

VARYING INFORMATION CONDITIONS IN BARGAINING: AN EXPERIMENT

A Master's Thesis

by

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August 2021



To my father and Yarkın

VARYING INFORMATION CONDITIONS IN BARGAINING: AN EXPERIMENT

The Graduate School of Economics and Social Sciences  
of  
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by

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August 2021

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## ABSTRACT

### VARYING INFORMATION CONDITIONS IN BARGAINING: AN EXPERIMENT

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We vary the information regarding the source of bargaining power. In our experiment, there are two potential sources of bargaining power gained through an advantageous disagreement point payoff: (i) effort and (ii) luck. For each one of these, we vary the source information as follows: (i) both agents know and (ii) neither knows. This gives us a  $2 \times 2$  experimental design varied across subjects. In line with the previous work, we have found that advantageous players in both knows-performance treatment earns significantly more whereas there is no difference between luck based treatments and none knows treatments in agreement conditions. Additionally, there is no difference in disagreement rates among any treatment.

Keywords: Disagreement points, effort, luck, on-line experiments, unstructured bargaining.

## ÖZET

### PAZARLIKTA DEĞİŞEN BİLGİ KOŞULLARI: DENEYSEL BİR ÇALIŞMA

Erođlu, Nazlıcan

Yüksek Lisans, İktisat Bölümü

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Bu çalışmada, pazarlık gücünün kaynađına ilişkin bilgi koşullarını manipüle ederek katılımcıların pazarlık süreçlerini ve elde ettikleri kazançları incelemeyi amaçlıyoruz. Deneyimizde, avantajlı bir anlaşmazlık noktası yoluyla kazanılan iki potansiyel pazarlık gücü kaynađı vardır: (i) performans ve (ii) şans. Deneyde, bunların her biri için iki farklı bilgi koşulu vardır : (i) her iki katılımcıda da kaynađın ne olduğunu bilir ve (ii) hiçbiri bilmez. Bu bize denekler arasında çeşitlilik gösteren 2×2 deneysel bir tasarım sunar. Önceki çalışmalar ile uyumlu olarak, pazarlık gücünün performansa dayalı olduğu ve bunun bilindiđi tretmanda avantajlı oyuncuların önemli ölçüde daha fazla kazandığını, ancak şansa dayalı tretmanlar ile pazarlık gücünün kaynađının bilinmediđi tretmanlar arasında kazanç farkı olmadığını bulduk. Ek olarak, herhangi bir tretman arasında anlaşmazlık oranlarında bir fark bulmadık.

Anahtar Kelimeler: Anlaşmazlık noktası, performans, şans, çevrimiçi deneyler, kuralsız pazarlık

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## CHAPTER 1

### INTRODUCTION

Disagreement points are one of the most essential elements of bargaining problems/games since Nash's (1950) celebrated work. The disagreement point represents the value/payoff that the bargainers would receive in case they fail to reach an agreement. Given this definition, it is natural to treat the disagreement point as a potential source of bargaining power. Hence, starting with Nash (1950), most –if not all– bargaining models included disagreement points to incorporate the power (or lack of it) that comes with them. Nash (1953), Kalai Smorodinsky (1975), and Kalai (1977) are just some well-known examples among many.

After decades of theoretical work on bargaining, some of those predictions that were taken granted (e.g., the influence of disagreement point on the bargaining agreement) started to be questioned or empirically tested. There has been empirical evidence that bargainers do not utilize their bargaining powers to the extent that it is theoretically predicted. In fact, this phenomenon seems to be valid when bargaining power stems from something else other than disagreement points. For instance, it is well-known since Güth et al. (1982) that players refrain from asking for the whole pie in the ultimatum game (see Roth (1995) and Güth and Kocher (2014) for surveys). In yet other experiments, it has been shown that bargainers' behavior change in favor of the disadvantageous player when 50-50 splits became available (Güth et al., 2001; Falk et al., 2003).

Moreover, there are several experimental papers, which report that bargainers do not fully exploit their bargaining power, which stems from advantageous disagreement points (Fischer et al., 2007; Binmore et al., 1991; Hennig-Schmidt et al., 2018). Some experiments even report that players accepted offers lower than their disagreement payoffs (Hoffman and Spitzer, 1982). Finally, and more importantly for the current work, Anbarcı and Feltovich (2013) report that subjects not only do not react to the changes in their own disagreement payoffs but also to the changes in their opponents' disagreement payoffs to the extent that the theory (e.g., predictions from the Nash bargaining solution or the Kalai-Smorodinsky bargaining solution) anticipates.

One reason behind this under-utilization may be related to the fact that bargainers do not *earn* their bargaining power in the laboratory experiments. Most of the time, they are randomly assigned through exogenously given disagreement points. Therefore, an unearned power may not be perceived as legitimate and not be exercised to the fullest extent. Obviously, this is not something captured in standard models of bargaining, where agents are fully rational. The experimental literature, though, is full of studies, which consistently report that the source of the power and whether it is legitimate or not influence its utilization (list some papers here).

Another important characteristic of real life bargaining interactions is the imperfect information environment surrounding them. In many instances, the information regarding important parameters of the problem (e.g., time preferences, risk aversion, reference points, etc.) there is no perfect, complete or symmetric information. We already know from a substantial theoretical and experimental literature on bargaining that such imperfections significantly influence bargaining process and outcomes (references here). Related to the current work in this paper, for instance, Karagözoğlu and Riedl (2015) report that subjects' behaviour changes significantly depending whether the relative

performance information in joint surplus production is available or not and whether the resulting surplus over which subjects bargain is produced completely by effort or partially by luck. Along similar lines, it is easy to imagine that the information about the source of bargaining power (i.e., effort or luck) may not always be available to some or all bargaining parties. Since we know from earlier work that the source of bargaining power influences how much it is exercised, it immediately follows that these information imperfections may have significant influence on bargaining behavior and outcomes.

To the best of our knowledge, the question of how information conditions regarding the source of bargaining power influence bargaining process and outcomes has not been addressed in the literature. The aim of this paper is to fill this gap by investigating the impact of disagreement points (as a major source of bargaining power) on bargaining behavior and outcomes under different information conditions. For this inquiry, we design an experiment where we vary information conditions similar to the ones in Roth and Murnighan (1982). More precisely, we have two "source" conditions: effort vs luck; and two "information" conditions: (i) both players know the basis (effort or luck) of disagreement point assignment, (ii) neither player knows. In these four conditions, we will investigate the influence of disagreement points on bargaining process and outcomes.

## CHAPTER 2

### LITERATURE REVIEW

There are several studies regarding the role of information in bargaining. Roth and Malouf (1979) have showed that the Nash solution is descriptive only when bargainers know their opponent's utility payoffs and not monetary payoffs. They have designed an experiment where they manipulated the information given to bargainers by providing them full or partial knowledge about the monetary payoff of their opponents. Since monetary payoffs are defined on a common absolute, when bargainers know their opponents' expected monetary payoff exactly, it permits them to make comparisons that they could not make otherwise and this affects the bargaining outcome.

In a follow-up paper, Roth and Murnighan (1982) investigated the component causes of this information effect. They conducted an experiment where they have different treatments for common knowledge and non-common knowledge information conditions as well as treatments for players with higher or lower prizes. They found that the effect of information on agreement points is primarily stems the information condition of the small prize owner. Additionally, they showed that whether the information is common knowledge or not affects the frequency of the disagreement percentages. We plan to use the information structure similar to their paper since it will enable us to clearly see how bargaining process and outcome will change when the source of bargaining power is known to bargainers and when it is not known.



Ultimately, this paper treats disagreement points as the primary source for bargaining power given its theoretical intuition. It has been shown by Anbarcı and Feltovich (2013) that even though bargaining outcomes do vary as disagreement points change, bargainers significantly under-react to the changes both in their own and also their opponent's disagreement points. They also show theoretically that introducing risk aversion to existing theoretical models cannot account for this difference.

One possible explanation for this disjointedness can be the fact that those bargaining powers are given exogenously in a laboratory setup. In real life, however, it is likely that an individual's bargaining power may stem from her past decisions, personality and effort. For instance, in a wage negotiation, a prospective employee's bargaining power is very well related to her former job positions, education and also previous wages. Therefore, it might be this lack of external validity which causes researches to see different results than what theory predicts.

One way to control this is to make subjects earn their bargaining power before the bargaining phase to create an entitlement. It is shown by Gaechter and Riedl (2005) that entitlements significantly influence bargainer's fairness judgments and through that channel it also influences opening offers and disagreements. Similarly, Karagözoğlu and Riedl (2015) have showed that when there is an information about performance, bargainers derive strong, mutually inconsistent, subjective entitlements which results in agreement points that are skewed away from equal splits. In Bolton and Karagözoğlu (2016), it is shown how these entitlements affect bargaining process and outcome under different leverage conditions. In this paper, we will utilize a real-effort task combined with an information structure to create such entitlements.

