Bargaining under Time Pressure

Emin Karagözoğlu (Bilkent University)
Martin Kocher (Ludwig Maximilians Universität München)

Boğaziçi University
Center for Economics and Econometrics
December 21, 2015

Motivation

Whether it is wage negotiations, climate negotiations, political negotiations on disarmament deals or contract negotiations in general —a common feature is (often severe) time pressure toward the deadline for striking a deal in bargaining.

Bargaining theory abstracts from time as a variable...

For practical bargaining problems, the timing of offers and deadlines play a central role in bargaining strategies and outcomes.

As a consequence of the lack of theoretical models, economists have mostly neglected issues of time pressure, deadlines, and timing in bargaining.

Research Question(s)

What is the effect of time pressure on the bargaining process and outcomes in a rich context unstructured bargaining game with real effort, earned entitlements, and competing reference points?

Aims

… to provide a set of empirical insights based on an experiment in a rich bargaining context that yet has enough structure to be able to rigorously control for important aspects.

… to extend the scarce existing evidence from simple and highly structured bargaining games such as the ultimatum game to much more realistic environment.

What Will be Analyzed?

Not only agreements! But also the process!

- Subjective Entitlements
- Opening Proposals
- Number and Frequency of Proposals
- Verbal Communication
- Concession Behavior
- Bargaining Duration
- Last Moment Agreements
- Disagreements
- Agreements

Literature

Time pressure in bargaining

– Roth, Murnighan, Schoumaker (1988)

– Druckman (1994)

– Stuhlmacher et al. (1998)

– Mosterd and Rutte (2000)

– Sutter et al. (2003)

– Harinck and De Dreu (2004)

– Güth et al. (2005)

– Cappelletti et al. (2011)

Experimental Design

Real effort, earned status

Subjective entitlements

Competing reference points: explicitly induced vs implicit

Stake-size variation (as a robustness check)

Unstructured bargaining game (verbal communication is also allowed)

Main treatment variable: time given to subjects for bargaining

- Low time pressure: 10 mins
- High time pressure: 90 seconds
- Severely high time pressure: 45 seconds

Experimental Design – Sequence of Events

Table 1: Sequence of Events

1.	Reading of instructions
2.	Performance determination
3.	Outcome determination
4.	Elicitation of beliefs on performances
5.	Relative performance information*
6.	Measurement of entitlements
7.	Bargaining
8.	De-briefing questionnaire

Scenario: Bargaining between two "heads of departments" over a salary budget in a hypothetical company that consists of two departments.

- Gächter and Riedl (2005, 2006)
- Bolton and Karagözoğlu (2013)
- Karagözoğlu and Riedl (2015)
- Gächter, Karagözoğlu, Riedl (2015)

Experimental Design – Source of Entitlements

- Subjects are anonymously and randomly matched into pairs and perform a general knowledge quiz similar to *Trivial Pursuit*.
- The quiz consists of 50 multiple choice questions.
- Chosen from a sample of 100 questions on the basis of the results of a pilot experiment.
- History, politics, art, geography, popular culture, music, astronomy, philosophy, science, movies, commerce etc.
- 20 sec. per question. Not answered questions count as wrong.
- Same questions for all. Same/fixed sequence. No going back.

Experimental Design – Claim/Surplus Determin.

- In the past, the salary budget in the company was 21.000 pts.
- Salary policy: high (low) performing department head 14.000 (7.000).
- Depending on exogenous/stochastic economic factors, the current salary budget can be 15.000 or 27.000 pts.
  - Die # 1, 2 or 3: Bad economic conditions – 15.000 pts budget
  - Die # 4, 5 or 6: Good economic conditions – 27.000 pts budget
- Top management changes its salary policy now. Do not impose. Let them negotiate.
  - 15.000 – reduced stake, infeasible historical claims.
  - 27.000 – increased stake, feasible historical claims.

Experimental Design – Subjective Entitlements

- **Performance belief elicitation (incentivized)**
  - How many correct answers you think you had?
  - How many correct answers you think the other dept. head had?
- **Relative performance information**
  - "You had more (less) correct answers in the knowledge quiz than the other department head."
- **Arbitrator question (Babcock et al. 1995)**
  - "What would be the fair distribution of the salary budget* from the perspective of a neutral and non-involved arbitrator?"

