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Social comparisons in ultimatum bargaining

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This paper employs experiments to examine the effects of social comparisons in ultimatum bargaining. We inform responders on the average offer before they decide whether to accept or reject their specific offer. To provide a metric for social comparison effects, we compare them with another change in informational conditions, asymmetric information on the pie size. Knowing comparable offers or knowing the pie size increases offers and rejection probabilities by similar magnitudes. Our results are consistent with people disliking deviations from the norm of equity but inconsistent with fairness theories, where people dislike income disparity between themselves and their referents.

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Ample findings from bargaining games show that people typically depart from the standard notions of money-maximizing preferences.[1] Attempting to explain such results, recent theoretical models on fairness and reciprocity focus on the relationship between the two bargainers.[2] But parties to a negotiation do not always compare themselves to their bargaining counterpart. In salary negotiations, for example, prospective employees typically do not compare their wage (or wage less reservation price) with the surplus the employer reaps from their employ, but rather with the wages of similarly situated employees.[3] The reference group of others in like circumstances has received relatively little attention in the literally thousands of experimental studies on bargaining. The term "social comparisons" refers to information on such "others".

We use the ultimatum game,[4] probably the most studied bargaining game, to investigate the role of social comparisons between responders. A large body of research in psychology, building on Festinger (1954), suggests that social comparisons affect behavior, since they provide information on what is the "right behavior" in a certain context. When social comparisons are given, we expect offers to gravitate towards the "right behavior," and rejection rates to rise where there are deviations from such behavior.

There are a small number of earlier studies on social comparisons in bargaining. In contrast to them, we inform our responders on the *average offer*, what might be thought of as the social norm, rather than on one other offer (Knez and Camerer 1995, Cason and Mui 1998, Duffy and Feltovich 1999, Kagel and Wolfe 2001).[5] Knowledge of one other offer has only modest effects.

[1] For recent surveys of bargaining games, see Camerer (2003) and Roth (1995).
[2] For a recent survey of theories of fairness and reciprocity, see Fehr and Schmidt (2002).
[3] See e.g., Babcock et al. (1996) and Frank (1985) for examples in economics addressing the issue.
[4] In the standard ultimatum game, a proposer first allocates a fixed amount of money, the "pie," between herself and a responder. The responder can either accept or reject the proposer's offer. If he accepts, the deal stays as proposed; if he rejects, both earn zero. The subgame perfect equilibrium prediction is for the proposer to offer ε, the smallest possible amount, and for the responder to accept.
[5] Harrison and McCabe's (1996) ultimatum games, which were not designed to study social comparisons, are of interest here as well. In these experiments, subjects were asked to indicate their strategies regarding offers and acceptances "behind the veil of ignorance", before knowing whether they would be in the role of proposer or

A randomly chosen "other" may not "cause an individual to change her belief regarding what constitutes the appropriate or correct behavior" (Cason and Mui 1998: 262), whereas information on average behavior or the social norm may.

Social norms raise questions of coordination. In contrast to earlier studies, we pose that social comparisons in bargaining are linked to problems of coordination. If social comparisons establish a social norm about which responders care, proposers can no longer take advantage of reference-point ambiguity**.** If all other proposers made a small offer, the reference point would be low and a given proposer could afford to offer less as well—but successful collusion is unlikely within large groups of proposers who do not know each other and cannot communicate. More likely, such proposers will tend toward a focal point that may serve as the norm. As the modal offer in the standard ultimatum game is typically an equal division, we expect social comparisons to reinforce the role of this focal point.[6]

This paper has two objectives: First, it aims to explore the relevance of social comparisons in general and over time, and to distinguish the channels through which social influence is exerted. Second, it seeks to assess the economic significance of these effects. To provide a metric, we compare social comparison effects with another well-established factor in informational conditions, asymmetric information on the size of the pie.[7] We chose to compare social

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responder. Information on the complete distribution of strategies behind the veil of ignorance led to a decrease of offers over time.

[6] While the focal point is an equal split in the standard ultimatum game in most Western societies, this does not need to be the case. If proposers earned the right to allocate the money, for example, they feel entitled to keep more than half of the pie, which responders accept (Hoffman and Spitzer 1985). Depending on the social distance between the proposers and the responders, the focal point may be more or less prominent (Bohnet and Frey 1999). Substantially different norms have been found to guide behavior in ultimatum games in some non-Western societies (Henrich et al. 2002).

[7] See, for example, Croson (1996), Croson et al. (2003), Forsythe et al. (1991), Güth et al. (1996), Kagel et al. (1996), Mitzkewitz and Nagel (1993), Straub and Murnighan (1995), Rapoport et al. (1996), Rapoport and Sundali (1996).

comparison with pie-size-knowledge effects because we believe that both are important characteristics in real world bargaining.[8]

(i) Channels of influence: People might rely on social comparisons for two reasons, which would lead to different outcomes in our experiment:

The *Relative Standing Hypothesis* states that responders may not only care about the absolute amount of money they receive but also about their standing relative to other responders. Among the models on relative income and inequity aversion, the model by Bolton and Ockenfels (2000) most closely reflects the informational conditions in our design.[9] In their model, players care about absolute payoffs, but also how their payoff relates to the *average payoff* of their referents. Responders who care about their standing relative to other responders should never reject a positive offer.[10] By rejecting, they would simultaneously give up absolute money and *increase* the disparity between themselves and their referents.