There are only few studies focusing on the earned disagreement points. In Anbarcı and Feltovich (2018), they found similar results to previous studies

(Fischer et al., 2007; Anbarcı and Feltovich, 2013) where there is still low responsiveness to the changes in disagreement payoffs even when it is earned. However, as they have also noted, it was not a controlled comparison across studies. Another study focusing on the earned disagreement points is Feltovich (2019) where they investigate whether bargainers exploit their bargaining power more when it is earned. Under their controlled setup, they found that bargainers are more responsive to the changes in bargaining position when it is earned. Our experimental design contributes on top of this study in a sense by examining whether this responsiveness change under different information conditions.

Ultimately, we plan to answer the following main questions: (1) How does a change in the source of bargaining power affect the bargaining process and outcome? (2) Does that change have the same effect under different information conditions? The organization of the thesis is as follows: Firstly, we will present our design and hypotheses. In the following section, we report our results under subsections of statistical results and regression analyses. Lastly, we provide discussion and conclusion for the thesis.

## CHAPTER 3

### EXPERIMENTAL DESIGN AND RESEARCH HYPOTHESES

#### 3.1 Experimental Design

To answer the questions we outlined above, we design an online experiment with a  $2 \times 2$ , between-subjects design where we manipulate the information conditions. Below, we describe each phase of the experiment in detail.

***Real Effort Task:*** Subjects will be randomly paired and they will be given identical real-effort tasks, all of which will be common knowledge. The real effort task is a neutral one as far as gender, cognitive capacity, and department of study are concerned. The time for the task is kept short given that we plan to conduct the experiment online: in total we gave them four minutes for the effort phase. The real effort task is adding the highest numbers of two randomly generated  $5 \times 5$  matrices filled with random numbers between 1 and 99. Only the correctly counted ones count towards a subject's success/performance. Subjects are not informed about their performances.

***Disagreement Point Advantage:*** The subjects in a representative pair are assigned an asymmetric disagreement point, providing a bargaining advantage to one side and disadvantage to the other. Here, we use 5TL for disadvantageous player and 15TL for the advantageous player.

***Bargaining Phase:*** We used Tacit bargaining protocol in the experiment: It

allows players to make offers in any time and in any order, i.e. a player can make consecutive offers. In the last two decades, using similar semi-structured bargaining protocols in experiments gained popularity. Karagözoğlu (2019) and Camerer et al. (2019) discuss the advantages of using such bargaining protocols. Basically, we give 4 minutes to subjects for them to reach an agreement. Sequence of timing of offers are not fixed. If they can reach an agreement within these four minutes, then they receive their corresponding payoffs. If they cannot reach an agreement within four minutes, then they receive their disagreement point payoffs. The interaction will be one-shot and hence the experiment is not a multi-round one. This has at least two advantages: (i) given the reduced level of control over subjects in online and the possibility of drop-outs (due to internet connection problems, discouraged/bored subjects) in online experiments, it is better to keep the duration of the experiment short and (ii) with one-shot interaction, the data collected is cleaner for statistical analysis purposes. A clear disadvantage is: if there are significant learning/gaining experience effects present, they cannot be captured.

***Information Conditions:*** This is where our treatment variations take place. As we mentioned above, our treatment variations mimic some of those (to be precise, common knowledge condition) in Roth and Murnighan (1982). An important difference is that RM varies the information conditions on the prizes of agents who are bargaining over probabilities in a lottery. In our design, subjects are not bargaining over lotteries but instead they are bargaining over sure amounts of money. RM gives a training on introduction to probability theory to their subjects before the experiment. We think that comprehending probabilities, establishing the connection between probabilities and expected payoffs, and bargaining over the distribution of probabilities in a given lottery will be demanding, especially in an online experiment, under tight time restrictions. Hence, we choose a design where subjects bargain over sure amounts of money. It is the asymmetric disagreement point payoffs, which can give/take bargaining

Knowledge Condition	Luck	Performance
Both Knows	1	2
Noone Knows	3	4

power. Another important difference from RM is: the values of agents' prizes are known or unknown (or known to one and unknown to the other). In our design, disagreement point is always known to both agents. It is the *source* of bargaining power over which we vary the information conditions. More precisely, in our experiment, the bargaining advantage (implied by the disagreement point) can be due to (i) better performance in the real effort task (earned) or (ii) pure luck (random). It is common knowledge that the assignment is made on the basis of luck or effort with equal probabilities. If it is the former, it means that the agent with a better disagreement point payoff is given that advantage due to his superior performance in the real effort task. If it is the latter, it means that the agent with a better disagreement point payoff is given that advantage due to luck, in a random draw where both agents had  $\frac{1}{2}$  probability of being chosen. It is this information we vary across treatments. Table 1 summarizes our treatment variations. In all four conditions, the information structure is known by each player.

***Sequence of Events:*** Here, we present the sequence of events in the experiment with times to allocate to each phase:

- \* Reading the instructions (5 mins)
- \* Real effort task (4 mins)
- \* Presenting the corresponding information condition (1 min)
- \* Testing/confirming subjects' comprehension of the instructions (3 mins)
- \* Bargaining (4 mins)
- \* Post-experimental questionnaire (3-4 mins)
- \* Payment information (1 min)

***Post-experimental Questionnaire:*** In the post-experimental questionnaire, we asked the following demographic questions: age, gender, department of study, year of study, and monthly disposable income. We conducted a very short risk attitude elicitation test (e.g., dynamically optimized sequential experimentation by Wang, Filiba, and Camerer, 2010) and short justice-centeredness scale. We have also utilized Big Five Personality Test and MACH IV tests.

***Experimental Implementation:*** Given the current state of affairs, we conduct the experiment online. We used LIONESS Lab to conduct the experiment. We invited students to the experiment using Bilkent University Academic Information system (BAIS). We have also did the payment online, subjects submitted their IBAN at the end of the experiment and they have received the payment within 2-3 work days. We have used an app called "Papara" where we were able to send money to IBAN numbers only without requiring any additional information from the participants such as name, address etc. We also told this in the mails that we have sent. We asked participants to bargain over 30TL and also gave each participant 5 TL as a show-up fee. on average. The experiment took less than 30 minutes. Participants did not need to commute, they have joined the experiment via their computers. We did not allow them to use cellphones or tablets to make sure that every participants sees exactly the same web page structure.

Once they have signed up for the experiment, we sent a reminder e-mail the day before and also in the morning of the experiment. We have explained the structure of the experiment briefly and also sent a Zoom link to be able to coordinate the experiment. During the Zoom meetings, we made sure that we had high enough number of students to ensure the anonymity of the participants. We also told them that they do not need to use their microphones and cameras, they could ask their questions privately via the chat box of the Zoom. Once participants have joined the experiment, we read the instructions clearly and loudly. Then, we have shared the experiment link. Once they have opened the link, they are anonymously and randomly matched with another participant. The

instructions were again presented to them in the first pages of the experiment. The sequence of the events are as explained in the experimental design section. We have used the servers of Bilkent University to conduct our experiment and also to store the data of the experiment as it includes personal information such as their IBAN numbers.

### **3.2 Hypotheses**

In this section, we present our hypotheses on the influence of our treatment variations on various markers of bargaining. Our primary focus is on bargaining outcomes: (i) agreement conditions (i.e., agreed sharing of the surplus) (ii) disagreement rate. That said, we will also exploit the rich data that our unstructured bargaining protocol will give us. Hence, we will also study various process variables such as (i) first offers, (ii) concessions, (iii) conflict in first offers, (iv) offer numbers and (v) various other measures on the timing of agreements such as the frequency of last-moment agreements. In what follows, we first present our hypotheses on agreement conditions and disagreement rate. We do not formulate hypotheses for all the process variables since it is not very straightforward to come up with a well-substantiated hypothesis for every process variable of interest in an experimental design with four conditions. However, we briefly explain our expectations for the variables which we think are insightful.

#### **Bargaining Outcomes: Agreements**

When the bargaining power is given on the basis of effort (luck) and when this is known by both players, i.e., condition 2 (condition 1), we expect the disagreement point to be most (least) influential on agreement conditions. Hoffman and Spitzer (1985) have showed that the subjects in their experiment have treated their entitlements (disagreement payoffs in our context) as legitimate justifications for unequal divisions when those entitlements are "earned". Similarly,

Karagozoglu and Riedl (2015) have showed that the subjects' entitlements are stronger with performance information than without it. In our experimental setup, these translates into a shift towards to the disagreement point outcomes when the performance information is known by both of the parties. Similarly, when parties know that their entitlements are not "earned", we expect disagreement points to lose some of its influence. These are summarized in the following hypotheses:

***Hypothesis 1:*** *On average, the advantageous participants earn more in treatment 2 (both knows - based on performance) than treatment 1 (both knows - based on luck).*

When no one knows the source of the bargaining power assignment (conditions 3 and 4), we again expect the disagreement point to be weakly influential on agreement conditions. It is hard to precisely rank it, since in this case players' beliefs may play a role. That said, we expect the influence of the disagreement point to be close to its value in Condition 1. We believe that not knowing the source of bargaining power and knowing that it was based on luck should result in similar payoff distributions. However, we also expect disagreement point to be less influential compared to the treatment 2. Because in treatment 2, it is common knowledge that advantageous players have performed better in the effort phase. We expect this to have a significant effect in comparison with other treatments.

