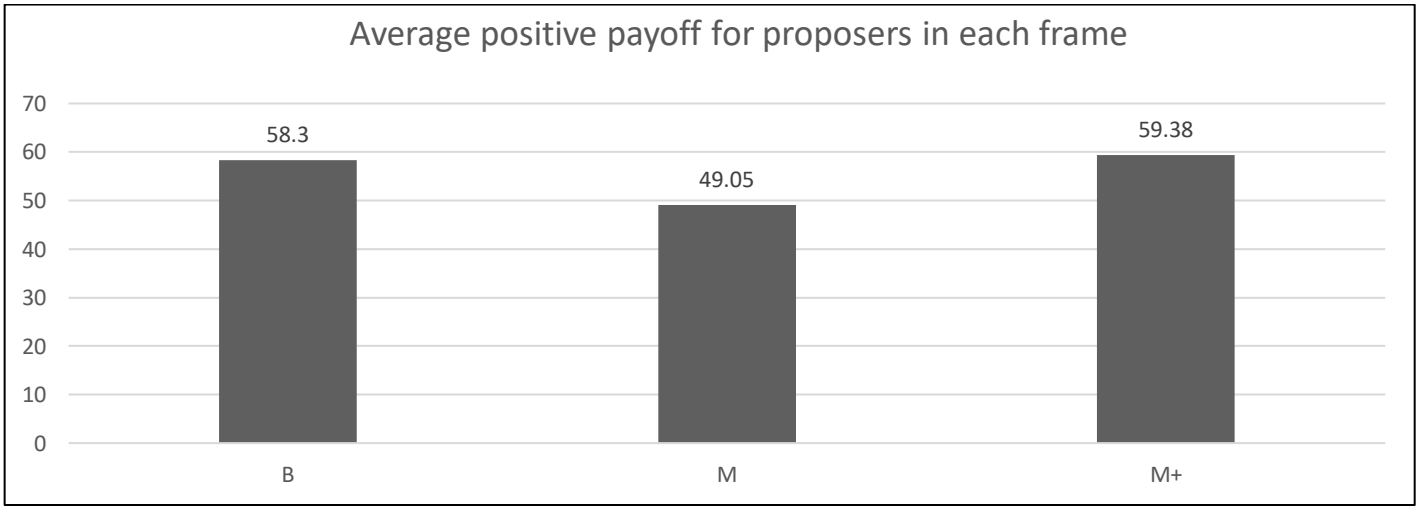

Figure 25: Average positive payoff for proposers in each frame.

Figure 25 tells us how much payoff proposers received on average in the observations in which altruistic rewarding occurred. As one can see proposers in frame M+ received on average the highest payoff (59,4). Proposers in frame B received on average 58,3 while in frame M they received the lowest average payoff at 49,1.

5.2.3 Analysis of ratio between demanded payoff and total value of the pie

By calculating the ratio between the demanded payoff by the proposer and the total value of the pie we can have a measure on how "generous" responders in each of the frame were. This is because dividing the demanded payoff by the total value of we can understand how much the responders had to give up relative to the benefit received by the proposer. The higher the ratio, the more generous the responders are because it means that they had sacrificed a larger payoff in relation to the proposer's payoff in order to let him benefit from a positive payoff.

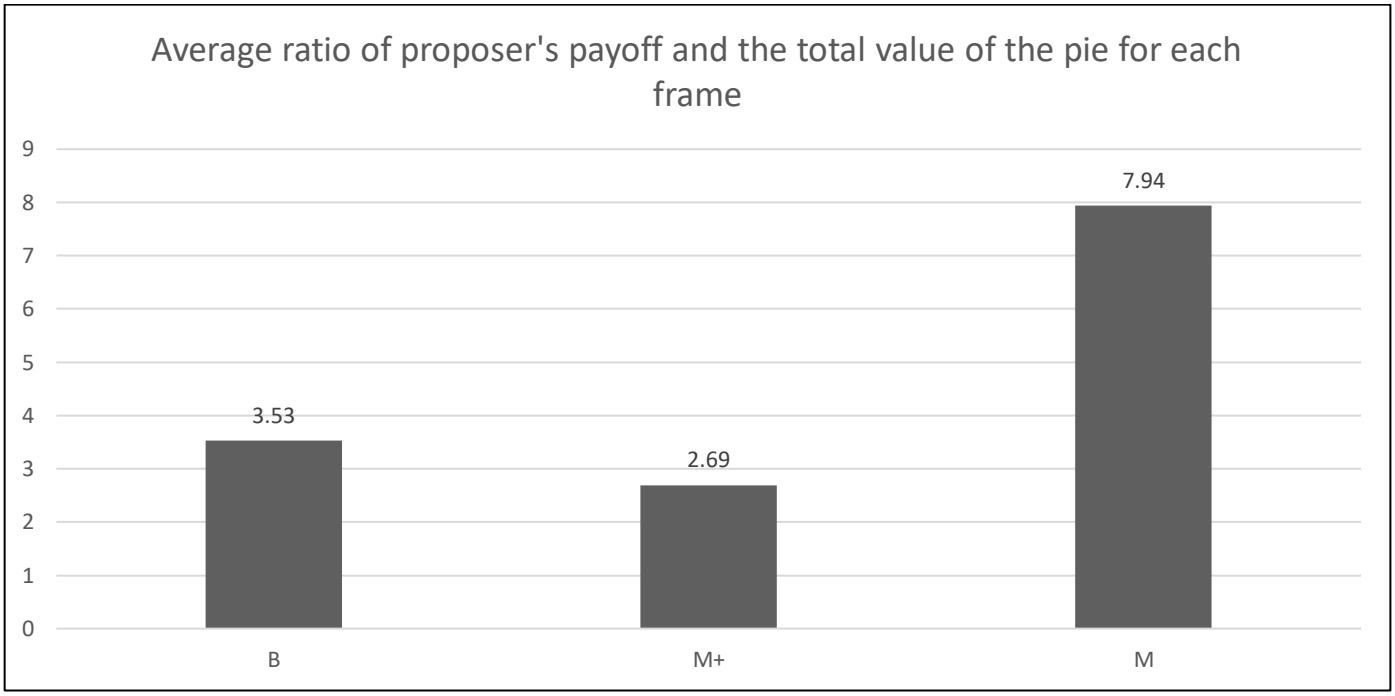

Figure 26: Average ratio of proposer's payoff and the total value of the pie for each frame.