Experimental Design – Bargaining

- Anonymous, unstructured bargaining over a computer network.
- Sending numerical proposals and chat messages.
- Very rich bargaining data.
- Inefficient proposals are not allowed.
- Maximum duration: 90 secs vs 10 minutes (45 secs as robustness).
- Disagreement payoffs: symmetric, zero for both.

What Can Be Expected?

Hypothesis 1. Average agreements are closer (further away) to 2/3-1/3 (from 1/2-1/2) divisions in HTP than in LTP.

Hypothesis 2. Time pressure increases the likelihood of observing 2/3-1/3 agreements.

Hypothesis 3. Time pressure decreases the likelihood of observing 1/2-1/2 agreements.

Hypothesis 4. The tension in first proposals is identical in HTP and LTP.

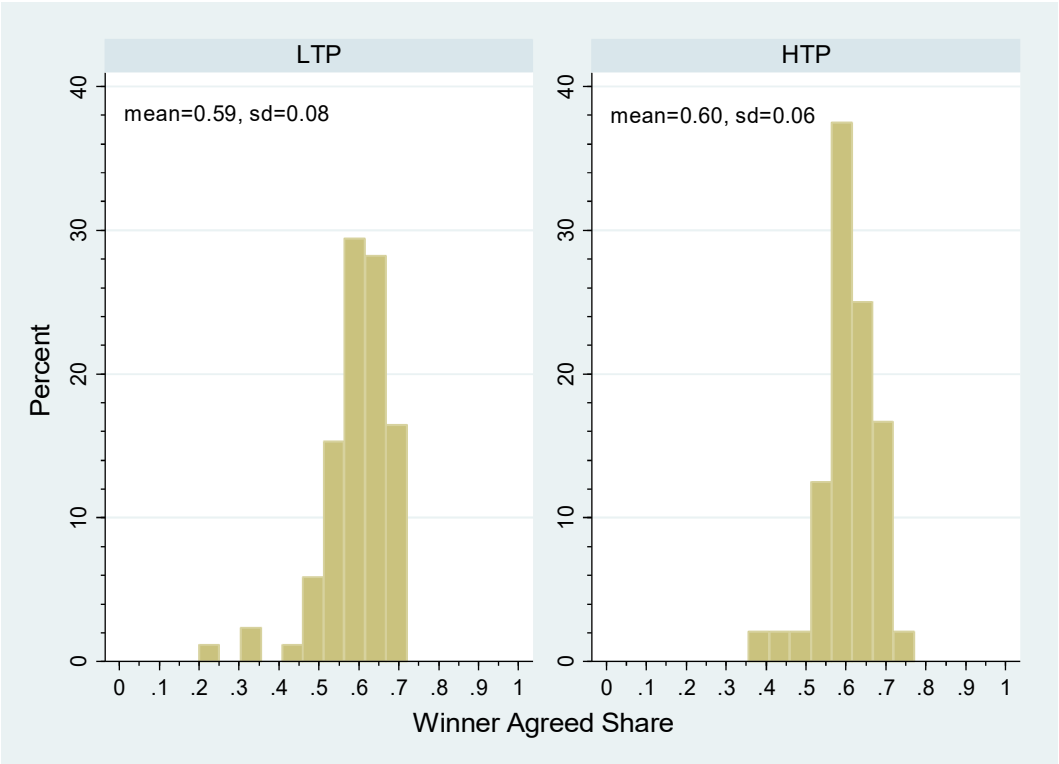
Hypothesis 5. The frequency of disagreements is higher in HTP than in LTP.

Hypothesis 6. The frequency of last-moment agreements is higher in HTP than in LTP.

Experimental Procedures

- 318 subjects. 185 male, 133 female. Mean age is 21.3.
- 89 pairs for 10 minutes, 70 pairs for 90 seconds. (22 for 45 seconds)
- Subjects from various fields of study.
- Sessions at Bilkent University (Ankara, Turkey).
- Duration of the experiment: ~ 1 hour.
- Show-up fee: 5 TL.
- Average earnings (including show-up fee): ~ 40 TL.
- Experiment programmed with z-tree.