***Hypothesis 2:*** *There is no significant difference on agreement conditions between treatment 3 or 4 and treatment 1.*

Combining both hypothesis, we expect that, on average the advantageous players in treatment 3 and 4 earns less than their counterparts in treatment 2.

### **Bargaining Outcomes: Frequency of Disagreements**



When the source of bargaining power is known by both players, we expect the disagreement frequency to be at its lowest since players can coordinate their justice/fairness concerns more easily and with less conflict. When the source of bargaining power is not known by either player, there is more uncertainty and more room for a higher conflict environment. However, there is also the principle of insufficient reason possibly in action. For instance, in Karagözoğlu and Riedl (2015), NOINFO treatment, where performance information was not provided, most subjects reached 50-50 agreements and very quickly. All in all, we expect a weakly higher disagreement frequency in conditions 3 and 4, than in conditions 1 and 2.

***Hypothesis 3:*** *Disagreement frequency will be lower in treatments where source of bargaining power is known by both players (treatment 1 and treatment 2) than test of the treatments (treatment 3 and treatment 4).*

### **Process Variables**

As mentioned earlier, we will not formulate specific hypotheses for the process variables given the number of variables and number of treatments. However, we still provide what is we expect very briefly.

For the treatment 2, where the source of bargaining power is performance and this is known by both players, we expect first offers to be at their highest compared to other treatments. This subject-level variable is the share of the surplus offered to the advantageous player (by himself or his opponent) in the first offer made by the corresponding subject. Hence, it takes values between 0 and 1. Advantageous player will want to start with a higher payoff as s/he thinks that this power is *legitimate*. Similarly, we expect disadvantageous player to offer relatively higher payoffs to other player due to fairness judgments as in line with the similar previous experiments. Related to this, we also have a dummy variable which takes 1 if the first offer is made by the advantageous player and

0 otherwise. The analysis of this variable can be found in the appendix.

Another interesting process variable is conflict in first offers. This pair-level variable is defined as follows: the sum of shares asked by the two subjects for themselves in their first offers minus 1. Hence, it is a continuous variable, which takes values between -1 and 1. We expect this to take higher values for the treatments where either there is not enough information regarding the source of bargaining power or when it is known that it is determined by luck (i.e. treatments 1, 3 and 4). The reasoning is very similar to that of disagreement points: When the source is uncertain/random, there is more room for contention. The same logic also applies to offer numbers and duration of the bargaining phase. As there is more conflict, the total offer numbers and the time spent in bargaining increases. However, there is also principle of insufficient reason applying to treatments with no information regarding the source of the bargaining. When there is not enough input to argue upon, participants can also reach 50-50 agreements without much conflict. Therefore, the net effect is not clear and that's why it is hard to have clear hypotheses about those process variables.

Lastly, we have average relative concession as a pair-level process variable. Gächter and Riedl (2005) defines relative concession of advantageous player as the difference between adv. player's standing offer and her new offer divided by the current bargaining area. The current bargaining area is the difference between standing offer of adv. player and the standing offer of disadv. player (both in adv. player's share). A relative concession of a disadv. player is defined analogously. The average relative concession of a bargainer is just the average of all of the relative concessions made by that bargainer. The pair variable takes the average of both player's average relative concessions. The importance of that variable is that, it tells whether a treatment provides a more suitable environment for negotiation and consensus or not. For our experiment, we

expect that this will be higher for treatment 2 and not very significant for the rest of the treatments.

## CHAPTER 4

### RESULTS

In this section, we present the results regarding our main variables. As we mentioned before, for most of the variables of interest, each pair will provide one independent data point. We conducted both statistical tests and regression analyses. For pairwise comparison of medians across treatments, we use the Mann-Whitney test (or Wilcoxon Rank-Sum test). For pairwise comparison of frequencies across treatments, we use Fisher's Exact test and Chi-Square test. After testing for the equality of sample variances, we do t-tests with appropriate test specification for the mean comparisons. In the regression analysis, we use OLS regression for continuous independent variables (e.g., agreed shares). For binary independent variables such as the dummy variable, which indicates whether a pair reached an agreement or not, we use Probit regression. In the Appendix, we also provide the results for the variables which are not covered in our hypotheses analyses.

As mentioned before, the experiment had been conducted online through LI-ONESS Lab. The participants have been recruited via Bilkent University Academic Information system (BAIS). In total, 288 undergraduate and graduate students have participated in the experiment. Our sample consists of students from almost every class and major. % 11 of the whole sample was economics majors. % 54.1 of the whole sample identified themselves as female and the remaining as male. The oldest participant is 41 whereas the youngest is 18 years old and the

average age is 21.5. The mean of disposable income of participants is 1888.94 TL. We have also asked whether they have taken any game theory of bargaining theory classes and in our sample %0.12 of them have taken such course. Lastly, we asked short version of the Big Five personality test (BFPT) (Gosling et al., 2003) and selected questions from MACH-IV test (Christie et al., 1970) as additional controls. The BFPT provides scores for extraversion, agreeableness, conscientiousness, emotional stability, and openness to experiences and we will use those scores as control variables.

#### 4.0.1 Statistical Tests

In treatment 3 and treatment 4, the participants does not know how the disagreement payoffs are determined. They only know that with  $1/2$  probability, the disagreement payoffs are determined based on their performance in the real effort phase and  $1/2$  probability, the disagreement payoffs are distributed randomly. We clearly stated that, the randomization is not about the size of the disagreement payoffs but it is about who is going get the *fixed* advantageous point and who is going to get *fixed* disadvantageous point. Since in both treatments the source of the disagreement points are not clear, what the participants see in the experiment is exactly the same. Therefore, we first did the statistical tests to show that there is no significant difference in these two treatments. In Mann-Whitney tests, t-tests, variance tests, Fisher's Exact tests and Chi-Square tests, we did not find any significant difference for any pair-level variable. Therefore, we will combine treatment 3 and treatment 4 for the further analyses.

Table 4.1: Agreement Conditions across Different Treatments

Treatments	Obs.	Mean	Std Dv.	Median	Min	Max
Treatment 1	35	0.528	0.134	0.5	0	0.967
Treatment 2	31	0.603	0.102	0.633	0.2	0.733
Treatment 3	21	0.526	0.068	0.5	0.334	0.667
Treatment 4	22	0.521	.0560	0.5	0.467	0.667
3 and 4 Combined	43	0.524	0.0615	0.5	0.334	0.667

#### 4.0.1.1 Agreement Conditions

This pair-level variable is defined as the share of surplus the advantageous player receives in an agreement. Hence, it is a continuous variable that takes values between 0 and 1. In table 2, we represent the summary statistics for agreement conditions. The pairs who could not reach to an agreement are not included in the analyses regarding agreement conditions.

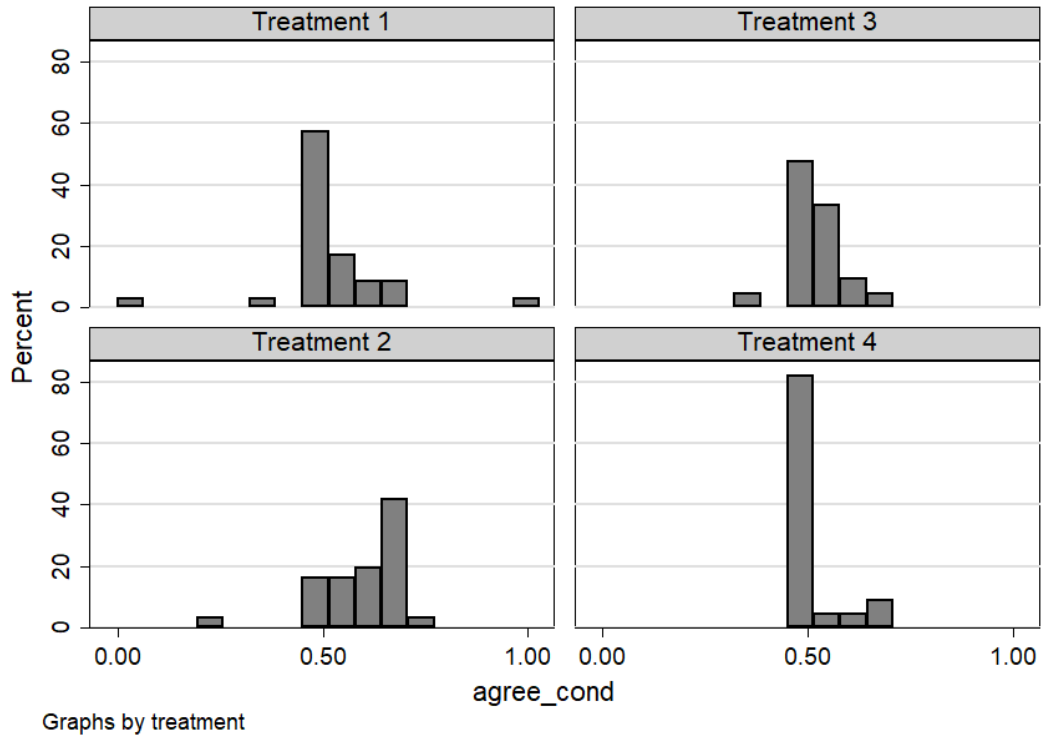
In Table 2, we report summary statistics for agreement conditions as in advantageous player's share. At the first glance, we can see that, on average, advantageous players earned more in treatment 2 compared to all other treatments. We also see that the median of agreed surplus for advantageous players is higher only in treatment 2 with 0.633 whereas we see equal divisions as median in other treatments.

