KÜBRA NUR GÜNGÖR MAGICAL THINKING IN AN INCOMPLETE INFORMATION BARGAINING GAME Bilkent University 2024

MAGICAL THINKING IN AN INCOMPLETE INFORMATION BARGAINING GAME: AN EXPERIMENTAL STUDY

A Master's Thesis

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Ankara
July 2024

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The Graduate School of Economics and Social Sciences
of
İhsan Doğramacı Bilkent University

by

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In Partial Fulfillment of the Requirements for the Degree of
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THE DEPARTMENT OF
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İHSAN DOĞRAMACI BİLKENT UNIVERSITY
ANKARA

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MAGICAL THINKING IN AN INCOMPLETE INFORMATION BARGAINING GAME: AN EXPERIMENTAL STUDY
By Kübra Nur Güngör

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Economics.

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ABSTRACT

MAGICAL THINKING IN AN INCOMPLETE INFORMATION BARGAINING GAME: AN EXPERIMENTAL STUDY

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July 2024

This thesis investigates the effect of magical thinking on individuals' decision-making processes, with a specific focus on incomplete information ultimatum bargaining games. Hiding behind the small pie is a robust finding of this literature where the proposers use an information advantage for their personal gain. Using a simple ultimatum bargaining setup, we examine the impact of the timing of uncertainty resolution on the proposers' offers and the frequency of hiding behind the small pie behavior. We employ a between-subject design with two treatments: BEF(ore) and AFT(er), varying the timing of randomization that determines the pie size without any variation in the information set of proposers across treatments. The probit regression analysis results suggest that treatment variation impacts the proposers' tendency to hide behind the small pie, in line with our hypothesis. To the best of our knowledge, this is the first study investigating the effect of magical thinking in a sequential bargaining game.

Keywords: Magical thinking, incomplete information, ultimatum bargaining, hiding behind the small pie behavior, experimental economics.

ÖZET

EKSİK BİLGİLİ BİR PAZARLIK OYUNUNDA BÜYÜLÜ DÜŞÜNME: DENEYSEL BİR ÇALIŞMA

Güngör, Kübra Nur

Yüksek Lisans, İktisat Bölümü

Tez Danışmanı: Doç. Dr. Emin Karagözoğlu

Temmuz 2024

Bu tez, bireylerin karar alma süreçlerinde büyülü düşünmenin etkisini, eksik bilgi ile yürütülen ültimatom pazarlık oyunlarına odaklanarak incelemektedir. Bu literatürdeki sağlam bulgulardan biri olan "küçük pastanın arkasına saklanma" davranışı, teklif veren oyuncuların sahip oldukları bilgi avantajını kişisel çıkarları için kullanmalarını ifade eder. Basit bir ültimatom pazarlık düzeni kullanarak, belirsizliğin çözülme zamanlamasının teklif veren oyuncuların tekliflerine ve küçük pastanın arkasına saklanma davranışının sıklığına olan etkisini inceliyoruz. Denekler-arası bir tasarım kullanarak iki farklı uygulama (BEF(ore) ve AFT(er)) gerçekleştirdik ve uygulamalar arasında teklif veren oyuncuların bilgi setinde herhangi bir değişiklik yapmadan pasta boyutunu belirleyen randomizasyon zamanlamasını değiştirdik. Probit regresyon analizi sonuçları, uygulama değişikliğinin teklif veren oyuncuların küçük pastanın arkasına saklanma eğilimini etkilediğini ve hipotezimize uygun olduğunu göstermektedir. Bildiğimiz kadarıyla, bu çalışma, büyülü düşünmenin ardışık pazarlık oyunlarındaki etkisini araştıran ilk çalışmadır.

Anahtar Kelimeler: Büyülü düşünme, eksik bilgili ültimatom pazarlık oyunu, küçük pastanın arkasına saklanma davranışı, deneysel iktisat.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

The importance of take-it or leave-it offers in modeling real-life bargaining instances is evident as the literature on ultimatum bargaining is extensive. Starting with the original paper, Güth et al. (1982), the number of ultimatum game experiments still expands even after 40 years. Although it may seem that the ultimatum bargaining game is not complex enough to match real-life bargaining situations, the simplicity of the game structure is an advantage since it helps to further the understanding of the decision-making processes in strategic interactions and the motivations behind bargaining decisions. As Güth and Kocher (2014) report, Amnon Rapoport claims that "the ultimatum game is one of the behaviorally most complex games in experimental economics" (p.397).

Furthermore, in most instances of life, instead of complete information, it is more prevalent to encounter situations involving asymmetric information. Beginning in the 1970s, games with imperfect information structures, including ultimatum bargaining games, drew the attention of many scholars. The ultimatum game with asymmetric information has been studied by an important number of economists, such as Mitzkewitz and Nagel (1993), Rapoport and Sundali (1996), Kagel et al. (1996), Besancenot et al. (2013), and Kriss et al. (2013). With the expansion of this literature, a stylized fact emerged for the incomplete information ultimatum game

where the proposers have an information advantage over the responders, and they exploit this position by implicitly deceiving the responder to appear fair. In particular, when the responder is not informed about the total amount to be shared between her and the proposer, the proposer makes offers equal to half of the small pie when he is distributing the large pie. There are studies where this observation is labeled as implicit deception (Kriss et al., 2013; Vesely, 2014) or 'hiding greed' (Klempt & Pull, 2019), but we will refer to it as 'hiding behind the small pie'. In our study, we will take this as a paradigm and study the effect of magical thinking here.