Distribution of Agreements

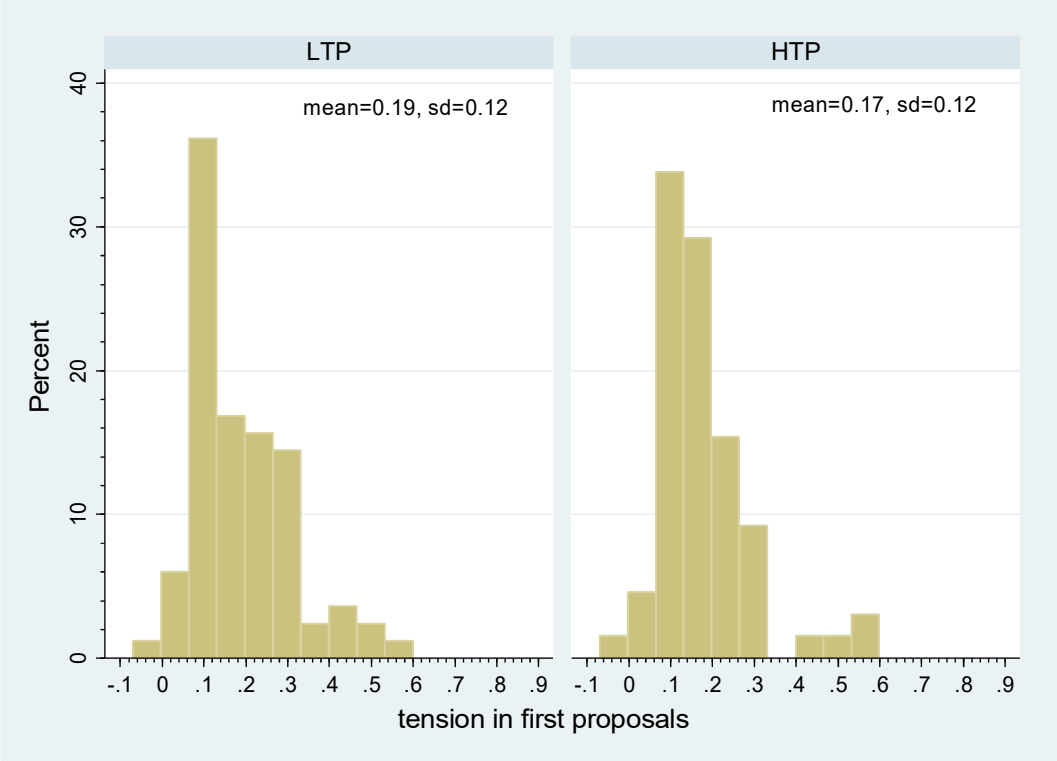


The average agreed share of winners is 0.59 in LTP and 0.60 in HTP (MW, p = 0.87; KS, p = 0.98).

The time pressure did not have a level effect on bargaining agreements.

Result 1. The average winner agreed share (and the distribution of winner agreed shares) does not differ between LTP and HTP.

Distribution of Tension in First Proposals



The distributions in LTP and HTP do not present any evidence for a difference in the tension of first proposals (0.19 for LTP and 0.17 for HTP; MW, p = 0.40; KS, p = 0.61).