As one can see from *Figure 26* on average participants in the market frame M were more generous compared to the participants in frame B and frame M+. The ratio between the proposer's payoff and the total value of the pie is larger on average for participants in frame M. This ratio is 7,94 for participants in frame M, 2,69 for participants in frame M+ and 3,53 for participants in frame B.

5.2.4 HISTOGRAM OF ALTRUISTIC REWARDING

In this section we are going to look at the previously described data in the form of a histogram for different series of intervals. I chose 5 intervals, in the first one I measured the frequency of observations having a ratio of payoff per total value of the pie between one and two (including two). The second interval was for ratios between two and three (not including 2, but including three), then ratios between three and five, then five to ten and finally all ratios above ten.

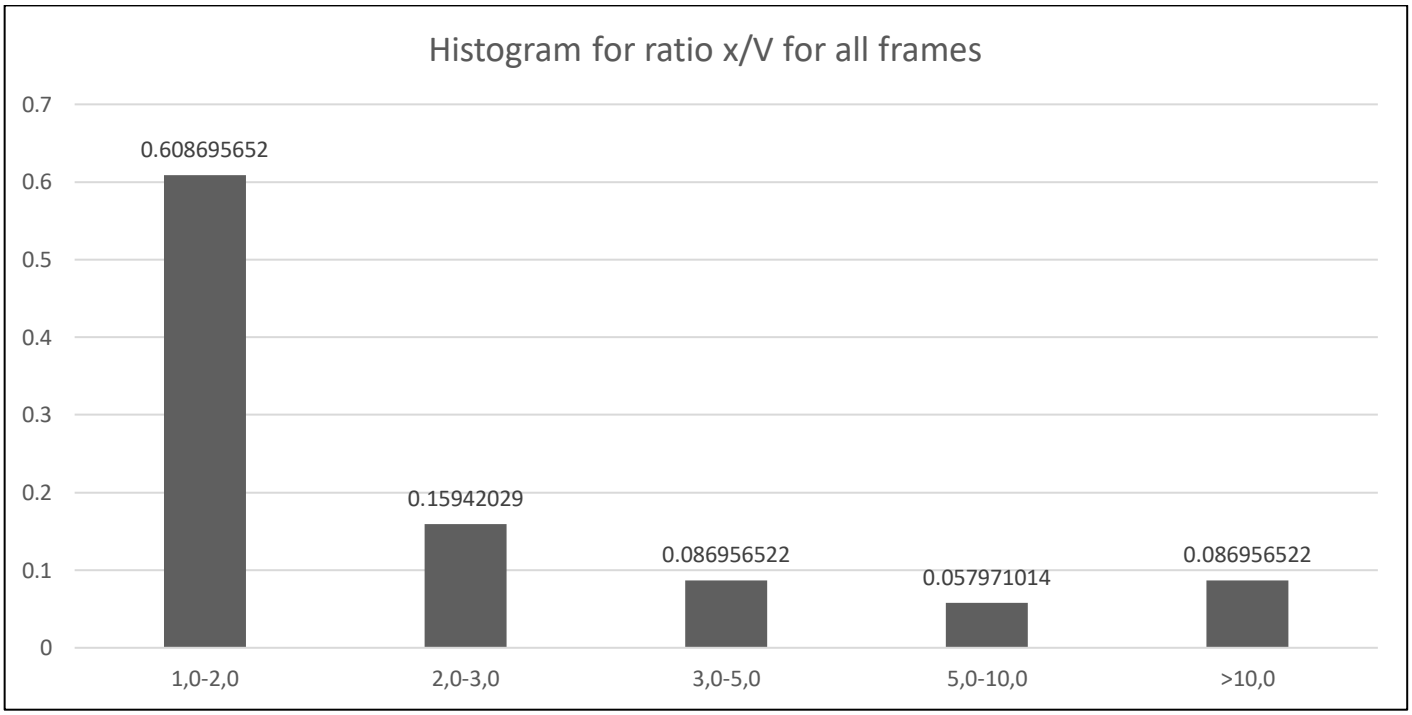

Figure 27: Histogram for ratio x/V for all frames.

In *Figure 27* we can see the histogram for the ratio between the proposer's payoff and the total value of the pie for all frames. The histogram is downward sloping, meaning that for all frames as the ratio increases we have fewer observations. Of all the observations, 60,7% came from accepted offers that earned the proposer a payoff that was in between one or two times the value of the pie. This ratio occurred 15,9% of the times for demanded payoff that were two to three times the value of the total pie, 8,7% for demanded offers between three to five times larger. 5,7% of the observations came from demanded offers that were five to ten times the value of V. While 8,7% of the observations came from demanded payoffs that were higher than ten time the value of the total pie. This graph includes the results of all the framing protocols (B, M and M+).