Magical thinking is a concept referring to the case where individuals erroneously believe that their actions can influence an outcome without the existence of a causal link (Shafir & Tversky, 1992, p. 463). The concept has been studied in various disciplines, including Psychology, Philosophy, Sociology, and Economics. As an example, Langer (1975) studies the phenomenon of the "illusion of control", which can be considered an umbrella term for magical thinking, defined as "an expectancy of a personal success probability inappropriately higher than the objective probability would warrant" (p. 311). In our study, we consider magical thinking as, in brief, the participants' belief in being able to increase the probability of a desired outcome by behaving in a more generous/selfless manner. Hence, following the author's explanation, magical thinking can also be regarded as a form of 'belief in a just world' since this would mean expecting good outcomes in exchange for good behavior (Langer, 1975).

Although the magical thinking literature in Economics is not extensive, there are theoretical and experimental studies investigating the possible effects of magical thinking in prisoners' dilemma games (Daley & Sadowski, 2017; Shafir & Tversky, 1992; Semb, 2021), public goods games (Masel, 2007), dictator games (Semb, 2021), and other experimental setups involving uncertainty (Arad, 2014; Tykocinski, 2008). In the literature, the magical thinking phenomenon is considered a channel through which the agents' undesired behaviors predicted in standard economic models and/or observed in economic experiments are tempered. In other words, when agents make decisions in the presence of uncertainty, they tend to believe that choosing the less greedy option, being fair, or acting "good" would increase the likelihood of their preferred outcome. The concept is similar to the belief in karma or tempting fate, in the sense that people act as if they will be punished for their undesirable actions and rewarded for the desirable ones. In the case of symmetric games such as prisoners' dilemma, the mentioned reward can be interpreted as the other player reciprocating their cooperation. In line with this interpretation, for example, Shafir and Tversky (1992) found that people choose cooperation more frequently in a prisoners' dilemma game when the action of the other player is uncertain, compared to the cases where the other player's action is known with certainty to be either cooperation or defect.

In our case, the undesired behavior considered is the proposers' tendency to 'hide behind the small pie'. We designed a simple, one-shot ultimatum bargaining experiment where the possible pie sizes are 40₺ and 240₺. We are examining the effect of magical thinking in decreasing the frequency of offers that hide behind the

small pie and increasing the average generosity by varying the timing of randomization that determines the realized pie size.

To the best of our knowledge, the existence of magical thinking has yet to be tested in an ultimatum bargaining setup. We believe this is an interesting topic to study because the implications and applications of magical thinking are not limited to bargaining situations. If magical thinking indeed has an impact on discouraging undesired behavior or encouraging desired outcomes, it can be used as a convenient strategy in education and policymaking.

In the remainder of this paper, we first review the literature, focusing mainly on incomplete information ultimatum bargaining game experiments, and magical thinking. Then, in chapters 3 and 4, we present the design of our experiment and provide the research hypotheses. Chapter 5 includes the results and analysis of experimental findings. In the appendix, we provide the experimental instructions and comprehension questions, translated from Turkish, along with various robustness check results.

CHAPTER 2

LITERATURE REVIEW

In the asymmetric/incomplete information literature, the ultimatum bargaining game and its variations (eg. Yes-No Game) have been studied frequently. Experimental findings show people's tendency to use informational advantages for personal gain. Mitzkewitz and Nagel (1993) studied the ultimatum game with asymmetric information using two variations: the offer game and the demand game. In both variations, there are 6 possible pie sizes (1, 2, 3, 4, 5, 6) to be shared between the proposer and the responder. The proposer has the information advantage since the responder does not know the realized pie size, she is informed only about the probability of realization for each size. In the offer game, the proposer offers a sum to the responder, so she only knows her own potential gain. In the demand game, the proposer shares his demands from the pie, and the responder makes a decision only knowing her opponent's share. The authors use the strategy method to collect the offers and accept/reject decisions of the players. In line with hiding behind the small pie behavior, the proposers offer 2 for cakes 5 and 6 while offering equal splits for smaller pie sizes.

Kriss et al. (2013) studied this tendency to deceive by comparing explicit vs implicit deception. In an ultimatum game where the proposer has private information about

the pie size, the authors used 3 treatments varying the proposers' communication channels: they could make offers with no communication with the responder, they could indicate (truthfully or not) the drawn pie size or they could provide a promise of truth in addition to the pie size. The findings suggest that proposers took advantage of their private information, and explicit deception led to more dishonesty while the addition of promises decreased the deceptive behavior. Similar to Kriss et al. (2013), Besancenot et al. (2013) also conducted an experiment of an ultimatum bargaining game with message communication. Their results also showed consistent strategic deception by the proposers via messages sent to the responders.

The extensive literature on asymmetric information ultimatum game experiments that achieve results confirming the consistent presence of hiding behind the small pie behavior is not limited to the few papers we reviewed here. However, we now continue this chapter by reviewing magical thinking literature because our aim is to study the existence and possible effects in the context of an incomplete information bargaining game that produces the hiding behind the small pie behavior as a robust empirical phenomenon.

As briefly mentioned in Chapter 1, Shafir and Tversky (1992) conducted a prisoners' dilemma experiment where the participants played the game simultaneously or sequentially, depending on the treatment. In the sequential version, the second player moves after observing the first player's action. According to the experimental data, the participants reciprocated compete by choosing to compete in response, as expected. Interestingly, their results show that, while 16% of the participants in the

sequential treatments reciprocated their opponents' cooperation, the ratio of the participants who cooperated in the simultaneous treatments, when the opponent's action is unknown, is 37%. The authors introduced magical thinking and quasi-magical thinking as plausible ways to interpret unpredicted experimental findings.