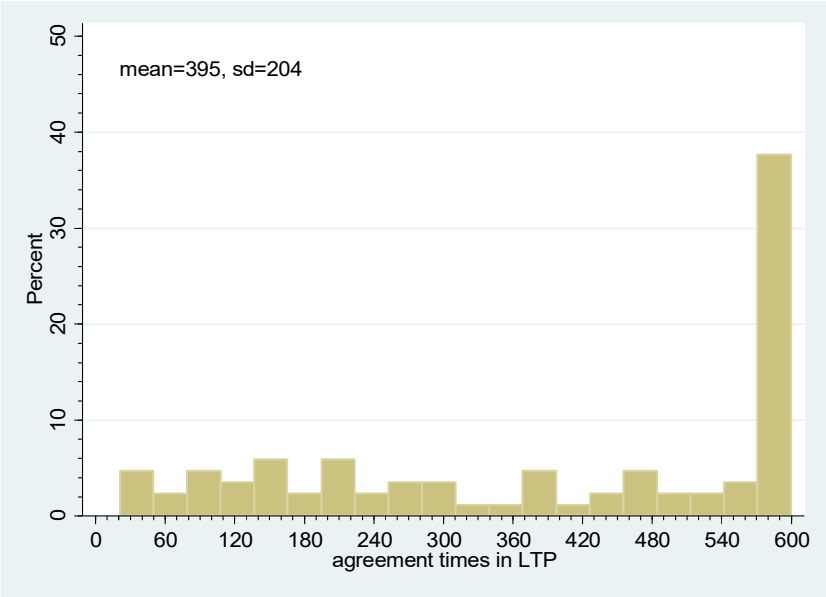
Result 2. The average tension in first proposals (and the distribution of tension in first proposals) does not differ between LTP and HTP.

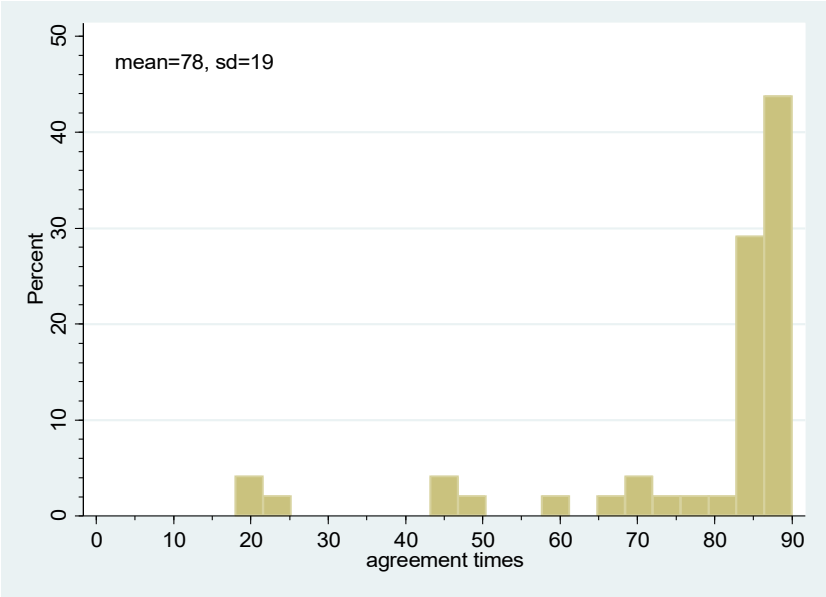
Distribution of Agreement Times

	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
LTP	5.90	7.00	9.40	9.40	4.70	4.70	5.90	7.00	4.70	41.00
HTP	0.00	2.08	4.17	0.00	2.08	4.17	2.08	6.25	6.25	72.90

41% of all agreements in LTP are reached in the last 10% of the allotted time, whereas 72.9% of all agreements in HTP are reached in the last 10% of the allotted time.

Distribution of Agreement Times





The average agreement time in LTP (395 seconds) is 65.8% of the allotted time (900 seconds), whereas the average agreement time in HTP (78 seconds) is 86.7% of the allotted time (90 seconds).

Last Moment Agreements

Last-moment Agreement	LTP	HTP	Total
0	59	24	83
1	26	24	50
Total	85	48	133
Fisher's Exact Test = 0.02			

Result 3. The frequency of last-moment agreements is higher in HTP than in LTP.

Disagreements

Disagreement	LTP	HTP	Total
0	85	48	133
1	4	22	26
Total	89	70	159
Fisher's Exact Test < 0.001			

Result 4. The frequency of disagreements is higher in HTP than in LTP.

Level Effects

Time pressure does not have a “level” effect on initial bargaining positions, concessions, and agreements.

However, it has a significant effect (both statistically and economically) on the frequency of disagreements and last-moment agreements.

In particular, it leads to a huge increase both in the frequency of disagreements and last-moment agreements among bargainers.