5.2.4.1 ALTRUISTIC REWARDING FOR FRAME B

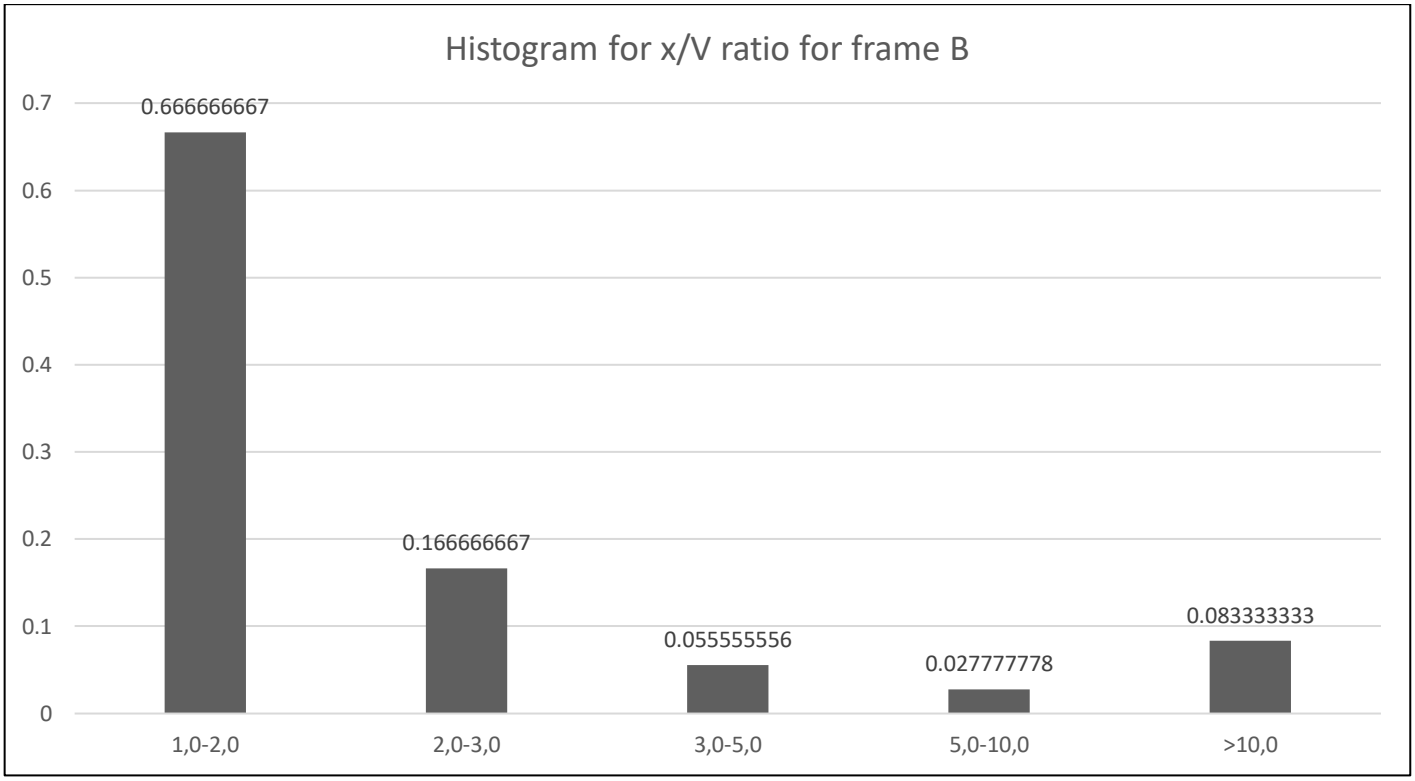

Figure 28: Histogram for x/V ratio for frame B.

In *Figure 28* we can see the histogram for the ratio between the proposer's payoff and the total value of the pie occurred in bargaining frame (B). Of all the observations, 66,7% came from accepted offers that earned the proposer a payoff that was in between one or two times the value of the pie. This ratio occurred 16,7% of all the observations for demanded payoff that were two to three times the value of the total pie; 5,6% for demanded payoffs between three to five times larger than the total value. 2,8% of the observations came from demanded payoffs that were five to ten times the value of V. While 8,3% of the observations came from demanded payoffs that were higher than ten times the value of the total pie.