Quasi-magical thinking is defined as "cases in which people act as if they erroneously believe that their action influences the outcome, even though they do not really hold that belief" (Shafir & Tversky, 1992, p. 716). Following this definition, Masel (2007) introduced a "Bayesian model of quasi-magical thinking" to provide an explanation for the cooperation behavior in public good games, as the baseline theoretical models would predict the participants to make 0 contributions. The new model utilizes the conditional expected utility (CEU) for the agents' utility maximization problem instead of the common practice of expected utility. CEU considers the "perceived probabilities" assigned to different levels of contributions conditional on the strategy chosen by the agent (p. 219). Consequently, Masel (2007) showed that the quasi-magical thinking model is indeed able to explain the contributions in a public good game by using various data pieces.

It is worth mentioning that in the literature, magical thinking is considered an additional factor that could shed light on unpredicted experimental findings regarding human behavior, which is mainly because it is not plausible to infer beliefs directly from actions. Nevertheless, the results obtained in the literature support the presence of the explanatory power of magical thinking, which we believe can be a valuable contribution to Behavioral Economics as a way of thinking.

Continuing our review with another theoretical study incorporating magical thinking, Daley and Sadowski (2017) provide a behavioral model and a representation result that explains behavior in 2x2 symmetric games. Although the authors' focus is on PD games, the proposed model has implications for games such as the battle of the sexes, the stag hunt, etc. Similar to other papers considering symmetric games, Daley and Sadowski (2017) also describe magical thinking as the players believing that their 'good' behavior is more likely to be reciprocated by their opponent. In their model, authors assign types, α_i, to the players representing their level of magical thinking, i.e. the probability they assign to the event that the opponent will perfectly correlate with their actions. The implications of the strategic model suggested by Daley and Sadowski (2017) were consistent with the experimental findings in the literature for the mentioned symmetric games.

Another paper examining the possible effect of magical thinking in a PD game, the Ph.D. thesis Semb (2021), studies a replication of the experiment from Shafir and Tverksy (1992) using between-subject design instead of the original within-subject design. The author also conducted an experiment using the dictator game. Focusing on the effect of the timing of uncertainty in the first part and the effect of the similarity on the second, the experimental findings do not yield significant results favoring the presence of magical thinking. As mentioned above, it is more convenient to search for magical thinking in a form of expectations about reciprocity when considering a symmetric game like PD. However, we argue that the source of return to the players' 'good' behavior may not necessarily be their opponent. In our

study, we expect to observe the effects of magical thinking through the probability of obtaining the large pie as a result of the randomization.

Lastly, Arad (2014) also presents results showing that the participants in an experimental setup involving uncertainty deliberately avoid choosing the lottery with the highest prize, i.e. “the greedy option,” with the fear of some “magical punishment” (p. 22). The author also mentions the possibility of other explanations than magical thinking, such as randomness and salience of the middle options.

CHAPTER 3

EXPERIMENTAL DESIGN AND IMPLEMENTATION

With the aim of testing the existence of magical thinking as a factor affecting the behavioral patterns of the proposers in an incomplete information ultimatum bargaining game, we designed a computer-based experiment to conduct at Bilkent University with subjects being the university students who are recruited on a voluntary basis. The subjects are invited to the experiment through an invitation e-mail sent to all undergraduate students of Bilkent University, and among them, only the students who are native Turkish speakers and above the age of 18 are accepted as subjects to the experimental sessions in which the instructions are prepared and presented in Turkish.

Two pilot sessions have been conducted with 38 subjects in November 2023, according to which the design of the instructions and the software are refined. For the refinement, we included comprehension questions and visualizations in order to improve students' understanding of the rules and the mechanism of the game. Before starting the game, the students were asked to answer 5 comprehension questions about the information structure, the timing of randomization for the pie size, and the payoff structure and were provided with a visualization of the randomization process. The instructions and the comprehension questions are included in the appendix for detailed information. After the refinements, the remaining sessions were conducted

during April and May 2024. With a challenging recruitment process, we were able to gather 92 subjects across 11 sessions. We randomized treatments across morning and afternoon sessions.

Following the experimental design of the offer game in Mitzkewitz & Nagel (1993), our experiment involves a one-shot ultimatum bargaining game with incomplete information regarding the pie sizes. We used a between-subject design where subjects are randomly and anonymously paired and assigned to their roles as proposers or responders. In this setup, among two possible pie sizes, 40₺ and 240₺, the probability of realization of each is randomly determined between 0.4 and 0.6.

There are two treatment variations that differ in terms of the timing of the resolution of uncertainty: BEF(ore) treatment, where the stake size is randomly determined before the proposer submits her offers, and AFT(er) treatment, where the stake size is randomly determined after the proposer submits her offers. In either treatment, the proposer offers are collected using the strategy method before the information about the realized pie size is revealed. Thus, the information structure is not varied across treatments so that any significant difference between the results of two treatments can only originate from the timing of the randomization. The responders, on the other hand, do not know the specific value of the pie size when making their accept/reject decision and will not be informed about this specific value during or after the experiment.

The experiment was programmed using z-Tree (Fischbacher, 2007), conducted in a computer laboratory at Bilkent University, and a session took approximately 30 minutes. The instructions were read aloud so that the rules of the game were common knowledge. The subjects were not allowed to talk or use their electronic devices during the experiment. They answered 5 comprehension questions after the instructions were given and then proceeded to the game. After the experiment, they were asked to answer (i) a risk attitude questionnaire (Dohmen et al., 2011), (ii) questions regarding the motivations behind their decisions, and (iii) socio-demographic questions such as gender, age, field of study and whether they were exposed to Game Theory before. Finally, the subjects were paid their earnings from the experiment in addition to a 20₺ show-up fee.