Agreements (Robust OLS)

Dependent Variable: W_agreedshare | winner's share in the agreement

Independent Variables	Specification 1	Specification 2
Time pressure	0.001 (0.12)	0.29** (0.12)
W_fair	0.28*** (0.06)	0.36*** (0.08)
L_fair	0.10 (0.08)	0.18** (0.10)
Time pressure*W_fair		-0.26**(0.12)
Time pressure*L_fair		-0.20 (0.16)
Constant	0.35*** (0.06)	0.25*** (0.08)
# of Obs. = 133	F(3, 129) = 7.40 Prob > F = 0.0001 R^2 = 0.08	F(5, 127) = 5.51 Prob > F = 0.0001 R^2 = 0.10

Result 5. Time pressure increases the share winners receive in agreements. The influence of subjects' entitlements on agreements decreases under time pressure.

2/3-1/3 Agreements (Robust Probit)

Dependent Variable: Statusquo | equals 1 if 2/3-1/3 agreement, 0 otherwise

Independent Variables	Specification 1	Specification 2
Time pressure	0.05 (0.30)	8.25** (4.44)
W_fair	5.57*** (2.15)	7.00** (3.54)
L_fair	1.75 (2.36)	8.16*** (3.13)
Time pressure*W_fair		-1.38 (5.21)
Time pressure*L_fair		-12.49*** (4.44)
Constant	-5.32*** (1.97)	-10.55*** (3.80)
# of Obs. = 133	Pseudo-R^2 = 0.07 Wald-$chi^2(3)$ = 6.96 Prob > chi^2 = 0.07	Pseudo-R^2 = 0.15 Wald-$chi^2(5)$ = 9.96 Prob > chi^2 = 0.08

Result 6. Time pressure increases the likelihood of subjects reaching agreements on the explicit/induced reference point, i.e. the 2/3-1/3 distribution.

1/2-1/2 Agreements (Robust Probit)

Dependent Variable: Equal | equals 1 if 1/2-1/2 agreement, 0 otherwise		
Independent Variables	**Specification 1**	**Specification 2**
Time pressure	-0.50 (0.44)	-23.3** (12.50)
W_fair	1.51 (2.07)	-0.61 (1.62)
L_fair	4.13 (3.82)	2.55 (4.13)
Time pressure*W_fair		12.14* (6.75)
Time pressure*L_fair		22.18* (13.24)
Constant	-5.07* (2.78)	-2.75 (2.29)
# of Obs. = 133	Pseudo-R^2 = 0.06 Wald-chi^2(3) = 7.61 Prob > chi^2 = 0.06	Pseudo-R^2 = 0.12 Wald-chi^2(5) = 5.00 Prob > chi^2 = 0.42

Result 7. Time pressure decreases the likelihood of subjects reaching agreements on the implicit reference point, i.e. the 1/2-1/2 distribution.

Disagreements (Exact Logistic)

Dependent Variable: Disagree | equals 1 if disagreement, 0 otherwise		
Independent Variables	**Odds Ratio**	**95% conf. interval**
Time pressure	4.78**	0.83 – 50.52
Binary_tension	0.98**	0.07 – 14.07
Time press*Binary_tension	3.02**	0.16 – 57.35
# of Obs. = 148	Model score = 24.38	Pr ≥ score = 0.0000

Result 8. Time pressure increases the likelihood of disagreements.

Result 9. The influence of the tension in first proposals on the likelihood of disagreements increases under time pressure.

Last Moment Agreements (Robust Probit)

Dependent Variable: last_moment | equals 1 if agreed in the last 5 seconds, 0 otherwise

Independent Variables	Specification 1	Specification 2
Time pressure	0.62*** (0.26)	0.84** (0.49)
Diff_first	3.19*** (1.24)	3.61*** (1.38)
Time pressure*Diff_first	--	-1.31 (2.77)
Constant	-1.08*** (0.28)	-1.16*** (0.30)
# of Obs. = 124	Wald-chi^2(2) = 9.53 Prob > chi^2 = 0.00085 Pseudo-R^2 = 0.08	Wald-chi^2(3) = 11.72 Prob > chi^2 = 0.0084 Pseudo-R^2 = 0.08

Result 10. Time pressure increases the likelihood of last-moment agreements.