The distribution of agreement conditions for each four treatments are represented in the Figure 4.1. It is clearly seen that agreement conditions concentrate on the right side of the mean for treatment 2. In all other treatments, equal divisions are the most observed agreement condition. This takes us to our first results.

**Result 1:** *In line with Hypothesis 1, the advantageous participants earn more in treatment 2 than treatment 1 on average (t-test with equal variances, one-sided  $p = 0.0066$ ).*<sup>1</sup>

<sup>1</sup>Using Mann-Whitney test did not affect our results ( $p < 0.0002$ ).

Figure 4.1: Distribution of Agreement Conditions



In line with the previous work, this result tells that participants do care about the source of the bargaining power and judgments regarding meritocracy or fairness come into play. A more interesting question is whether there will be a difference between the treatment 3 or 4 and treatment 1. We hypothesized that knowing the source of bargaining power is luck and not knowing the source at all would give us the same results. In line with this hypothesis, we have the next result:

**Result 2:** *There is no significant difference on agreement conditions between treatment 1 and combined treatments where there is no information regarding the source of bargaining power (i.e. treatment 3 and 4). (t-test with unequal variances, both-sides  $p = 0.8570$ ).<sup>2</sup>*

<sup>2</sup>Using Mann-Whitney test did not affect our results ( $p < 0.5130$ ). Due to the results from our variance tests, we have used unequal variances for t-test for this analysis.

Table 4.2: Disagreements across Different Treatments

Treatments	Obs.	Mean	Std Dv.
Treatment 1	43	0.186	0.394
Treatment 2	42	0.261	0.445
Treatment 3	30	0.3	0.466
Treatment 4	29	0.241	.4354
3 and 4 Combined	59	0.271	0.443

#### 4.0.1.2 Disagreements:

This pair-level, dummy variable is defined as follows: if the pair reached an agreement, it takes the value, 0; otherwise it takes the value 1. In table 2, we present summary statistics of disagreements.

In table 3, we see that highest disagreement rate is observed in treatment 3 and lowest rate is seen in treatment 1. In contrast with our hypothesis, we have observed no significant difference between treatments where source of bargaining power is known and treatments where it is unknown. That brings us to our last result:

**Result 3:** *There is no significant difference in disagreement rates between treatments where source of bargaining power is known (i.e. treatment 1 and 2) and treatments where it is not known (i.e. treatment 3 and 4). (Fisher's exact  $p = 0.557$ , 1-sided Fisher's exact  $p = 0.322$ ).*<sup>3</sup>

#### 4.0.1.3 Process Variables:

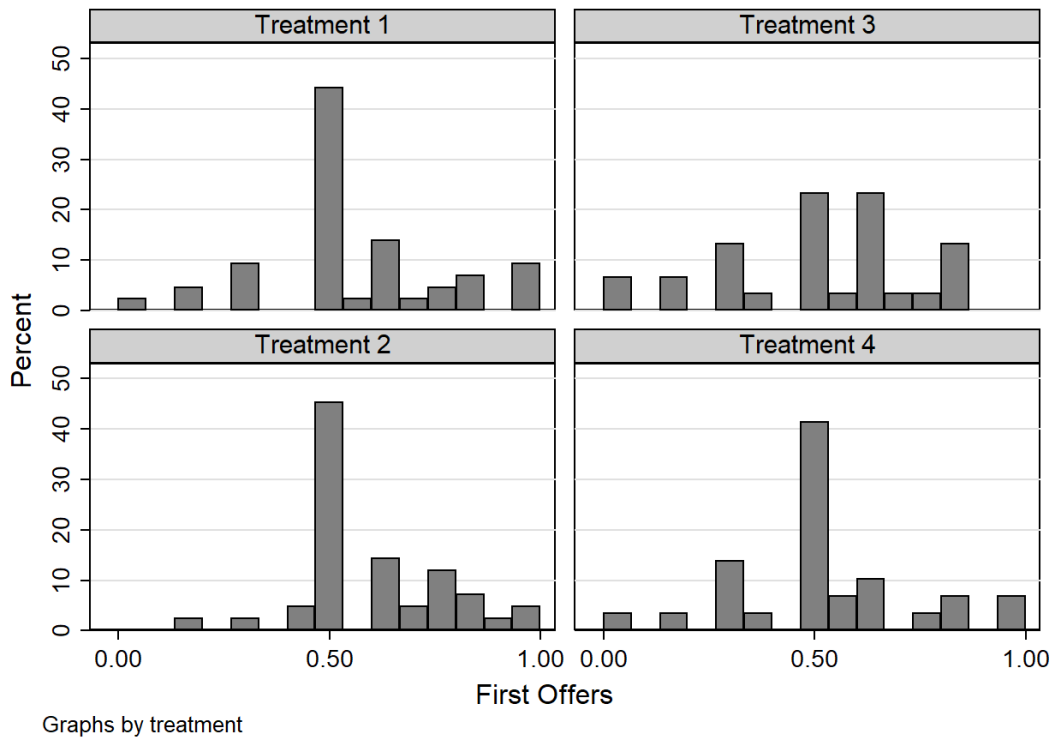
The process variables that we are interested in this section are first offers, conflict in first offers, duration (conditional on reaching an agreement), offer numbers and concessions. The analyses of other process variables can be found in the

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<sup>3</sup>Using Chi-Square test did not affect our results ( $p = 0.512$ ).



Figure 4.2: Distribution of First Offers



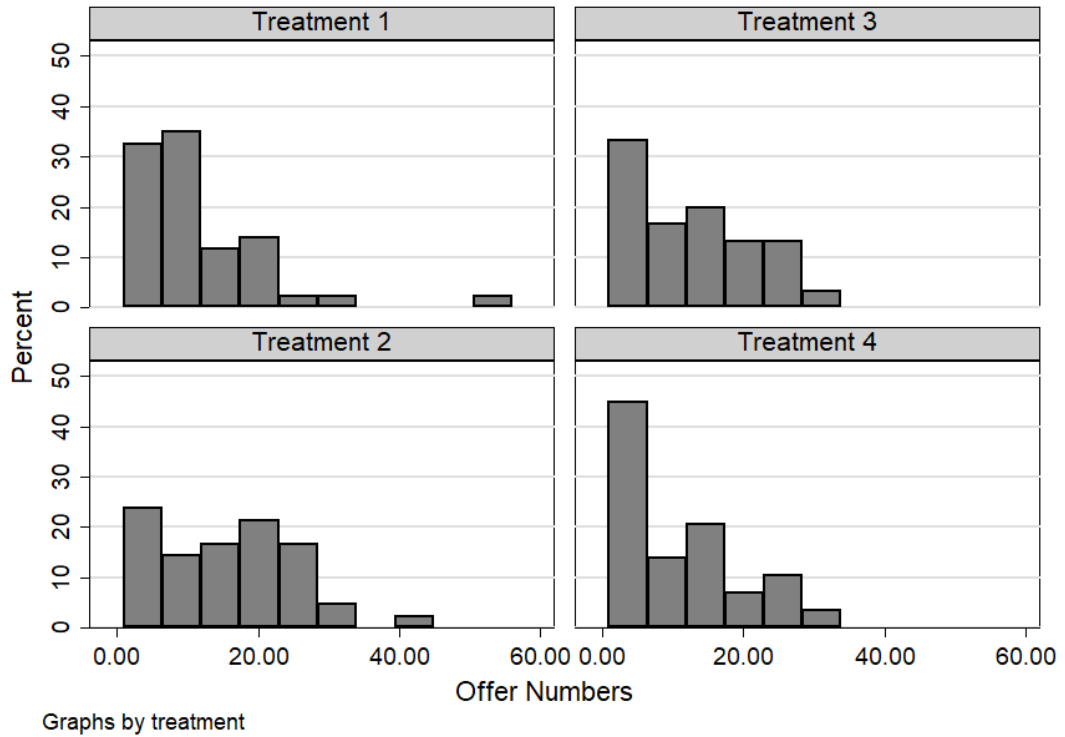
appendix.

The distribution of first offers is represented in Figure 4.2. As stated before, we have found no statistically significant difference between treatment 3 and treatment 4. Similarly, we found that the means of treatment 1 (0.570) and combination of none knows treatments (0.530) are not different (t-test, equal variances, both sides  $p = 0.3706$ ). However, in line with our expectation, we have found that treatment 2 (0.0198) is significantly higher than none knows treatments (t-test, equal variances, one-sided  $p=0.0198$ ). When we compare treatment 1 and treatment 2, statistically there is no difference again (t-test, equal variances, both sides  $p = 0.2872$ ).<sup>4</sup>

In the next figure, we present the distribution of offer numbers for each treatment. We have found that on average, there are more offers made in treatment 2

<sup>4</sup>Using Mann-Whitney test did not affect none of those results.