5.2.4.2 ALTRUISTIC REWARDING FOR FRAME M+

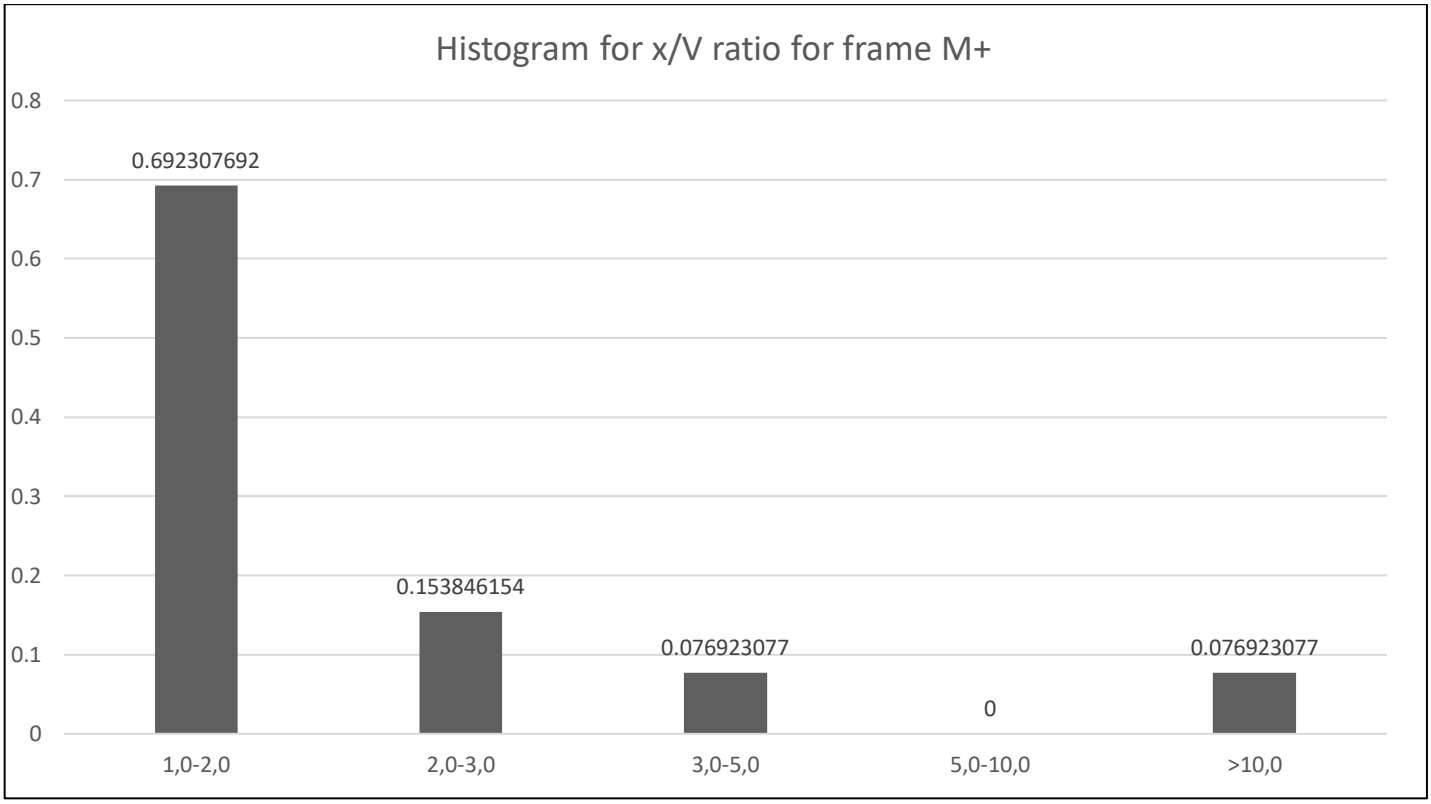

Figure 29: Histogram for x/V ratio for frame M+.

In *Figure 29* we can see the histogram for the ratio between the proposer's payoff and the total value of the pie occurred in market frame (M+). 69,2% of the observations came from offers that earned the proposer a payoff that was in between one or two times the value of the pie. This ratio occurred 15,4% of the all the observations for demanded payoff that were two to three times the value of the total pie; 7,7% for demanded payoffs between three to five times larger than the total value. While 7,7% of the observations came from demanded payoffs that were higher than ten times the value of the total pie.