Slope Effects

Time pressure has a significant “slope” effect on agreements.

Moreover, it has a significant slope effect (both statistically and economically) on the likelihood of disagreements and last-moment agreements.

In particular, it increases both the likelihood of disagreements and last-moment agreements among bargainers.

The effect of time pressure appears to be channelled through the tension in first proposals.

Further Analyses

More Severe Time Pressure: 45 seconds (data from 22 pairs).

Content Analysis of Verbal Messages

Timing of offers, concessions, and dynamics of bargaining

45 Seconds

	45sec	90sec	Test for Equality
W_first	0.70 (0.10)	0.69 (0.07)	0.70
L_first	0.50 (0.13)	0.52 (0.10)	0.55
W_concess	0.09 (0.13)	0.08 (0.08)	0.76
L_concess	0.10 (0.11)	0.07 (0.08)	0.54
W_agreed_sh	0.62 (0.09)	0.60 (0.06)	0.97
% of disagreements	38.0	31.4	0.60
% of last-moment agreements	61.5	50.0	0.54

No significant difference between any markers of bargaining activity across 45 sec and 90 sec.

Content Analysis of Verbal Messages

Category of messages	10mins	90secs
Greetings	27 (3.7%)	6 (5%)
** Mentioning time-related concerns	53 (7.2%)	12 (10%)
Mentioning 2/3-1/3, the historical precedent, old system etc.	110 (15%)	16 (14%)
Mentioning 1/2-1/2 division	37 (5.1%)	4 (3.4%)
Mentioning fairness, justice, equality, equity, performances etc	201 (27.5%)	35 (30%)
** Threats, tactics, cheap-talk, mentioning the disagreement outcome	91 (12.4%)	21 (18%)
Mentioning need-based concerns	9 (1.2%)	1 (0%)
Mentioning integrative, cooperative aspects, common goals	155 (21.2%)	22 (19%)
* Chitchat, seemingly unrelated conversations	12 (1.6%)	0 (0%)
Words of approval, agreement, and farewell etc	37 (5.0%)	4 (3.4%)

What's Behind that 31.4%?

	Disagree	Agree	Difference
Timing of the Opening Offer (in secs)	15.64	10.98	4.66**
Number of Offers in the 1st 45secs	2.27	2.65	-0.38**
Number of Offers in the 2nd 45secs	3.36	2.46	0.90**
Total number of Offers	5.63	5.11	0.52
Initial Conflict	0.22	0.15	0.07**
Remaining Conflict / Initial Conflict After the 1st 45secs	0.99	0.90	0.09**
Remaining Conflict / Initial Conflict After the 2nd 45secs	0.75	0.54	0.21**

Disagreeing pairs start bargaining later, start with a larger conflict, make fewer early offers, make less (early) concessions.

Three-Stage-Least-Squares

EQ. 1. Dependent Variable: Diff_fair | difference between fairness judgments	
Independent Variables	# of Obs. = 65, R^2 = 0.06, F = 4.30, P = 0.04
Diff_Perform	0.005** (0.002)
Constant	0.04** (0.02)
EQ. 2. Dependent Variable: Diff_first | difference between first proposals	
Independent Variables	# of Obs. = 65, R^2 = 0.08, F = 4.23, P = 0.04
Diff_fair	0.33** (0.16)
Constant	0.15*** (0.02)
EQ. 3. Dependent Variable: Disagree | equals 1 if disagreement, 0 otherwise	
Independent Variables	# of Obs. = 65, R^2 = 0.08, F = 5.20, P = 0.02
Diff_first	1.08** (0.47)
Constant	0.12 (0.10)

Summary of All Results

Time pressure does not directly influence opening offers, concession behavior, or agreements.

It directly influences the frequency of disagreements and last-moment agreements.

It increases/decreaes the likelihood of observing the more/less salient reference outcome in agreements.

It increases the likelihood of observing disagreements and last-moment agreements.

The effect on disagreements is channeled through the tension in first proposals.