CHAPTER 4

RESEARCH HYPOTHESES

3.1. Hiding Behind the Small Pie

As mentioned in Chapter 2, previous literature on incomplete information ultimatum games shows that hiding behind the small pie behavior (offering half of the small pie size when the realized pie size is the large one) is a robust observation. This can be interpreted as people caring about appearing fair to the other party rather than acting fair. This behavioral pattern is also called implicit deception by Kriss et al. (2013). Based on this phenomenon, we propose two hypotheses: one is to confirm the presence of such behavior in an incomplete information ultimatum game and the second one is regarding frequency comparison across treatments.

Hypothesis 1: In both treatments, half of the small pie is the most frequently offered amount by the proposers for the large pie.

Hypothesis 2: The frequency of offers that are equal to half of the small pie is lower in AFT than in BEF.

3.2. Ultimatum Game Giving

Compatible with the idea of magical thinking, we expect proposers to, on average, give more in the AFT treatment compared to the BEF treatment. In other words, the effect of magical thinking would lead the proposers to act less greedy when the uncertainty is yet to be resolved because they are expected to believe that greediness decreases the probability that the uncertainty will be resolved in their favor.

Hypothesis 3: The average offers are higher in AFT than in BEF.

In order to statistically test these hypotheses, data on proposer offers for both pie sizes are to be collected. Additionally, the participants will be provided with a post-experimental questionnaire that includes questions about sex, age, department, game theory background, and motivations underlying their actions. Since these are individual characteristics that play a role in the participants' decisions, controls for these variables will be implemented during regression analyses.

CHAPTER 5

RESULTS

In this chapter, I will first provide basic information about the participants of the experiment and introduce the variables from the data collected. After that, the analysis and interpretation of the experimental data will be provided. I use Wilcoxon rank-sum (Mann–Whitney) test, Pearson chi-square and Fisher's exact test, the standard t-test, along with OLS and probit regressions for the analysis.

5.1. Participants

Excluding the pilot sessions, 92 students from Bilkent University participated in the experiment, which consisted of 48 women and 44 men. The experimental sessions took 25 minutes on average, and the average earnings from the sessions, including the show-up fee, was 90₺. Overall, the performance on the comprehension questions was high, with an average of 3.7 out of 5. The subject pool involved only 22 Economics students, which is also used as a control variable in the regression analysis. Although it is not our focus in this study, the acceptance rate was 76/92, and the accepted low offers, as the share of the realized pie size, mostly were the ones that fit the definition of hiding behind the small pie.

5.2. Analysis Variables

For our main analysis variables, OfferH shows the proposer's offer out of 240₺ while OfferL is the offer out of 40₺. OfferH_sh is computed by dividing OfferH to 240₺. OfferL_sh is similarly defined. Hide is a binary variable that takes the value of 1 if the OfferH is around half of the small pie, i.e. the offers around 20₺. Treat is another binary variable showing the treatment variation and is equal to 0 for BEF and 1 for AFT. Risk is computed as the sum of the subjects' answers to the risk attitude questionnaire. The variable Prob_Pred is a number between 40 and 60 where the subjects submitted their guesses for the randomization probability that determines the pie size. Econ and Game are binary variables showing whether the subjects are Econ students and have taken any Game Theory courses, both are equal to 1 if the answer is yes. Help, Expect, Payoff, Blame, and Magic are the variables capturing the subjects' answers to the motivation questions asked in the post-experimental questionnaire.

5.3. Main Results

Below, the results of the Wilcoxon rank-sum (Mann–Whitney) test, Pearson chi-square, and Fisher's exact test are reported for the Hide variable. As can be seen from Tables 1 and 2, there is no significant difference present between the two treatments. Since there are numerous factors influencing a participant's decisions, conducting analysis with control variables is essential in understanding the interaction between our focus variables. Hence, in order to better analyze the results by adding controls, I also conducted regression analysis using 3 model specifications.

Table 1. Two-sample Wilcoxon rank-sum (Mann-Whitney) Test Results for Hide

Treat	Obs	Rank sum	Expected
0	27	562	634.5
1	19	519	446.5
Combined	46	1081	1081

Unadjusted variance	2009.25
Adjustment for ties	-547.20
Adjusted variance	1462.05

H0: Hide(Treat==0) = Hide(Treat==1)

z = -1.896

Prob > |z| = 0.0579

Exact prob = 0.1067

P{Hide(Treat==0) > Hide(Treat==1)} = 0.359

Table 2. Pearson Chi-square and Fisher's Exact Test Results for Hide

Treat=0 for BEF, =1 for AFT	Hide 0	Hide 1	Total
0	19	8	27
	0.6	0.9	1.5
1	8	11	19
	0.9	1.3	2.2
Total	27	19	46
	1.5	2.2	3.7

Pearson chi2(1) =	3.675	Pr = 0.055
Fisher's exact =		0.073
1-sided Fisher' exact =		0.053

In the baseline model specification, the interaction of the variables Treat and Prob_Pred is included in the regression because, due to our experimental design, we expect the treatment effect to appear through the probability prediction channel.