5.2.4.3 ALTRUISTIC REWARDING FOR FRAME M

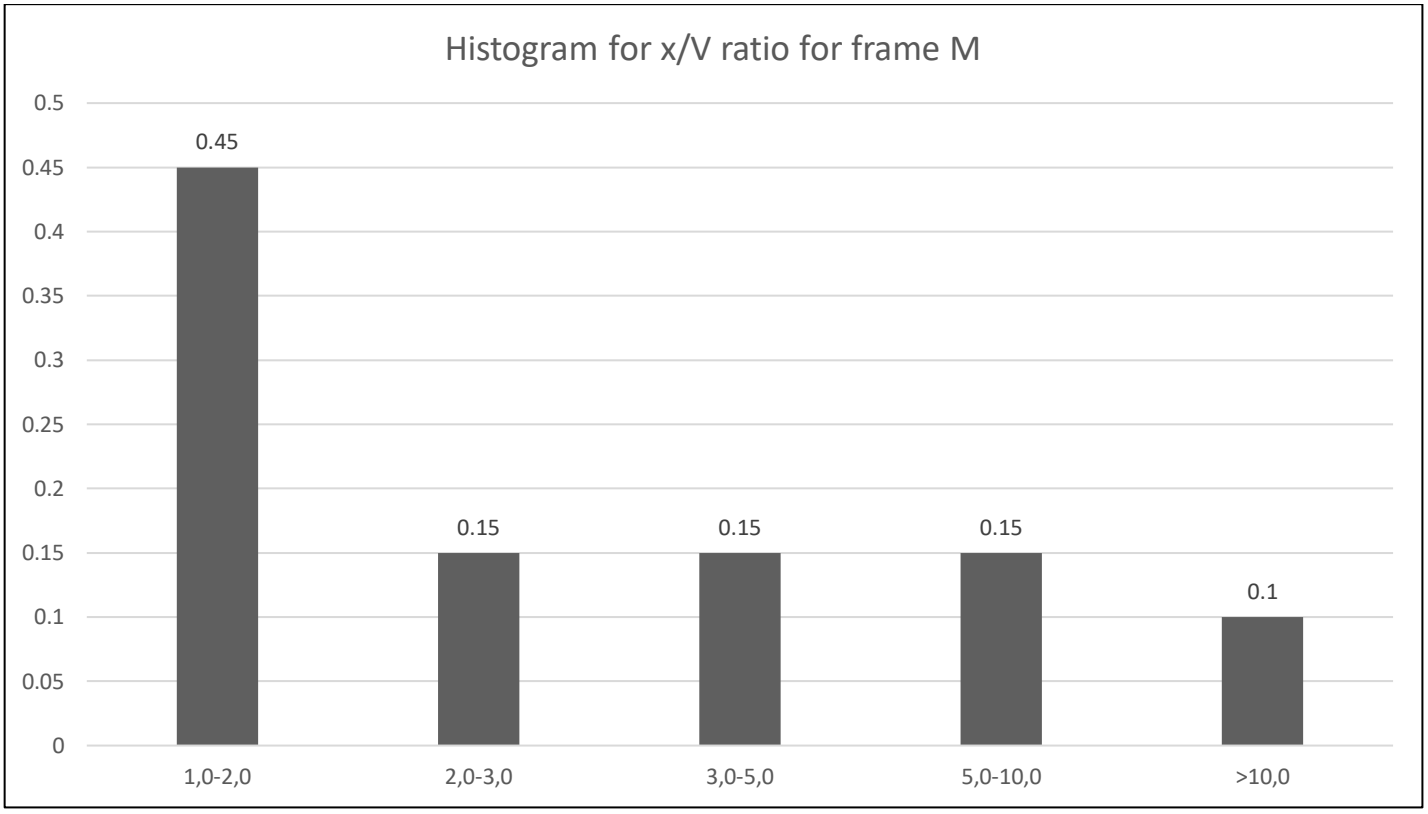

Figure 30: Histogram for x/V ratio for frame M.

In *Figure 30* we can see the histogram for the ratio between the proposer's payoff and the total value of the pie occurred in market frame (M). Only 45,0% of the observations came from offers that earned the proposer a payoff that was in between one or two times the value of the pie, which is the lowest of all the three frames. 15,0% of the registered data came from demanded payoff that were two to three times the value of the total pie; 15,0% for demanded payoffs between three to five times larger than the total value and again 15,0% for demanded payoffs that were five to ten times the total value of the pie. Finally, 10,0% of the observations came from demanded payoffs that were higher than ten times the value of the total pie. This histogram reflects the really high average ratio that participants in this frame had, which was the highest of all. In fact, if compared to the other frames this one has higher percentages of observations occurring above three times the total value of the pie.

5.2.4 Analysis of Altruistic Rewarding for each gender

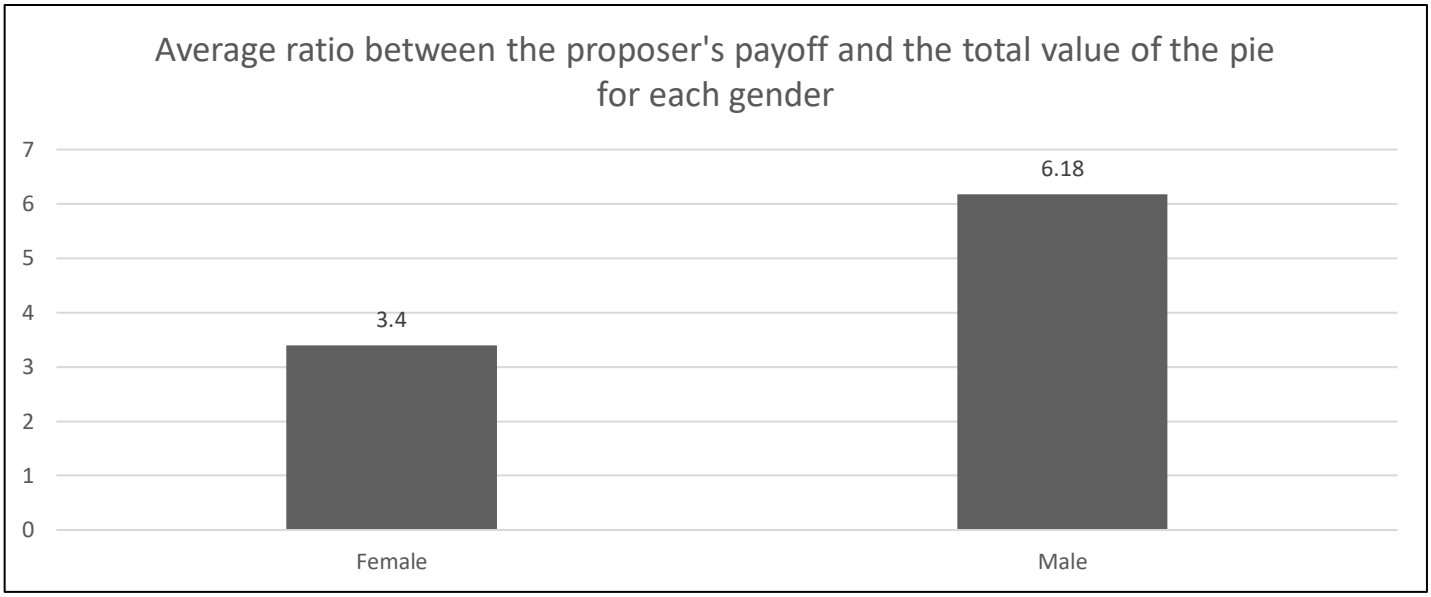

Figure 31: Average ratio between the proposer's payoff and the total value of the pie for each gender.

The bar graph above shows the difference in the average ratio of proposer's payoff and the total value for all frames. As one can see the graph the Female gender had a lower ratio than the Male gender. On average, the ratio for women was 3,40, while for men it was 6,18. Those results consist of all the results registered for all treatments (B, M and M+).

