Pre study plan

Leif Helland, Tom-Reiel Heggedal & Thomas McKay

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Research question

Discounting in experimental bargaining games has typically been implemented by shrinking the pie along the game path. How one should implement real world discounting in a laboratory setting to imitate real world trade-offs is not obvious, and the procedure chosen may impact on experimental outcomes. In this study we analyze whether the main results found in Ochs and Roth (1989) replicate well when using delayed mobile phone payments to implement discounting.

Relation to the literature

Ochs and Roth (1989) is a seminal paper investigating the predictions of the SPE in alternating bargaining games with low and asymmetric discount factors. They find that theory predictions based on a self-interested expected utility maximizer are violated. Specifically they find: i) a first mover advantage where there should be none; ii) no difference in payoffs between two round and three round bargaining games where there should be a difference; iii) rejection rates above zero where they should be at zero. In conclusion they reject the theory that players' utility is captured solely by their monetary payoffs (Ochs and Roth, 1989).

Ochs and Roth (1989), among others, sparked a new branch of the literature investigating Other Regarding Preferences and questioning peoples ability to understand and perform backwards induction (Dhami, 2016). This literature contains a large amount of empirical, experimental and theoretical work including inequity aversion models and reciprocity models (Dhami, 2016; Fehr and Schmidt, 1999; Fischbacher, Gächter, and Fehr, 2001; Fehr, Fischbacher, and Gächter, 2002; Bolton and Ockenfels, 2010; Falk, Fehr, and Fischbacher,

2003).

In experimental bargaining games, a shrinking pie proxy is the traditional approximation for real world delay (Dhami, 2016). This has been used in most of the existing literature (Dhami, 2016). One of the main reasons for using the shrinking pie proxy is the concern that attrition and selection effects will bias samples when longitudinal experiments are used (Dhami, 2016; Camerer, 2010).

In contrast to bargaining literature, time preferences need delayed payment in order for elicitation. This has led to time dated money payments becoming standard in the literature (Kim, 2017; Frederick, Loewenstein, and O'donoghue, 2002). The method requires three key assumptions; subjects must ignore external arbitrage opportunities, subjects must ignore their external consumption opportunities, and transactions costs must be minimal and payment highly credible (Kim, 2017; Sprenger, 2015). There is a broad literature investigating how stable time preferences are over time , how they vary across measurements and what other parameters they are related to, specifically risk (Dhami, 2016). Two main methodologies for elicitation are the Multiple Price List (MPL) and Convex Time Budget (CTB) (Andreoni, Kuhn, and Sprenger, 2015). There are studies that find that CTB outperforms MPL, while others find that MPL admits less measurement bias (Andreoni, Kuhn, and Sprenger, 2015; Cheung, 2019). There is considerable heterogeneity in time preferences across individuals and in the average discount factors across studies (Frederick, Loewenstein, and O'donoghue, 2002; Harrison, Igel Lau, Rutström, and Sullivan, 2005). There is evidence that time preferences vary less with methodology than risk preferences (Andersen, Harrison, Lau, and Rutström, 2006). Although previous studies have highlighted potential issues in separating risk and time preferences, which imply measurement bias, more recent findings find that this measurement error is immaterial (Cheung, 2019, 2015).

A recent study by Kim, Lim, and Schweighofer-Kodritsch (2019) experimentally investigates key predictions from Rubinstein (1982) and Schweighofer-Kodritsch (2018) and finds broad support. This was done using mobile payments (Vemno) in order to credibly pay participants for their participation with real world delay. Combining dated payment method with a strategic environment was first done by Kim (2017) with 'effective discounting procedure'. Recent improvements in technology have allowed for simple and credible mobile payments from individual to individual. Kim, Lim, and Schweighofer-Kodritsch (2019) use delays of 1 week and 1 month per period, in a series of asymmetric and symmetric treatments with and without front end delay. They find that on average, subjects internalize the effects of

discounting on their opponent's strategy in treatments with and without front end delay (Kim, Lim, and Schweighofer-Kodritsch, 2019). Their findings are consistent with purely self motivated preferences.

Hypothesis

Our treatment variables are the number of periods (2 or 3).
Our treatment measures are the average divergence from equilibrium payoffs.
Whether the results of this study will replicate Ochs and Roth (1989) is an open question. The results of Kim, Lim, and Schweighofer-Kodritsch (2019) broadly supporting theoretical predictions lends support to the possibility of replicating theoretical predictions in a finite setting. However Kim, Lim, and Schweighofer-Kodritsch (2019) finds first mover advantage consistent with theory, where as Ochs and Roth (1989) find it in contrast to theory. So it is also possible that the original results of Ochs and Roth (1989) are replicated.