It seems that non-negligible percentage of subjects under high time pressure underestimate the time required to resolve their conflicts.

Concluding Remarks

The first study of (rich-context) bargaining behavior under time pressure.

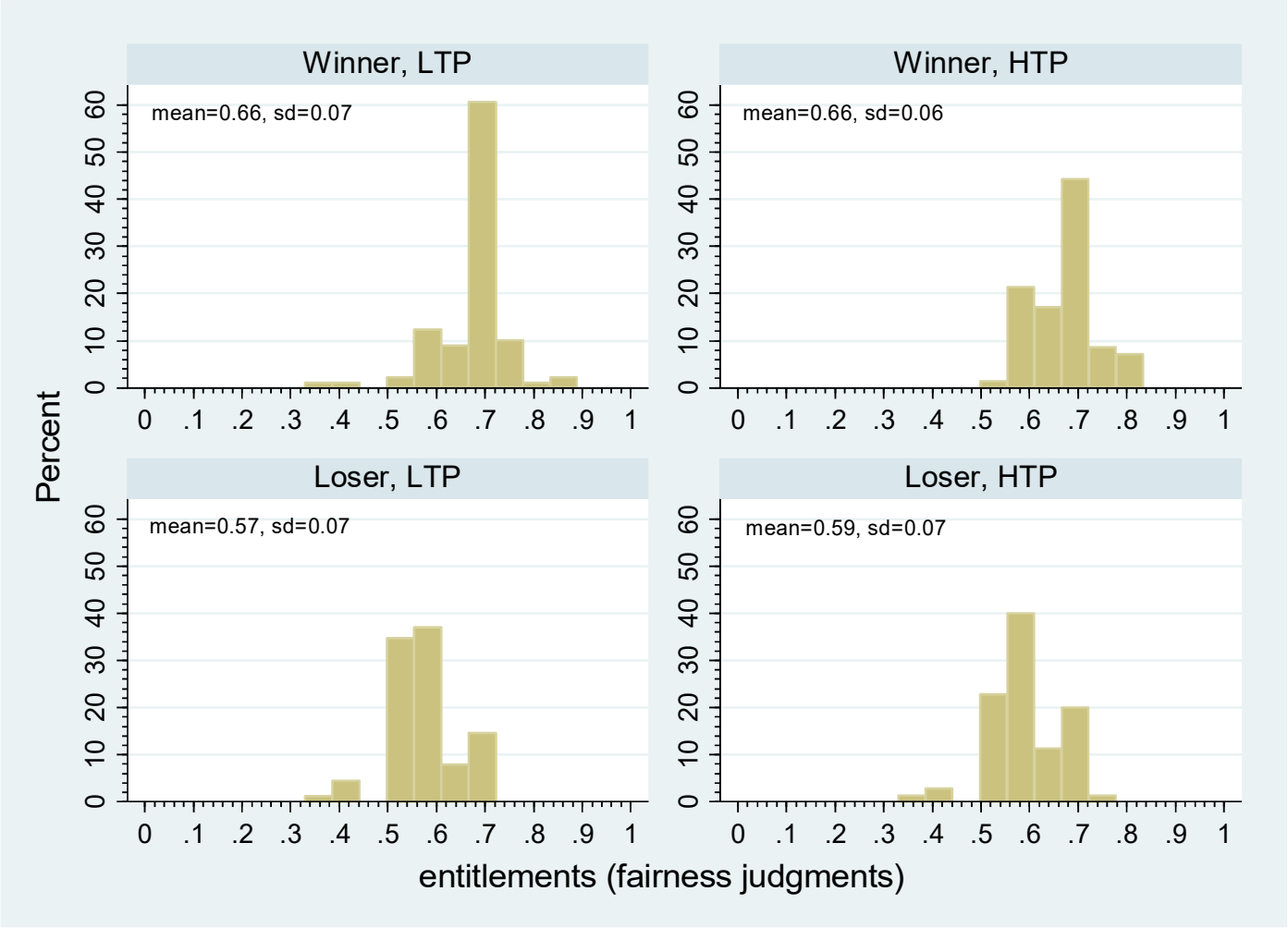
A large set of bargaining markers under study.