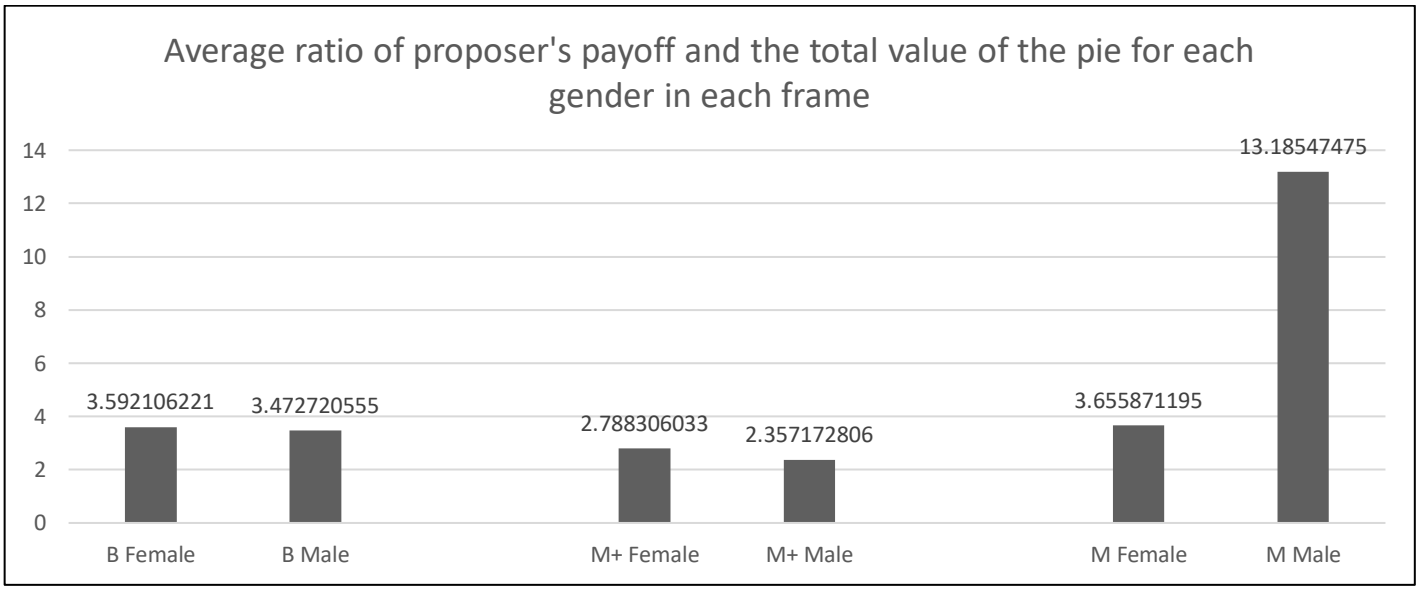

Figure 32: Average ratio of proposer's payoff and the total value of the pie for each gender in each frame.

If we analyse the results obtained for each gender for all the different treatments, we can see that the female ratios are similar to the male ratios in frame B and M+. In frame B the average ratio between the proposer's payoff and the total value of the pie for the female gender was 3,59 while it was 3,47 for the male gender. In frame M+ it was 2,79 for the female gender and 2,36 for the male. The difference in result came from frame M which was the frame with the highest ratio for both genders. The ratio for the female gender is 3,66 while for the male gender it is 13,18.