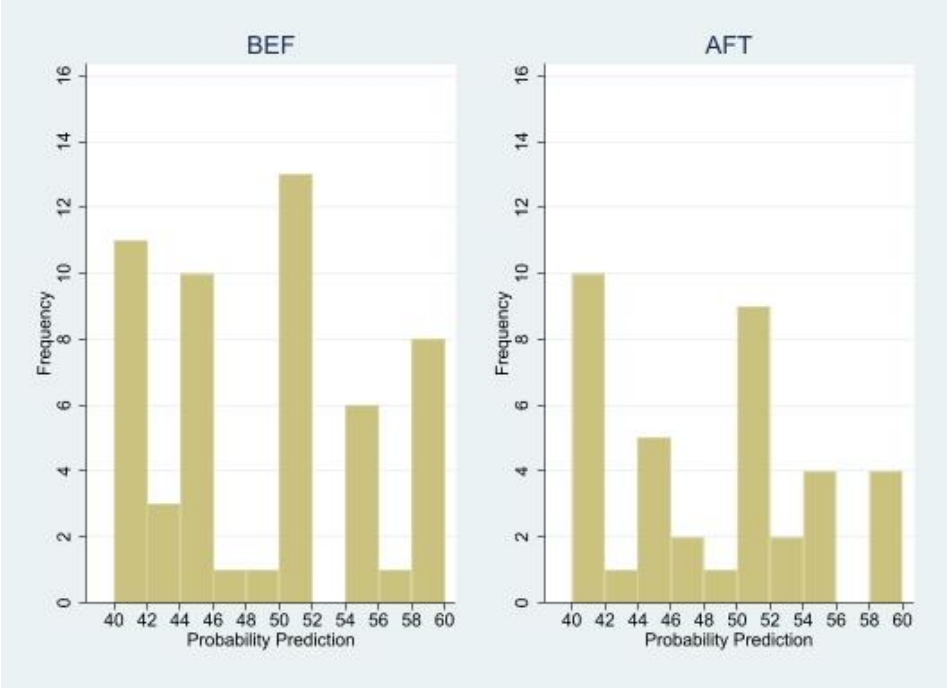
Table 3. Probit Regression Results with Dependent Variable Hide

	(1)	(2)	(3)
VARIABLES	Hide	Hide	Hide
Treat	-4.786	-6.240*	-23.677**
	(3.278)	(3.687)	(10.966)
Prob_Pred	-0.049	-0.056	-0.004
	(0.042)	(0.050)	(0.063)
Treat*Prob_Pred	0.112*	0.135*	0.473**
	(0.066)	(0.074)	(0.213)
Risk		0.057*	0.293**
		(0.032)	(0.114)
Prop_Sex		-0.528	-4.466***
		(0.525)	(1.297)
Age		0.150	1.150***
		(0.144)	(0.329)
Econ		-0.556	-4.326***
		(0.596)	(1.535)
Game		0.690	1.601
		(0.638)	(0.974)
Help			-2.510***
			(0.811)
Expect			1.892***
			(0.546)
Payoff			-0.077
			(0.404)
Blame			-1.444**
			(0.618)
Magic			-0.190
			(0.341)
Constant	1.898	-2.274	-23.774***
	(2.066)	(4.099)	(6.748)
Observations	46	46	46

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

To clarify, we hypothesize that if magical thinking plays a role in proposers' offers, then they should expect being fair/generous to increase the probability that the realized pie size will be 240₺ instead of 40₺. Hence, even though the coefficients of Treat and Prob_Pred are not individually statistically significant, the statistically significant interaction term demonstrates a result consistent with our second hypothesis. Moreover, Risk, Prop_Sex and Econ are also significant variables as expected since background education and individual characteristics play an important role in decision-making processes of individuals. Additionally, the histograms below show the probability predictions of participants for both treatments.

Figure 1. Probability Prediction Distribution across Treatments



In the first part of our analysis, Hide was the focus variable because it is a robust phenomenon consistently observed in the incomplete information ultimatum bargaining literature, as reviewed in Chapter 2. Since we collected the data on individual offers, we also analyzed the offer shares to test our first hypothesis.