Methodology

As in Ochs and Roth (1989) we will use a 2 or 3 period finite alternating bargaining game with $\delta = \{0.4, 0.6\}$. To begin with we will first replicate two treatments from Ochs and Roth (1989) exactly. These treatments will be 2 and 3 period games with a proposer $\delta_1 = 0.6$ and a responder $\delta_2 = 0.4$.
As in (Ochs and Roth, 1989) we fix roles so that players occupy the same role in each game. We name these roles Blue and Red to avoid any priming or inference of rank. Subjects play 10 games with randomly drawn opponents. At the conclusion one of these games is independently randomly drawn for each subject and payment is based upon this game. The bargaining protocol is implemented in zTree (Fischbacher, 2007) and subject management is handled through ORSEE (Greiner, 2015).
In writing the instructions, material is kept as similar to Ochs and Roth (1989) as possible.We use the same description of the game, refer to it as a bargaining game, include a practice round, give feedback after each offer and round, and, most controversially include the text "It is in your interest to earn as much in each game as you can". We determine that in order for the closest possible comparison, we need to elicit the same responses and biases that Ochs and Roth (1989) do. As Ochs and Roth (1989) is a pen and paper experiment, the use of computers and programming shortens the overall length of the instructions.

The study will progress in two stages, first pure replication of Ochs and Roth (1989), and then a replication using the effective discounting procedure where we will assign Blue types a delay of 1 month per period of disagreement, and the Red type 1 week per period of disagreement. We will also elicit time preferences via MPL (as in Kim, Lim, and Schweighofer-Kodritsch (2019); Kim (2017)) and use this to calculate the SPE offers.

Pilot study

Individuals recieved 50NOK as a showup fee. The exchange rate is set such that expected earnings for participants is 250NOK per hour. We used five matching groups for the 2 period treatment and five matching groups for the 3 period treatment and replicated Ochs and Roth (1989) results well.

Summary from Ochs & Roth (1989)

No rounds	δ_1	δ_2	Eq offer	Av Offer	R1 Offer	R10 Offer	Rejection %
2	.6	.4	40%	FIND	49.1%	47.8%	15%
3	.6	.4	16%	FIND	46.8%	43.9%	14%

Summary from our replication (2019)

No rounds	δ_1	δ_2	Eq offer	Av Offer	R1 Offer	R10 Offer	Rejection %
2	.6	.4	40%	42.28%	47.44%	41.4%	12%
3	.6	.4	16%	43.72%	46.88%	42.2%	12.8%

In addition, two blocks were tested with in the 2 period version with 1 week and 1 month as the delay lengths. This was conducted solely to ensure that the payment mechanism functioned as intended. Analysis of deviation from equilibrium for this matching group is not possible without also eliciting time preferences which will happen in the next phase of this project.

Phase 2 Plan

In phase 2 we will gather data in two additional treatments. Both treatments will begin with 10 bargaining games, and afterwards, 4 time elicitation questions using MPLs. The MPLs will then be used to calculate the associated discount factors, and compute the equilibrium

offers based on this.

- T3: 2 period alternating bargaining game. We will implement fixed roles and 1 week delay per period for the proposer, and 1 month delay per period for the responder. There will be no front end delay.
- T4: 3 period alternating bargaining game. We will implement fixed roles and 1 week delay per period for the proposer, and 1 month delay per period for the responder. There will be no front end delay.

These will be compared with our pure replication which was gathered during the pilot phase

- T1: 2 period alternating bargaining game. We will implement fixed roles and $\delta = 0.6$ for the proposer, $\delta = 0.4$ per period for the responder.
- T2: 3 period alternating bargaining game. We will implement fixed roles and $\delta = 0.6$ for the proposer, $\delta = 0.4$ per period for the responder.

Hypotheses

As these treatments will have different equilibruim values, we will make comparisons by measuring distance in percentage points from equilibruim offers. If results are more in line with theoretical predictions we predict the following:

1. We expect to find significantly lower rejection rates between (T1 and T2) and (T3 and T4)
2. We expect to find a treatment effect between T3 and T4 in average first round offers
3. We also expect that there will be first mover advantage only in accordance with theory

It is unclear whether (3) will in fact be testable or not. It may be that the length of delays need to be adjusted in order to form a game with no first mover advantage (if the true $\delta_{1month} > 0.5$, then this is not testable in T3). However for sufficiently high δ this should be testable in at T4 ($\delta_{week}(1 - \delta_{1month}) < 0.5$ for sufficiently large δ_{1month})

Empirical Strategy

Average treatment effects will be computed and tested using non-parametric tests. Specifics are TBD.

As a robustness check we will test that there is no differences in time preferences between treatments.

Current state

Instructions and z-Tree program files will be made available for download once data collection commences.

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