Figure 4.3: Distribution of Offer Numbers

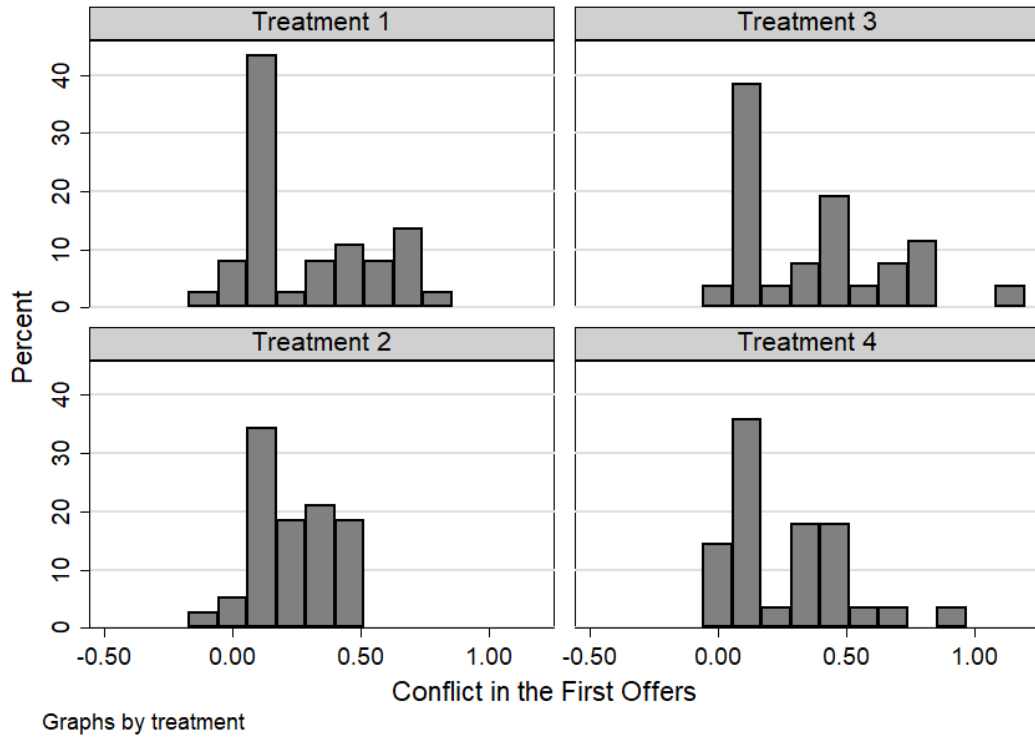


(15.36) than treatment 1 (11.28) (t-test, equal variances, one-sided = 0.0349). For comparison between treatment 1 and none knows treatments, we have found no difference. Lastly, we again found that average offer number is higher in treatment 2 compared to none knows treatments (11.27) (t-test, equal variances, one-sided  $p = 0.0150$ ).<sup>5</sup>

Distribution of conflict in first offers can be seen in Figure 4.4. The definition of the variable is as explained in the hypotheses section. We have found no difference between treatment 2 (0.249) and treatment 1 (0.303) on average. Similarly, treatment 1 and none knows treatments are not significantly different. However, we have found that in treatment 2 there were significantly less conflicts in the first offers compared to none knows treatments. (t-test, unequal variances,

<sup>5</sup>Using Mann-Whitney test did not affect none of those results.

Figure 4.4: Distribution of Conflict in First Offers



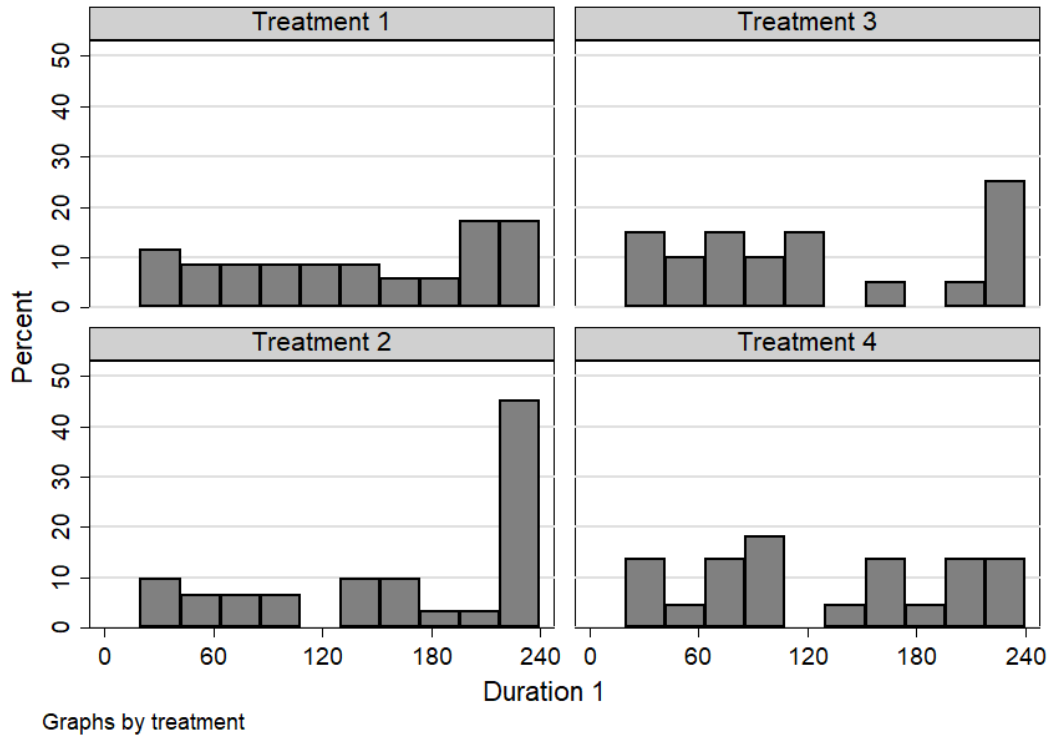
one-sided,  $p = 0.0225$ ).<sup>6</sup>

In the following figure, we present the distribution for duration 1: This is a pair-level variable, which measures the time spent (in seconds) until an agreement is reached. Hence, it takes values between 1 and 240. As seen in the graph, we found that participants spend significantly more time in treatment 2 (163.9) compared to none knows treatments (t-test, equal variances, one-sided  $p = 0.0298$ ). However, we have found no difference between treatment 2 and treatment 1. Similarly, treatment 1 and none knows treatments are also not significantly different.

We have one more duration variable which measures the time spent (in seconds) in bargaining, not conditioning on an agreement. It also takes values between 1

<sup>6</sup>Using Mann-Whitney test gives us  $p = 0.2794$ . Since we have 54 and 38 observations for none knows treatments and treatment 2 respectively, we believe that t-test gives the appropriate results nevertheless.

Figure 4.5: Distribution of Duration 1



and 240. For this variable, we found no difference between treatments. For the concessions variable that was defined in the hypotheses section, we again did not find any significant difference.

#### 4.0.2 Regression Analyses:

In this part, we report the various regression results as a robustness check for our statistical tests. Similar to the previous chapters, we combine treatment 3 and 4 under none knows treatments. In table 4.3 first column, we regress the payoff of advantageous player on treatment dummy (which takes the value of 1 if treatment 2 and 0 if none treatment), agreement dummy (which takes the value of 1 if the pair had reached an agreement). For this regression, we have used the advantageous player data. In column 2, we add controls for age, female dummy, econ dummy (which takes the value of 1 if the player is economics

Table 4.3: OLS for Dependent Variable: Payoff of Adv. Player

VARIABLES	(1) Treat. 2 vs None K.	(2)	(3) Treat. 1 vs None K.	(4)	(5) Treat. 1 vs Treat. 2	(6)
tr_dummy	1.762***	1.731***	0.103	0.0684	-1.770**	-1.092
agree_dummy	1.682***	1.806***	0.745	0.506	2.087**	2.102**
age		-0.0309		0.160		-0.0692
female_dummy		-0.696		-0.594		-0.781
econ		-0.591		0.412		-0.784
relatedclass		0.878		-1.068		-1.447
income		5.31e-05		-0.000399		-0.000209
extraversion		0.0497		0.184*		0.264**
agreeableness		3.80e-05		0.0824		0.0278
conscien		-0.0154		-0.158		-0.0209
emo_stab		0.185**		0.0174		0.0539
open_exp		0.0625		0.0357		0.0385
MACH_index		0.0131		-0.0638		0.00605
Risk_index		0.0153		0.0247		0.0240
Constant	14.28***	13.83***	14.97***	12.99***	15.75***	15.94***
Observations	101	101	102	102	85	85
R-squared	0.227	0.346	0.015	0.162	0.123	0.256

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

major), disposable income, various BFPT test scores regarding extraversion, agreeableness, conscientiousness, emotional stability, openness to experiences; MACH IV test index and risk aversion index. In columns 3 and 5, the treatment dummy takes the value of 1 if it is treatment 1, and takes the value of 0 if it is none knows treatments and treatment 2 respectively. These also apply to the following regressions tables.