Figure 2. Proposer Offers for the Small Pie

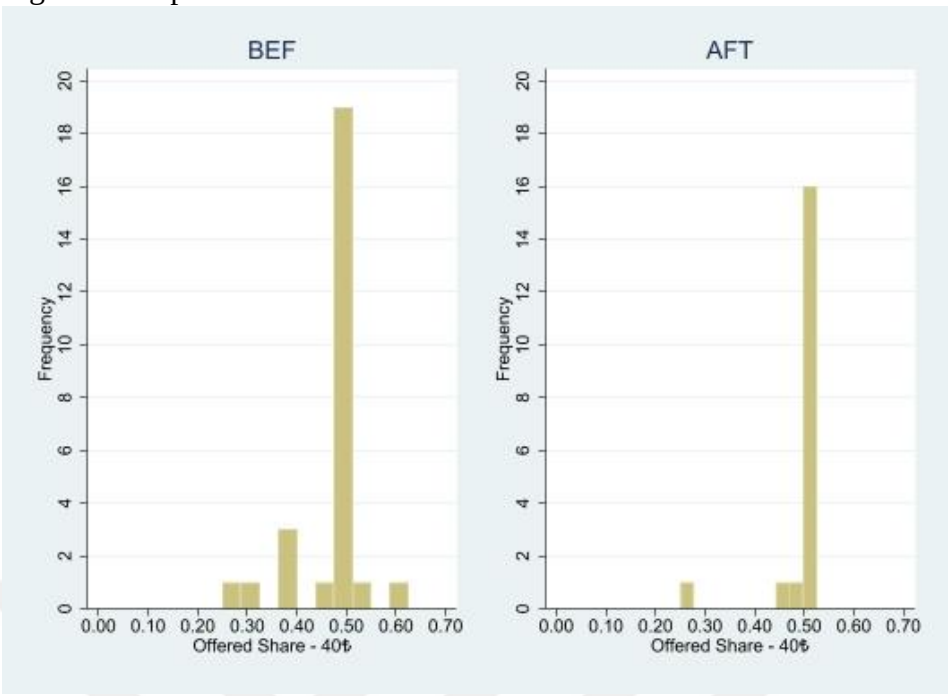
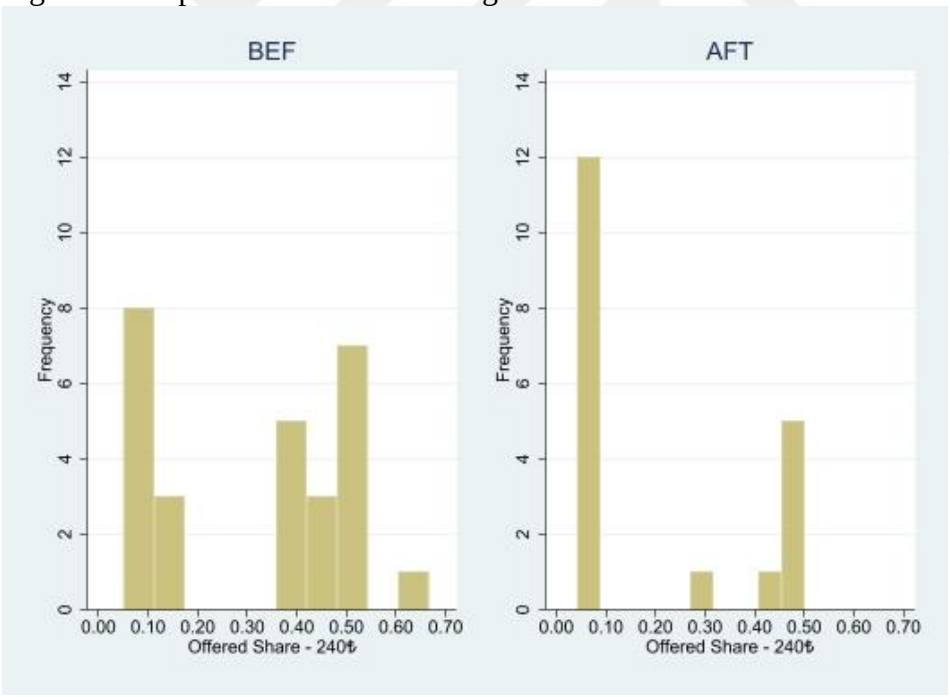


Figure 3. Proposer Offers for the Large Pie



The histograms show the frequency of offer shares, both for 40₺ and 240₺. As it can be seen, while an equal split is the most preferred distribution choice for 40₺, for the large pie, the proposers seem to exploit their information advantage and offer half of the small pie. This finding confirms that while the proposers choose an equal split for

the small pie, they often choose to hide behind the small pie when making an offer for the large pie. Consistent with the findings in the literature, the results show that people prioritize being perceived as fair by others over making fair decisions.

Due to our experimental design and the small number of observations, it is hard to analyze the results by comparing simple averages. It is also evident in the table below that, without any controls, the Wilcoxon rank-sum (Mann–Whitney) test results do not demonstrate any significant differences either. Hence, our analysis is focused mainly on the regression results.

Table 4. Two-sample Wilcoxon rank-sum (Mann–Whitney) Test Results for OfferH

Treat	Obs	Rank sum	Expected
0	27	700	634.5
1	19	381	446.5
Combined	46	1081	1081

Unadjusted variance	2009.25
Adjustment for ties	-67.41
Adjusted variance	1941.84

H0: OfferH(Treat==0) = OfferH(Treat==1)

z = 1.486

Prob > |z| = 0.1372

Exact prob = 0.1397

P{OfferH(Treat==0) > OfferH(Treat==1)} = 0.628

Table 5. OLS Regression Results with Dependent Variable OfferH_sh

VARIABLES	(1) OfferH_sh	(2) OfferH_sh	(3) OfferH_sh
Treat	0.635	0.622	0.455
	(0.463)	(0.512)	(0.439)
Prob_Pred	0.014**	0.014**	0.008
	(0.005)	(0.006)	(0.007)
Treat*Prob_Pred	-0.015	-0.014	-0.010
	(0.009)	(0.010)	(0.009)
Risk		-0.005	-0.005
		(0.004)	(0.003)
Prop_Sex		0.004	0.041
		(0.067)	(0.056)
Age		-0.005	-0.023
		(0.019)	(0.020)
Econ		0.072	0.103
		(0.071)	(0.071)
Game		-0.070	-0.042
		(0.082)	(0.073)
Help			0.055
			(0.033)
Expect			-0.048***
			(0.016)
Payoff			-0.018
			(0.025)
Blame			0.033
			(0.027)
Magic			-0.013
			(0.021)
Constant	-0.357	-0.157	0.444
	(0.275)	(0.531)	(0.692)
Observations	46	46	46
R-squared	0.186	0.298	0.527

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Similar to the first part of our analysis, the regression analysis includes 3 model specifications. Table 5 reports the OLS results for the depending variable OfferH_sh. Distinctly from the regression results in Table 3, we do not observe a significant effect of the interaction variable or Treat alone. However, this is not a completely

surprising result because OfferH_sh has a polarizing effect on the data compared to Hide, which is also derived from OfferH. Thus, it is more likely and plausible to see significant results in the first model.