5.2.5 Analysis of Altruistic Rewarding for Economics and Non-Economics students

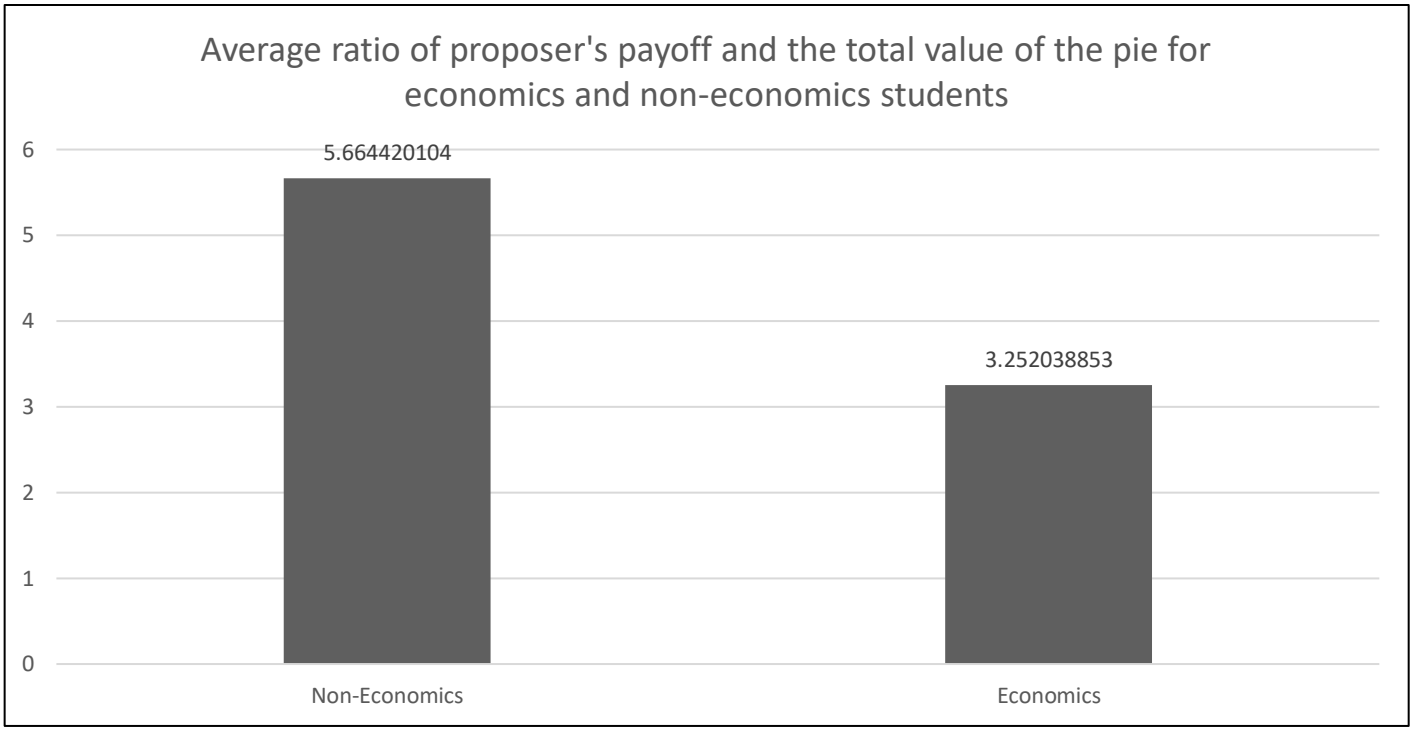

Figure 33: Average ratio of proposer's payoff and the total value of the pie for economics and non-economics students.

In this final section of our analysis we are going to look at the data for Economics students and Non-Economics students. We can see from our bar-graph above that on average Non-Economics students tend to have a higher average ratio of proposer's payoff to the total value of the pie compared to Economics students whose category includes "Law students" and "Politics, Philosophy and Economics" students. On average the ratio for Economics students was 3,25 while the ratio for Non-Economics students was 5,66.

6 CONCLUSION

We have described in the previous chapters various aspects of the observations in which the altruistic sanctioning effect was present. We started section 5.1 by analysing the differences in the percentage of the value of the rejected offers over the total value for each of the three frames. The participants that were studied using frame "B" are the ones that on average rejected the lowest offers, they rejected an average of 17,35% of the total value. While the group of participants which rejected on average the highest offers were the ones under treatment "M", which refused an average of 35,18% of the total value. Instead, participants under treatment "M" rejected an average of 22,35% of the total value. In Section 5.1.2 we studied how much the proposers for each frame decided to keep for themselves in the observations in which the responders rejected a positive payoff. Proposers in frame B proposed on average the lowest amount to the responder before that the total value of the pie was revealed, their demanded payoff was on average 51 (X=0,51), while in the frames M and M+ the average demanded payoff offers was X=0,36 and X=0,38 respectively. From these results we can deduce that the difference of 17,83% between Frame "B" and Frame "M" for the average share of rejected pie can be explained from the fact that on average the demanded payoffs from the proposer in the observed results were much higher, consequently the rejected share of total pie from responders was lower on average. Therefore, responders in frame B were more likely to reject lower offers than responder in the market frame.

In Section 5.1.3 we analysed the percentage of payoffs of rejected positive observations for each frame and their percentage of subjects rejecting at least one offer. Combining these two sets of information we can find the ratio of rejected offers per subject. This ratio is the lowest for subjects tested in frame "B", meaning that they rejected fewer offers per person than the subjects in Frames "M" and "M+". Subjects that refused at least one offer in the experiment that were participating in Frame "B" rejected on average 1,45 offers each, while for frame "M+" and Frame "M" is respectively 2,25 and 2,5. We can conclude that the way that the bargaining frame is structured might make more likely for a participant to reject an offer that they consider unfair, but it makes them less likely to rejects an offer more than once relative to the market frame. Meaning that they are more likely to punish a non-co-operator but are less likely to punish selfish behaviours for more than one time.

In section 5.1.4 we analysed the frequency of rejected offers for each interval of the rejected share for all frames. These results reflected the information given in Section 5.1.1. One should expect a steeper histogram for the market frames as opposed to the bargaining case. This was also the case once we analysed the data. However, in the histogram for frame M we found something unusual as we realized that 20,0% of the registered observations came from offers rejecting 80%-100% share of the total value of the pie. In particular subject 21, treatment M. We can consider this as a double error from both the proposer or the responder, due to the fact that it is really unlikely that the proposer demanded a payoff of zero on purpose, and that the responder rejected it knowing that it still wouldn't affect the value received by the proposer in any way. However, we could also consider that the responder decided to refuse the offer because he felt guilty from taking advantage of the too

far generous offer of the proposer. We could have omitted this observation from the data, however in the same frame another two observations were recorded, rejecting 82,6% and 87,7% of the total value, from another two different subjects. The second option might seem plausible because it only happened in the market frame M. This would give a different meaning to the average rejected share of the pie. Before I would have considered a higher average share of the total value as a less cooperative strategy because one would sacrifice a larger amount of payoff in relation to its counterpart to punish him for what he thinks is an unfair division, but if the hypothesis of rejecting the offer because the responder felt that it was too unfair from his side accepting an unfair split of payoff, it could change the way we see this result, as the high average share of rejected value might be influenced by it.

In Section 5.1.5 we analysed the differences in altruistic sanctioning for each gender. On average female rejected 30,4% of the total value of the pie, while male rejected 21,6% of its value. We might conclude that for this experiment on average women tend to reject higher shares of the total value of the pie than men, meaning that they are more severe when they receive an offer that they deem as unfair. We then analysed these results for each frame and found out that the frame in which women rejected the highest share value was in frame M+ (47,1%) while for men was frame M (24,8%). The result for women may be variable as only 3 results for this observation.

In Section 5.1.6 we analysed the differences in altruistic sanctioning for economics and non-economics students. Non- Economics students rejected on average a share of 18,2% of the total pie while Economics students rejected on average a share of 27,2%. We can conclude that on average Economics students tended to reject relative higher offers than Non-Economics students, meaning that they are more severe when they receive an offer that they perceive as unfair.