As seen in the table 4.3, advantageous players in treatment 2 significantly earns more than their counterparts in none knows treatments at 0.01 significance level both with and without controls. This is in line with our statistical tests. Even though they again earn more compared to advantageous players in treatment 1, this significance disappears when we add controls. Additionally, we see that emotional stability and extraversion can make advantageous players to earn more.

In table 4.4, we report the results of the Probit regression where we regress the agreement dummy to treatment dummy. We have found no significant

Table 4.4: Probit Regression for Dependent Variable: Agreement Probability

VARIABLES	(1) Treat. 2 vs None K.	(2)	(3) Treat. 1 vs None K.	(4)	(5) Treat. 1 vs Treat. 2	(6)
tr_dummy	0.0283	0.0558	0.283	0.318	0.255	0.421*
adv_dummy				-0.104		0.0267
age		0.0244		0.0290		-0.0231
female_dummy		0.205		-0.0975		-0.0659
econ		0.647*		-0.000705		0.625*
relatedclass		-0.257		-0.0792		-0.918**
dispos_income		-1.80e-05		-8.20e-05		0.000160*
extraversion		-0.0621*		-0.0178		0.00679
agreeableness		-0.0251		-0.00278		0.0536
conscien		-0.0166		-0.0721*		-0.0676
emo_stab		0.00235		-0.000627		0.0281
open_exp		0.0257		0.0629		-0.0256
MACH_index		0.0269		0.0280		0.0215
Risk_Index		-0.00614		-0.00647		-0.0139
Constant	0.609***	-0.165	0.609***	-0.0384	0.637***	1.245
Observations	202	202	204	204	170	170

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

difference between treatments. In columns 2, 4 and 6, we add controls but treatment dummy remains insignificant. This is compatible with our last result and statistical tests regarding disagreement rate.

In the next table, we regress first offers (as a payoff given to the advantageous player) of each player to treatment dummies, advantageous player dummy (which takes the value of 1 if the player is advantageous or not), agreement dummy and group dummy (which takes the value of 1 if players are in the same pair). In the previous section, we have showed that the only statistical difference was between treatment 2 and none knows treatments as the former being higher. The OLS results in table 4.5 supports this result as only the treatment dummy in the first and second column is positive and significant. This means that both advantageous and disadvantageous players allocate more to the advantageous player as they know that advantageous player has performed better in the effort phase. Addition to that, we also see that emotional stability becomes significant in treatments where the source of bargaining power is known to the players. In

Table 4.5: OLS for Dependent Variable: First Offers

VARIABLES	(1) Treat. 2 vs None K.	(2)	(3) Treat. 1 vs None K.	(4)	(5) Treat. 1 vs Treat. 2	(6)
tr_dummy	2.326**	2.077*	-0.713	-0.637	-1.792	-1.514
adv_dummy	5.202***	4.887***	6.078***	5.093***	3.050***	2.868**
agree_dummy	-0.686	-0.493	-0.462	-0.671	-1.112	-0.864
Group	-0.00249	-0.00425	0.0270*	0.0181	0.0183	0.0180
age		-0.126		-0.0399		-0.178
female_dummy		0.151		-0.797		-0.479
econ		-0.533		-0.290		-1.843
relatedclass_dummy		1.754		0.546		1.231
dispos_income		-0.000219		-0.000637**		-0.000361
extraversion		0.0431		-0.368**		0.188
agreeableness		-0.261		-0.303		-0.160
conscien		-0.113		-0.0485		0.0127
emo_stab		0.502***		0.410**		0.272
open_exp		-0.0836		0.173		0.0392
MACH_index		-0.111		-0.0181		-0.00570
Risk_Index		-0.0207		0.00174		-0.0386
Constant	13.97***	21.58***	11.86***	16.92***	15.65***	22.07***
Observations	202	202	204	204	170	170
R-squared	0.175	0.239	0.181	0.259	0.091	0.128

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

treatment 1, the players' disposable income and level of extraversion is negative and significantly correlated with the first offer that they make.

In table 4.6, we regress the offer numbers of each player to treatment dummy, advantageous player dummy, agreement dummy and group dummy. In the statistical tests, we have showed there are significantly more offers made in treatment 2 both compared to treatment 1 and none knows treatments. We did not find difference in comparisons of other treatments. The OLS results for offer numbers is in line with what we have showed previously as only columns 1, 2, 5 and 6 are significant and have the expected signs. We know that conflict in the first offers are less in treatment 2 compared to none knows treatments. Therefore, this difference in the offer numbers can not be interpreted as a sign of conflict in bargaining. One interpretation can be the principle of insufficient reason. Since there is more information regarding the legitimacy of bargaining power available to the players in treatment 2, they may have a clearer idea of what the allocation should be in this treatment. This may be the motivation

Table 4.6: OLS for Dependent Variable: Offer Numbers

VARIABLES	(1) Treat. 2 vs None K.	(2)	(3) Treat. 1 vs None K.	(4)	(5) Treat. 1 vs Treat. 2	(6)
tr_dummy	2.480***	2.201***	0.100	0.0843	-1.614**	-1.366*
adv_dummy	-0.356	-0.328	-0.206	0.105	-0.382	-0.658
agree_dummy	-3.040***	-2.694***	-5.207***	-4.881***	-4.836***	-4.574***
Group	-0.00904	-0.00484	0.0121	0.00893	0.00328	0.00342
age		0.0255		-0.0533		-0.165
female_dummy		-0.824		-0.984		-0.997
econ		0.140		0.532		0.181
relatedclass_dummy		-0.450		-0.0689		1.283
dispos_income		0.000125		0.000366*		0.000467*
extraversion		-0.0594		-0.147		0.106
agreeableness		0.268*		-0.0331		0.141
conscien		0.304**		0.0805		0.113
emo_stab		0.0257		0.0171		0.00449
open_exp		-0.0341		0.0158		-0.107
MACH_index		-0.101*		-0.111**		-0.0850
Risk_Index		0.0523**		0.0468*		0.0667**
Constant	8.532***	6.592*	8.962***	10.22***	11.13***	12.34***
Observations	202	202	204	204	170	170
R-squared	0.131	0.199	0.228	0.307	0.191	0.282

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

behind higher offer numbers. Another result that we can derive from the table is that the players who have reached an agreement significantly have less offer numbers in each specification. We also see that risk aversion is negatively correlated with the offer numbers in each specification. Another interesting results is that, Machiavellian index becomes significant only in the specifications with none knows treatments.

Lastly, we present the OLS results regarding the duration 1 variable as it is defined in the previous sections. As seen in the first and second columns of the table, the players in treatment 2 spends more time on bargaining conditional on reaching an agreement compared to none knows treatments. There is no significant difference in comparisons of other treatments. This results supports the corresponding statistical tests in the previous section. Additionally, we see that female participants spend less time once they know that the source of bargaining power is luck compared to treatments where they do not know. We



Table 4.7: OLS for Dependent Variable: Duration 1

VARIABLES	(1) Treat. 2 vs None K.	(2)	(3) Treat. 1 vs None K.	(4)	(5) Treat. 1 vs Treat. 2	(6)
tr_dummy	31.70**	26.56*	0.435	0.861	-18.23	-12.29
Group	0.0526	0.167	0.420**	0.363*	0.226	0.296*
age		-2.255		-1.777		-7.041**
female_dummy		-9.123		-25.74*		-18.08
econ		-20.67		-0.351		-31.87
relatedclass_dummy		33.80		-5.351		24.73
dispos_income		0.00519		0.00659*		0.00182
extraversion		-2.834		-1.793		3.106
agreeableness		3.283		-0.519		0.134
conscien		4.926*		1.409		4.817*
emo_stab		1.948		0.0286		0.133
open_exp		-1.315		-2.128		-0.335
MACH_index		-1.242		-2.535**		-0.671
Risk_Index		1.241**		0.378		0.719
Constant	127.1***	128.3*	108.2***	203.7***	142.1***	257.3***
Observations	146	146	154	154	132	132
R-squared	0.050	0.153	0.042	0.155	0.040	0.175

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

also found that age comes into play in comparisons of both knows treatments: the older participants spends less time in luck treatments. Moreover, table shows that more Mach IV index is negatively correlated with the time spent in bargaining in treatments where the legitimacy of bargaining power is not obvious: namely, in none knows treatments and treatment 1.

## CHAPTER 5

### CONCLUSION AND DISCUSSION

In this study, we have examined the the impact of disagreement points (as a major source of bargaining power) on agents' bargaining outcomes and process under various information conditions. We believe this research connects the literature regarding information in experiments with bargaining and provides results which both supplements and contradicts the predictions that were taken granted in previous theoretical works. More specifically, we designed an experiment where we have two "sources" for bargaining power: effort vs luck; and two information conditions: both vs none knows. Given the restrictions of pandemic, the whole experimental process was conducted online including recruiting and payment. To the best of our knowledge, this work is first one to examine the question of how information conditions regarding the source of bargaining power influence bargaining behaviour.