As a last note, comprehension question performance (cq_per) is overall high, with the lowest score being 3 out of 5, and a small variation across subjects. This is why the regression analysis does not include the variable as one of the controls.

CHAPTER 6

CONCLUSION AND DISCUSSION

In this study, we focus on a consistent and robust finding of the incomplete information ultimatum bargaining literature, hiding behind the small pie behavior. We aim to examine the presence and impacts of magical thinking in an ultimatum bargaining setup with incomplete information. Magical thinking is a concept studied across disciplines, focusing on behavioral change in situations involving uncertainty. More precisely, magical thinking refers to the case where individuals act as if their 'good' behavior can cause the existing uncertainty to resolve in their favor. Although there are studies examining magical thinking in various experimental setups using PD, dictator, and public good games, to our knowledge, the concept has not been studied in a sequential bargaining setup.

Focusing on this gap in the literature, we conducted a simple one-shot experiment with two treatments: BEF and AFT. We incorporated uncertainty in the process of determining the pie size in the form of varying the probability of realization for two possible pie sizes: 40₺ and 240₺. We collected data from Bilkent University students and our statistical analysis shows that the frequency of hiding behind the small pie behavior is affected by the timing of randomization through the probability prediction channel. This result confirms our second hypothesis. This finding has

important implications for understanding human behavior as well as policymaking because the presence of such uncertainty can lead to a decrease in undesirable behaviors in various settings.

The limitations of the analysis mainly resulted from the small number of data points. We believe that having a much larger sample would strengthen the results and provide more opportunities for further analysis of the control variables. Hence, there is room for future research to study this topic more extensively in the ultimatum bargaining setup. Moreover, studying magical thinking in different fields of Economics, such as Political Economy, can be an exciting opportunity to further our understanding of the motivations driving human behavior.

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APPENDIX A

INSTRUCTIONS

In this section, we provide full instructions used in our experiment, the comprehension questions (including the correct answers provided to the participants after their answers are received), and the post-experimental questionnaire. The experimental sessions are conducted completely in Turkish, so the materials provided in this appendix are translations of the original texts. Since the instructions for both treatments differ only in a few parts, they are presented together where different parts are specified inside square brackets with the related treatment name noted before.

The Experimental Instructions

This is a decision-making experiment and part of a scientific project. Throughout the experiment, it is forbidden to communicate with other participants outside the framework specified in the protocol. When you have a question, please raise your hand and wait for one of the experimenters to come to you. Please do not ask your question out loud. Please refrain from any actions that may distract other participants. Please do not use your phone and/or tablet computer during the experiment. You will be able to earn money during the experiment. Your earnings may depend on your decisions, the decisions made by other participants, and luck. How your earnings will be determined is explained in detail in these instructions.

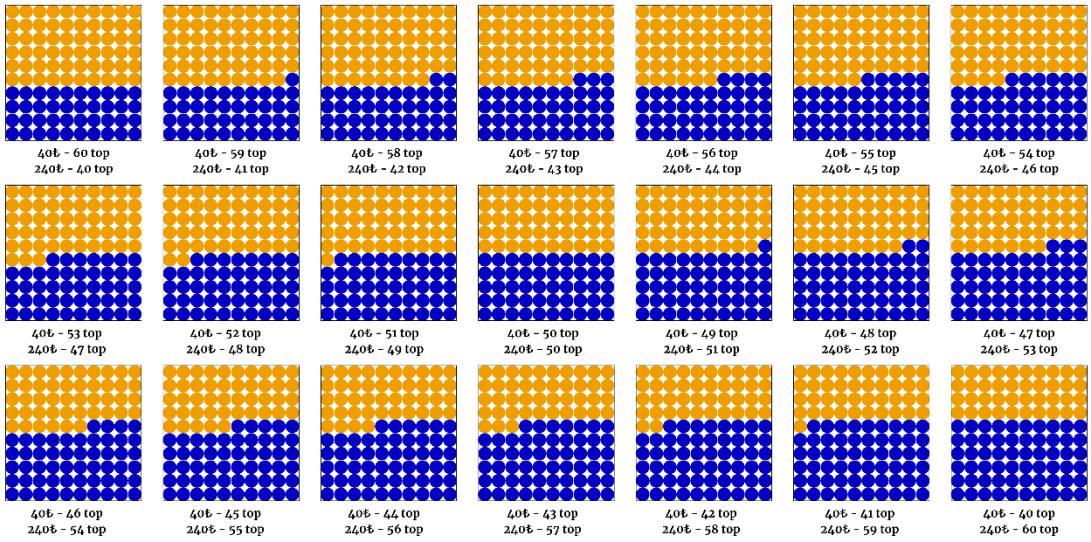
Therefore, it is important to read the instructions carefully. Your payment will be made immediately and in cash at the end of the experiment. Other participants will not be informed about your earnings. Your decisions and answers are anonymous and will only be used for research purposes.

Stages of the Experiment

For this experiment, you will be randomly paired with a participant from the laboratory. There are two different roles (A and B) in our experiment, and each of you will be randomly assigned to one of these two roles with equal probabilities. You will not be informed about who you are paired with during or after the experiment. You will play the game described below only once.

At the beginning of the experiment, you will be asked to answer 5 (comprehension) questions about the game to ensure that you understand the rules and how it works. If you answer incorrectly, you will see the correct answer on your screen. Please make sure to read carefully and understand the instructions and the correct answers to the questions. Then, you will proceed to the game stage.

In this game, each pair of participants will be asked to share a certain amount of money. The total amount to be shared will be determined randomly. There are two possible values for the total amount: 40₺ and 240₺. The probability of realization for both values will be randomly determined between 40% and 60%.