Results important for theory-building.

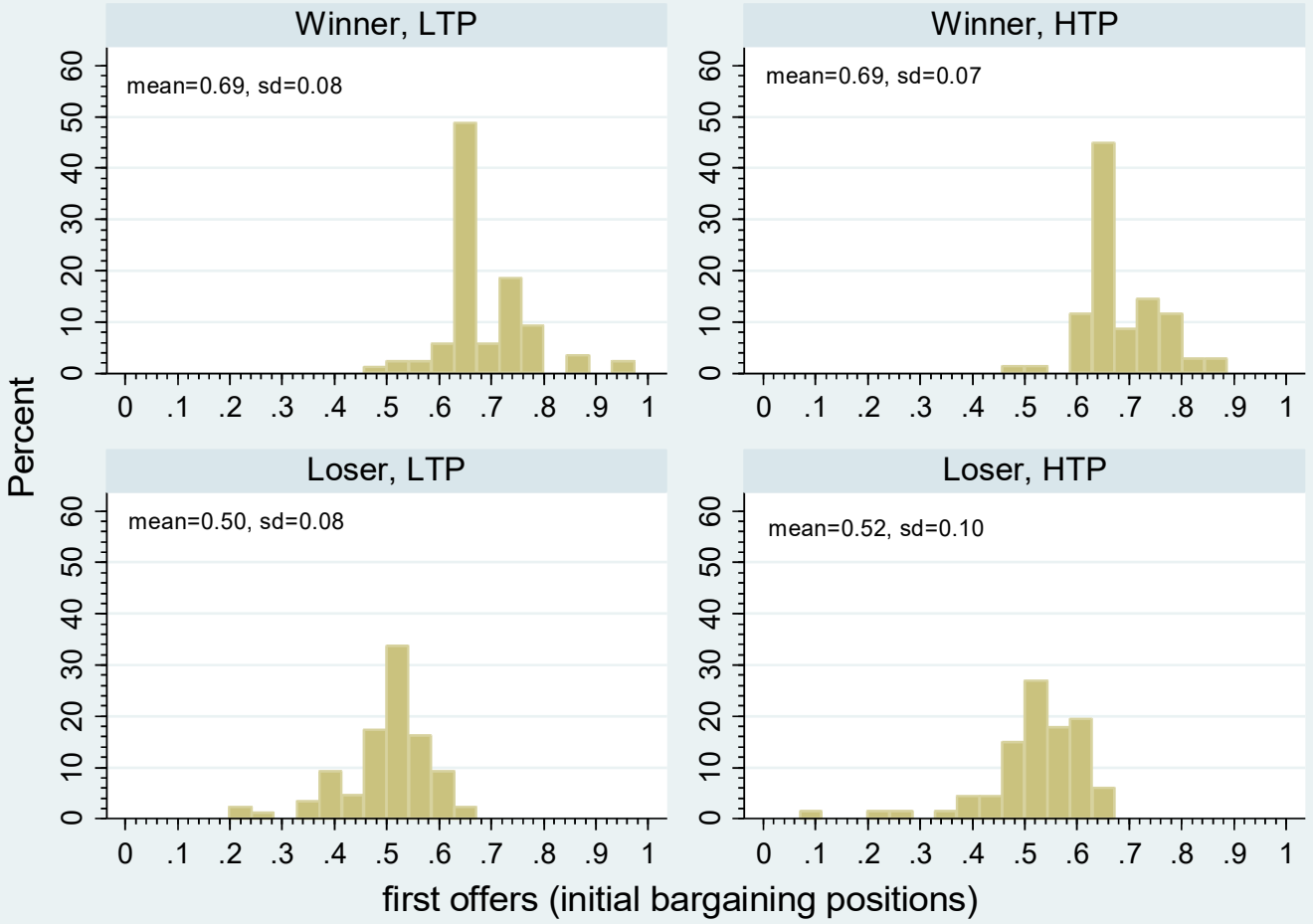
Calls for further experimental research.

Thank you.

Subjective Entitlements in LTP and HTP



First Proposals in LTP and HTP



Concessions in LTP and HTP