We have obtained three main results in light of our hypotheses. In line with the previous works regarding the entitlement in experiments, our first result states that the participants with more bargaining power (higher disagreement point in our case) significantly earn more when the source of bargaining power is known to both players and when it is based on performance. in other words, when it is known by both players that the parties did not "earn" their entitlements, the disagreement points lose their influence and equal division becomes the most common allocation.

Secondly, we have hypothesized that there is no statistically significant difference in agreement conditions between none knows treatments and luck treatment. Indeed, our second result confirms that knowing that the source of bargaining power is purely based on luck and not knowing the source leads to the statistically not different bargaining outcomes. Combining the two hypotheses above, we also expected advantageous players in none knows treatments to earn less than their counterparts in treatment 2. In line with that, we showed with the regression results that the payoff of advantageous players are more in treatment 2 than none knows treatments at 0.01 significance level.

Our third result states that there is no statistically significant difference in disagreement rates across treatments where the source of bargaining is known and in treatments when it is not known. As a robustness check, we have also showed that there is no statistically significant treatment dummy covariate in any specification in the Probit regression regarding agreement probability.

For our process variables, we refrained from providing hypotheses for each and every variable since it is not very straight-forward to formulate well-substantiated prediction for all variables of interest in an experimental design with four conditions. We report the results are regressions of the process variables that we thought are insightful for understanding the mechanisms behind participants' bargaining behaviour.

Firstly, we have examined the first offers that are made and found that the only statistical difference is between none knows treatments and treatment 2 with latter being higher. For the offer numbers, we have found that there are more offers made in treatment 2 in comparison to treatment 1 and also to none knows treatments. Lastly, both in statistical tests and regression analyses, we have showed that participants spend more time in bargaining phase if there are in treatment 2 compared to none knows treatments. The combination of these three process variables indicates the following: Even though the offers as

advantageous players' shares starts higher, the bargaining process is longer and involves more offers in treatment 2 compared to other treatments. We think that this may be about the sufficiency of reasoning: As there is more information regarding the "legitimacy" of bargaining available to the players in treatment 2, they have a clearer idea of what the allocation should be in this treatment, relative to the other treatments.

One important future work related to this study is to implement all of the treatment variations of Roth and Murnighan (1982) as it also includes treatments where a player knows the source of bargaining power while the other doesn't. This would provide a richer picture for understanding how information structures affect the bargainer behaviour.

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## APPENDIX

In this part, we present the instructions used in the online experiment which are translated from Turkish. The only difference across treatments is in the page regarding information condition. Hence, we present them together and specify the treatments only in that section. We provide the available answers of the questions within the experiment inside square bracelets.

### Page 1: Welcome

This experiment is developed by the researchers of Bilkent University Economics Department. In this experiment, you will be randomly matched with someone else. Both during and after the experiment, you will not be informed about the identity of the person with whom you are matched, and your pair will not be informed about your identity either. The decisions you made in the experiment, your answers to the questions, and your bargaining process with the person you match will be kept anonymous and in your identity will not be understood by the researcher.

Purpose of the research: The purpose of this research is to examine the behavior of individuals and their decision making mechanisms in different situations.

The experiment carries no risk for participants. The confidentiality of the decisions and the identity of the participants will be protected. The results of the research can be reported and published for scientific purposes, provided that the information regarding participants' identity is kept confidential.

Participation in the experiment is on a voluntary basis. Persons associated with the university If participants agree or refuse to participate in the research, or for any reason if they are expelled from the program or if they quit, this will not affect their academic evaluations or the service provided to them positively or negatively.

Please do not close the page until you see the text "The experiment has ended". If you exit the experiment before that, no payment will be made. At the end of the experiment, in addition to the winnings, a participation fee of 5 TL will be given to all participants. The experiment consists of six parts and it takes 25 minutes on average.

Do you agree to participate in the experiment under these conditions?

[Yes, No]

### Page 2: Instructions

- Effort phase (4 minutes): You and the person you are matched with will be



given an effort task. It may be advantageous for you to complete it as successfully as possible.

- Briefing (1 minute): You and the person you are matched with will be told **the amount of money you will earn in case you are unable to reach an agreement in the bargaining phase.**
- Bargaining (4 minutes): In this phase, you and your match will bargain for 30TL. You will have 4 minutes to reach an agreement. 30TL is a fixed amount, not an amount determined by your performances in the effort phase. On the bargain screen, you can make an offer **not exceeding 30 TL** to the person you match. **You can make as many offers as you want, whenever you want. Similarly, the person you are matched with will be able to offer you as much as he wants, whenever he wants, and you will instantly be able to see it on your own screen.** In addition, there is a list of all previous offers made on the screen. The table will be updated as you and the other party make offers. **If the other party accepts your offer or if you accept the last offer from the counter, the bargaining phase will be over and you will win your share of the offer. After 4 minutes, if neither you nor the person you matched with did not press the accept the offer button, the bargaining is will be over without and agreement.** In this case, you will receive the money that you were told in the previous phase.
- Post-experiment survey (3-4 minutes): After bargaining phase, you will take a survey asking questions about your monthly income, age, gender, department and class.
- Payment (1 minute): You will be asked payment information.

### Page 3: Information conditions

#### Treatment 3 and 4

- Advantageous Player

If you cannot reach an agreement, you will receive 15TL and the person you match will receive 5TL. **These amounts may be determined based on random/chance or based on your performance in the effort phase. You don't know how it's given.** With 0.5 probability, high performing participant receives 15TL and under performing participant receives 5TL. With 0.5 probability, a random participant was given 15TL and the other 5TL. Likewise, the person you are matched with does not know on what basis it is given. In the next page, you will answer a set of questions designed to make sure you understand the experiment.

- Disadvantageous Player

If you cannot reach an agreement, you will receive 5TL and the person you match will receive 15TL. **These amounts may be determined based on random/chance or based on your performance in the effort phase. You don't know how it's given.** With 0.5 probability, high performing participant receives

15TL and under performing participant receives 5TL. With 0.5 probability, a random participant was given 15TL and the other 5TL. Likewise, the person you are matched with does not know on what basis it is given. In the next page, you will answer a set of questions designed to make sure you understand the experiment.

### **Treatment 1**

- Advantageous Player

If you cannot reach an agreement, you will receive 15TL and the person you match will receive 5TL. These amounts are given at random/chance. In other words, it has nothing to do with your performance in the effort phase. Both you and the person you are matched with know that these amounts are given randomly.

- Disadvantageous Player

If you cannot reach an agreement, you will receive 5TL and the person you match will receive 15TL. These amounts are given at random/chance. In other words, it has nothing to do with your performance in the effort phase. Both you and the person you are matched with know that these amounts are given randomly.

### **Treatment 2**

- Advantageous Player

If you cannot reach an agreement, you will receive 15TL and the person you match will receive 5TL. These amounts are based on your performance during the effort phase. That is, you gave more correct answers than the person you matched with in the effort phase. Both you and your match know that these amounts are given according to performance.

- Disadvantageous Player

If you cannot reach an agreement, you will receive 5TL and the person you match will receive 15TL. These amounts are based on your performance during the effort phase. That is, you gave less correct answers than the person you matched with in the effort phase. Both you and your match know that these amounts are given according to performance.

## **Page 4: Control Questions**

Please answer the following questions. These questions are designed to make sure you understand the experiment.

Question 1: If you cannot reach an agreement in the bargaining, the money you will earn is determined according to your performance in the effort phase. [True, False]

Question 2: The person I am matched with knows how the money that we receive if we cannot reach an agreement is determined. [True, False]

Question 3: The 30TL on which we will bargain over has been determined according to our performance in the effort phase. [True, False]

### **Page 5: Explanation**

On the next page, you will negotiate with the person you matched with. The bargaining screen is divided into 3 sections.

In the leftmost section, you will see the latest offer from the counter. If you accept this offer, the bargaining will end. This section will be updated as the other party makes an offer.

In the middle section, you can view your latest offer and make a new offer to the other party whenever you want. Likewise, if the other party accepts your most recent offer, the bargaining will end.

In the far right section, you can see all the offers made in the past.

You can only communicate with the other party through offers. This phase will last 4 minutes in total. If no agreement is reached after 4 minutes, you will receive the disagreement scenario money that you saw in the previous phase. Please make offers in whole numbers. (For example, do not make offers such as 10.5.)

### **Page 6: Post-Experimental Questionnaire**

Please answer the following questions. Your answers will not affect your endgame winnings and will be kept anonymous.

- What is your age?
- What is your gender? [Male, Female]
- What is your department?
- Have you previously taken courses such as Game Theory or Bargaining Theory? [Yes, No]
- What is your monthly disposable income?

Please indicate to what extent the following features apply to you. *The options are [Disagree strongly, Disagree moderately, Disagree a little, Neither, Agree nor disagree, Agree a little, Agree moderately, Agree strongly] for this part.*

- I see myself as extraverted, enthusiastic.
- I see myself as critical, quarrelsome.