The process of randomly determining the amount of money to be divided will proceed as follows: There are 100 balls in each of the 21 boxes you see on the screen. Orange balls are worth 40₺, while blue balls are worth 240₺. During the experiment, the computer will first randomly select one of these 21 boxes - in other words, the probabilities of realization for 40₺ and 240₺ will be determined - and then a ball will be randomly selected from that box in the same way. The total amount of money to be shared by each pair will be 40₺ or 240₺ depending on the color of the ball drawn.

- One player in each pair will be assigned the role of A, the "proposer," while the other will be assigned the role of B, the "responder."
- Player A will make an offer for both amounts (40₺ and 240₺).
- AFT: [The total amount will be determined after player A has made their offers.]
- The offer is the amount of money player A wants to give to player B from the total amount. It can be determined with increments of 1₺ between 0₺ and the maximum amount. Note: If you enter a non-integer value in the offer boxes,

your offer will automatically be rounded to the nearest integer and conveyed to the other player in that way.

- AFT: [After the offers are received, player A will be informed about the total amount of money to be shared.]
- BEF: [At this stage, the total amount has already been determined as described above and player A will be informed after their offers have been received.]
- Player B, on the other hand, will not be informed about the total amount in any way during or after the experiment. They will not know player A's share; they will only learn the amount offered to them in ₺ and make their decision based solely on that.

The game will proceed step by step as follows:

- You will be randomly divided into pairs.
- You will be assigned to either the A (offeror) or B (responder) role by the computer.

Role A

- BEF: [The total amount of money to be shared will be determined randomly, but player A will not know this amount before making their offers.]
- Player A will write the amounts they want to offer for both amounts (40₺ and 240₺) in the relevant areas on the screen.
- AFT: [Then, the total amount of money will be determined randomly, and player A will be informed.]
- BEF: [Then, the proposer will be informed about the previously determined total amount.]

Role B

- The player in the B role will see the offer made by player A on their screen and decide whether to accept or reject it.
- If they decide to accept the offer, both players will earn the offered shares.
- If they decide to reject it, neither player will earn anything from the game.

- After the decision-making stages, your earnings will be calculated by the computer and conveyed to you.

After all the steps of the game are completed, you will be asked to answer some questions about the experiment. After answering the questions, the experiment will be completed. After this stage, one of the experimenters will pay your earnings from the experiment, including the 20₺ participation fee. Don't forget to fill out your receipt, hand over all the documents on your table to the experimenters and receive your payment when you are called for.

We have reached the end of the instructions. Do you have any questions? If so, please raise your hand and wait for an experimenter to come to you. If you have no questions, please wait for the experiment to start.

APPENDIX B

COMPREHENSION QUESTIONS

Q1. Please answer the question according to the scenario given below.

Assume that when the amount to be shared is 40₺, Player A offers 15₺, and when it is 240₺, Player A offers 25₺.

If the amount to be shared is randomly determined to be 240₺: Player B will see that Player A has offered him 25₺ out of 240₺.

A1. Player B will only see that 25₺ is offered and will not know the total amount of money shared.

Q2. If Player A offers more than 40₺ out of 240₺, Player B can infer that the shared amount is 240₺, even though he is not informed.

A2. Since Player A can only offer up to the total amount to be shared when proposing a division for 40₺, any offer greater than 40₺ indicates that they have 240₺ to share, not 40₺.

Q3. Player A will know the total amount of money to be shared (40₺ or 240₺) BEFORE making an offer.

A3. Player A will only learn the total amount of money to be shared after submitting their offers and will not be informed about the outcome while making the offers.

Q4. When determining the total amount to be shared, the probability of realization for 40₺ is always equal to the probability of realization for 240₺ (50%-50%).

A4. In the random selection process, a random number between 40% and 60% will be determined first, and this number will be the probability of the amount to be shared being 240₺. Then, 40₺ or 240₺ will be randomly selected according to this probability distribution.

Q5. Please answer the question according to the scenario given below.

Assume that when the amount to be shared is 40₺, Player A offers 15₺, and when it is 240₺, Player A offers 25₺.

If Player B accepts the offer; in the case 40₺ is randomly selected, Player A will earn 25₺, and Player B will earn 15₺. If 240₺ is randomly selected, then Player A will earn 215₺ and Player B will earn 25₺.

If Player B rejects the offer, both Player A and Player B will earn 0₺ in both cases.

A5. In his offer, Player A writes down the amount he wants to give to Player B from the total amount to be shared. If Player B accepts the offer, he earns the amount offered and Player A earns the remaining amount. If Player B rejects the offer, both of them earn 0₺.

APPENDIX C

MOTIVATION QUESTIONS

Below the motivation questions, translated from Turkish, are provided. These questions are asked only to the proposers as a part of the post-experimental questionnaire. The responders answered the demographic questions alongside the risk attitude questionnaire, excluding motivation questions. The answers to these questions are stored and used in our analysis with the variable names: help, expect, payoff, blame and magic, respectively.

Below are several options that might be among the reasons for your decisions. Please select a number from the five-point scale next to each statement to indicate how much each feature reflects you. (1 = strongly disagree, 3 = neither agree nor disagree, 5 = strongly agree)

I chose this action because...

1. I wanted to help the participant I paired with.
2. I wanted to act in the way I thought the experimenters expected me to.
3. I wanted to do what was best for my own payoff.
4. I wanted to choose the least blameworthy option.
5. I thought that if I acted this way, then the probability of realization for 240₺ would be higher.