The second section (5.2) investigates on the altruistic rewarding effect. We started in section 5.2.1 to analyse the percentage of registered observations for each frame and the number of subjects accepting at least one negative offer. We found out that on average the recorded observation of accepted negative offers in frame B is much higher than that for frame M and for frame M+. Frame “B” contains 52,2% of all the negative accepted offers, this percentage is 30,0% for frame “M” and 18,8% for frame “M+”. Participants in frame B also had the highest number of subjects rejecting at least one offer. The number of subjects who rejected at least one offer for the “B” frame is 41,9%, 35,5% for the “M” frame and 22,6% for the “M+” frame. We can conclude that one average this effect occurred more in frame B than for the market framing (M and M+), meaning that participants in frame B were more likely to accept a negative offer in order to compensate the proposer with a positive payoff.

In section 5.2.2 we analysed the average negative accepted offer for each frame, in order to understand the magnitude of the negative accepted offers. Participants in frame B that altruistically rewarded their counterpart accepted on average the lowest negative payoffs (23,3), while participants in frame M+ registered the highest

average (25,8). Subjects in frame M accepted on average a negative payoff of 24,8. This means that on average subjects in frame M+ tended to accept higher negative payoffs in order to reward the counterpart. This means that even though participants in frame B accepted negative offers more often, the magnitudes of those offers accepted by the responders were the lowest. In the same section, we analysed the average gained payoff by the proposer. As one can see from figure 25 proposers in frame M+ received on average the highest payoff (59,4). Proposers in frame B received on average 58,3 while in frame M they received the lowest average payoff at 49,1. Meaning that on average proposers in frame M received a lower payoff because they demanded a lower payoff. This is also consistent with the result of the Altruistic sanctioning effect in which proposers demanded the lowest payoff on average. We can conclude from this section that even though the number of subjects and the number of observations were higher in frame B compared to frame M and frame M+, both proposers and responder in the market frame (M) seemed to be more generous in term of magnitudes of the negative accepted payoff. Either because of the high average negative accepted payoff (24,8) compared to frame B (23,3) and because proposers in frame M demanded on average the lowest payoff (which is also their payoff).

In section 5.2.3 we analysed the average ratio between the demanded payoff by the proposer and the total value of the pie that we can use in order to measure on how "generous" responders in each of the frame were. This is because dividing the demanded payoff (x) by the total value of the pie (V) we can understand how much the responders had to give up relative to the benefit received by the proposer, because the responder will incur a loss equal to the total value of the pie minus the demanded payoff (V-x). The higher the ratio, the more generous the responders are because it means that they had sacrificed a larger payoff in relation to the proposer's payoff in order to let him benefit from a positive payoff. This ratio is larger on average for participants in frame M. This ratio is 7,94 for participants in frame M, 2,69 for participants in frame M+ and 3,53 for participants in frame B. We can conclude that on average participants in frame M were more generous than in frames B and M+.

In section 5.2.4 we looked at the previously described data in the form of a histogram for different series of intervals for all the frames. I chose 5 intervals, in the first one I measured the frequency of observations having a ratio of the payoff per total value of the pie between one and two (including two). The second interval was for ratios between two and three (not including 2, but including three), then ratios between three and five, then five to ten and finally all ratios above ten. The histogram has a downward sloping trend because it is rarer to find responders that incurred a high negative loss relative to a small relative positive gain for the responder. We analysed the same histogram for each of the frames and found out that the histogram for observations in frame M has a flatter trend compared to the other histogram and it registered many observations for demanded payoff that were more than two times larger than the value of the total pie, $x/V>2$, which were 55% of the total observations. Those results were 33,3% for frame B and 30,8% for frame M+.

Then in section 5.2.5 we analysed the difference in the average ratio of proposer's payoff and the total value for female and men and found out that one average female gender had a lower ratio than the Male gender. On average, the ratio for women was 3,40, while for men it was 6,18. Those results consist of all the results registered for all treatments (B, M, and M+). Then we analysed the results obtained for each gender for all the different frame, and we found that the female ratios are similar to the male ratios in frame B and M+. The difference in ratio came from frame M which was the frame with the highest ratio for both genders. The ratio for the female gender is 3,66 while for the male gender it is 13,18. We can conclude that on average men seem to be more generous than women when altruistic rewarding took place. This is also consistent with the findings for altruistic sanctioning as women deemed as unfair higher shares of the total pie than man.

Finally, in section 5.2.6 we looked at the altruistic rewarding data for Economics students and Non-Economics students. We noticed that on average Non-Economics students tend to have a higher average ratio of proposer's payoff to the total value of the pie compared to Non-Economics students. On average the ratio for Economics students was 3,25 while the ratio for Non-Economics students was 5,66. This means that non-economics students tend to be more generous when altruistic rewarding occur. This result is also consistent with the results we obtained for altruistic sanctioning since in that case economics students deemed as unfair higher shares of the total pie than non-economics students that were more collaborative.

From the analysis of the altruistic sanctioning and altruistic rewarding effect, we can observe that on average participants in the bargaining frame seemed to have acted in a more self-oriented matter, while participants in frame M were on average more generous. This can be denoted because of their average higher demanded payoff for both altruistic sanctioning and altruistic rewarding and through the analysis of the share of the rejected total pie for the altruistic sanctioning part and the ratio between proper's payoff and the total value of the pie in altruistic rewarding. These results can be explained by the "Social Norm Theory". The differences in frames might induce players to associate games with various social contexts, which are associated with different social norms. Framing the experiment in a market might induce participants to act with a more self-oriented strategy, as we analysed from our results.

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