- I see myself as dependable, self-disciplined.
- I see myself as anxious, easily upset.
- I see myself as open to new experiences, complex.
- I see myself as reserved, quiet.
- I see myself as sympathetic, warm.
- I see myself as disorganized, careless.
- I see myself as calm, emotionally stable.
- I see myself as conventional, uncreative.
- Honesty is the best policy in all cases.
- Most people are basically good and kind.
- There is no excuse for lying to someone else.
- When you ask someone to do something for you, it is best to give the real reasons for wanting it rather than giving reasons which carry more weight.
- All in all, it is better to be humble and honest than to be important and dishonest.

*The options are 11 digit scale where on one side it states "I have no intention of taking any risks" and on other side "I am very willing to take risks" for this part.*

- How would you rate yourself? Generally as a risk taker or as a risk averse person?

A person may behave differently in different situations. How ready are you to take risks in the following situations?

- While driving?
- When making a financial investment?
- In your rest time and while playing sports?
- Regarding your professional career?
- Regarding your health?
- About trusting people you don't know?

Please consider what to do if you encounter the following situation. Suppose you won 100,000 TL in a lottery. As soon as you receive the prize, you receive a new offer from a reputable lottery firm that will allow you to double your

deposit. In case you win your money will be paid immediately. However, there is a possibility that you will lose half of your deposited money. You may deposit all or part of your money in the lottery based on this offer, or you may not deposit it at all. How much of the 100,000 TL you won from the lottery would you invest in this new lottery that carries risks on the one hand and promises profits on the other?

[All 100,000TL, The amount of 80.000 TL, The amount of 60.000 TL, The amount of 40.000 TL, The amount of 20.000 TL, None]

Another question about risk taking. How would you act if you were faced with the following situation: Suppose you earned 100,000 TL. As soon as you receive the award, a reputable bank offers you an investment. You have the chance to double your deposit within 2 years. However, there is a possibility that you will lose half of the money you have invested. You can deposit 100,000TL in whole or in part or reject the offer completely. How much of your lottery winnings would you use in this investment opportunity?

[All 100,000TL, The amount of 80.000 TL, The amount of 60.000 TL, The amount of 40.000 TL, The amount of 20.000 TL, None]

## **Additional Checks**

### **Kolmogorov-Smirnov Tests**

In this section, we report our Kolmogorov and Smirnov tests as robustness check. All p-values are exact p-values.

- Treatment 1 vs. Treatment 2

Our Kolmogorov-Smirnov test regarding the the comparison of agreement conditions of the relevant treatments gives us a p-value of 0.001, meaning that that these distributions are significantly different from each other. In line with our previous statistical tests and regressions analyses, we found that distributions of disagreement rates (p-value= 0.998), first offers (p-value = 0.887), conflict in first offers (0.182) and duration 1 are also not different from each other. We have found that offer numbers have different distributions and this is also in line with our results.

- Treatment 1 vs None Knows Treatments

Again, all of the Kolmogorov-Smirnov test for this comparison validates our previous results. For our two main variables of interest, agreement conditions and disagreement rate, we have p-values of 0.856 and 0.983 respectively. Similarly for all the other process variables, there is no difference in the respective distributions.

- Treatment 2 vs None Knows Treatments Distribution for agreement conditions for these treatments are significantly different with p-value of 0.000 whereas distributions of disagreement rates are not different with p-value of 1.000. We have found that both duration 1 and offer numbers are in line with the results, distributions of both variables are significantly different. However, we did not find a difference for the distributions of first offers and conflict in the first offers with p-values of 0.141 and 0.262 respectively.

### **Other Process Variables**

*Last Moment Agreements:* These are pair-level dummy variables. It takes the value of 1 if an agreement is reached in the last 5 seconds and 0 otherwise for last 5 second variable. Last 10 second variable is also constructed in the similar fashion.

Throughout the Fisher's exact and Chi-Square tests, we did not find a significant difference between treatments for the last 5 second variable. In the regression analyses, we did not find any significant treatment dummy covariate either.

However, we have found a statistically significant difference between treatment 1 and treatment 2 for last 10 seconds treatment in 1-sided Fisher's exact test with p-value of 0.074. In Table 5.1, we report the results of Probit regression for last 10 second variable. In line with the Fisher's exact test, we see that treatment 2 involves significantly more pairs who had reached agreement in the last 10 seconds, in comparison to both none knows treatments and also treatment 1. Since we also know that duration 1 variable is also significant for treatment 2 in comparison to treatment 1, this is not a surprising result. We also found that Risk index is significant and has positive sign for each specification.

*Advantageous Acceptor Dummy:* The next process variable is advantageous acceptor dummy: This is again a pair level variable which takes the value of 1 if the last offer is accepted by an advantageous player and 0 otherwise.

For this variable, only the 1-sided Fisher's exact test for comparison of treatment 2 and none knows treatments is significant with p-value: 0.088. The Probit regression for this variable is reported in Table 10. Similarly, we see that treatment dummy is significant only in columns 1 and 2 of table 5.2.

*Advantageous Initiator Dummy:* Similar to the variable above, this is also a pair level variable which takes the value of 1 if the first offer is made by an advantageous player and 0 otherwise. For this variable, we have found no statistically significant difference in any of the tests and also in any treatment

Table 1: Probit Regression for Dependent Variable: Agreement in last 10 seconds

VARIABLES	(1) Treat. 2 vs None K.	(2)	(3) Treat. 1 vs None K.	(4)	(5) Treat. 1 vs Treat. 2	(6)
tr_dummy	0.507**	0.602**	-0.100	-0.0719	-0.607**	-0.616**
age		-0.00216		0.0332		-0.0496
female_dummy		-0.555*		-0.732**		0.0125
econ		-0.455		-0.170		0.0841
relatedclass_dummy		0.474		-0.313		0.300
dispos_income		8.22e-05		5.63e-05		3.04e-05
extraversion		-0.0738		-0.0595		0.00716
agreeableness		0.0363		-0.0658		-0.0596
conscien		0.105*		-0.0267		0.0140
emo_stab		0.0220		-0.00308		0.0301
open_exp		-0.116*		-0.0904		-0.0437
MACH_index		-0.0258		-0.0297		0.00407
Risk_Index		0.0335***		0.0293**		0.0235**
Constant	-0.967***	-1.705	-0.967***	-1.607	-0.460***	-0.535
Observations	146	146	154	154	132	132

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 2: Probit Regression for Dependent Variable: Adv. Acceptor Dummy

VARIABLES	(1) Treat. 2 vs None K.	(2)	(3) Treat. 1 vs None K.	(4)	(5) Treat. 1 vs Treat. 2	(6)
tr_dummy	0.470**	0.546**	0.313	0.329	-0.157	-0.126
age		0.00497		0.0105		0.0245
female_dummy		-0.252		0.0765		-0.382
econ		0.0808		0.566		-0.243
relatedclass_dummy		-0.481		-0.242		-0.519
dispos_income		-4.86e-05		3.16e-05		-9.42e-05
extraversion		0.0486		0.0408		0.0485
agreeableness		0.00132		0.0259		0.0282
conscien		-0.0775*		-0.0441		-0.131**
emo_stab		-0.0300		-0.0400		-0.0109
open_exp		-0.0362		-0.0524		0.108*
MACH_index		0.0406*		0.0268		-0.000815
Risk_Index		-0.00968		0.00327		-0.0189*
Constant	-0.349**	-0.496	-0.349**	-1.359	0.122	0.817
Observations	150	150	158	158	132	132

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1



Table 3: OLS for Dependent Variable: Duration 2

VARIABLES	(1) Treat. 2 vs None K.	(2)	(3) Treat. 1 vs None K.	(4)	(5) Treat. 1 vs Treat. 2	(6)
tr_dummy	16.05	13.47	-10.57	-7.495	-20.33*	-19.23
Group	0.0515	0.115	0.205	0.135	0.157	0.170
age		-2.967		-3.477		-4.836*
female_dummy		-15.17		-16.06		-13.39
econ		-28.20		-9.225		-36.14**
relatedclass_dummy		20.63		-1.577		40.51**
dispos_income		0.00524		0.00698**		-0.000927
extraversion		-0.305		-1.156		1.727
agreeableness		3.342		0.183		-0.961
conscien		4.416**		3.695		4.993**
emo_stab		1.188		0.598		-1.383
open_exp		-1.027		-2.823		-0.664
MACH_index		-1.514		-2.654***		-0.782
Risk_Index		0.931**		0.433		0.927*
Constant	162.7***	198.8***	154.9***	273.1***	168.3***	239.6***
Observations	202	202	204	204	170	170
R-squared	0.015	0.113	0.009	0.109	0.034	0.147

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

comparison. In the same fashion, we also did not find any significant treatment dummy coefficient in Probit regression either.

*Duration 2*: This variable is the same as duration 1 variable except that this is not conditional on reaching an agreement. In other words, we include the pairs who could not reach an agreement and duration 2 takes the value of 240 for these pairs as bargaining phase lasted for 240 seconds.

The only significance was found in the t-test for comparison of treatment 1 and treatment 2 with p-value= 0.0718 indicating that pairs in treatment 2 has spent more time in bargaining not conditional on reaching an agreement. In Table 5.3, we provide the OLS regression results for duration 2. The only significant treatment dummy is in column 5, indicating the same result with t-test. However, this significance disappears when we add controls.