The *Norm Hypothesis* states that responders may care not only about their material payoffs but also about whether their specific offer provides them their just deserts. The norm of equity prescribes that equals should be treated equally—so a responder is normatively entitled to earn as much as other people in like circumstances. A responder may reject a positive offer because he dislikes its deviation from the norm more than he values the additional income, or because he takes violations of the norm as an indicator of his proposer's intentions. Rabin (1993), Duvwenberg and Kirchsteiger (1998), Falk and Fischbacher (1998) and Charness and Rabin

[8] Many experimenters choose to study the effect of one institutional change at a time, which makes between-study comparisons challenging, since many variables will change between experiments (subject pool, incentives, information conditions, etc.). Our approach allows us to directly compare the magnitude of two important institutional effects, for specific parameter values. It follows in an experimental tradition that focuses on institutional comparisons; see Ostrom et al. (1994).

[9] Other recent fairness models include Bolton (1991) and Fehr and Schmidt (1999).

[10] Unless responders believe that all other responders reject their offers as well.

(2002) present theoretical models on how inferences about the proposer's intentions affect decisions.

Recent experiments attempting to discriminate between outcome- and intentionality-based fairness theories suggest that information on the proposer's available set of choices strongly affects the responder's fairness perceptions (Falk et al. 2003). Offering 20 percent of the pie in a discrete ultimatum game is perceived very differently, depending on whether the proposer's alternative option was an equal split of 50-50 or rather a 100-0 split of the pie. Information on the social norm may serve a similar purpose. It creates a reference point for judging the intentions lying behind the offer: An offer of 20 percent seems generous if others are offered nothing but unfair if others are offered 50 percent on average.

(ii) Relative importance: We measure social comparison effects against effects due to knowledge of the size of the pie. In our ultimatum game, when information is asymmetric responders know only the a priori likelihood of two possible sizes of the pie to be divided (while proposers know the size of the pie). They are informed that there is an equal chance that proposers will have a large or a small pie available for allocation between the two of them. We have no priors about the relative magnitudes of the two effects.

Our paper is organized as follows: Section II summarizes the experimental design and specifies our hypotheses. Section III presents the experimental results and Section IV concludes.

II. Experimental Design

We use a simple two-by-two design to test our hypotheses and to measure the relative importance of information on the average offer as compared to information on the size of the pie. Table 1 presents our design. The four boxes are labeled A, B, C, and D, depending on the responder's information. Vertical comparisons measure the significance of social comparisons. Horizontal comparisons tell the importance of knowledge of the size of the pie.

Table 1: Responder's information for four versions of the ultimatum game

		Responder knows how big the pie is: No	Responder knows how big the pie is: Yes
Responder Knows Comparable Offers	No	**A**bsent Information	**B**asic Information
	Yes	**C**omparable information	**D**ouble information

In the first control treatment, A, only the proposers were informed of the size of the pie. Responders knew that there was an equal chance that the pie was $10 or $30. To determine the size of the pie, we flipped a coin at the beginning of our first session (hoping that the pie would turn out to be large but willing to repeat the session in case we did not get lucky). The size of the pie turned out to be $30, and this value remained constant during all subsequent sessions. All subjects were informed of this procedure.[11] In the second control treatment, B, the standard ultimatum game, both, proposers and responders, knew the size of the pie, $30. In neither A nor B did proposers or responders know about any offers other than their own.

The goal of the two social comparison treatments, C and D, was to determine whether informing responders about average offers would affect the offers and the rejection rates for given offers.[12] In treatment C, responders did not know the size of the pie, though they may have been able to infer it over time from information on average offers. In treatment D, the size of pie was

[11] The four sessions with asymmetric information on the size of the pie were conducted on two consecutive days to avoid spillover effects from one session to the other. We did not find any significant differences in behavior between two sessions run on different days where the same treatment condition was employed.

[12] To test this, we established the following sequence for each round: 1. Proposers make their offers. 2. The average offer is computed and told to responders. 3. Responders are given their individual offers. 4. Responders decide whether to accept or reject. 5. Proposers are informed whether their offer was accepted or rejected, but not the experience of other proposers. The experimental instructions can be made available upon request.

common knowledge. Experimental participants played the same game with changing partners five times (stranger treatment) to test for the dynamic effects of comparison and pie-size information.

We test our hypotheses by looking at offers, rejection rates (both unconditional and for given offers), equal-split probabilities, and their evolution across rounds. We test the *Relative Standing* and the *Norm Hypotheses* against the *Null Hypothesis* that social comparisons do not affect behavior by the responder. Thus, the *Null* implies that behavior by the proposer should not be affected either. If information on the average offer induces different offers and different rejection rates for given offers with than without social comparisons, the *Null Hypothesis* is rejected. If offers and rejection rates are higher with than without social comparisons, the *Relative Standing Hypothesis* is rejected. Note that while we focus on comparisons between responders here, higher offers given social comparisons reject the *Relative Standing Hypothesis* independent of whether a responder cares about how he fares compared to other responders or compared to his proposer. If he only cares about his proposer, we should see no differences in offers and rejection rates with and without social comparisons.

The *Norm Hypothesis* assumes that social comparisons tend to focus people's attention on a focal point. If the focal point were lower than most offers, we should see lower offers and rejection rates with than without social comparisons, as in the *Relative Standing Hypothesis*. If the focal point is higher than most offers, we should see higher offers and rejection rates with than without social comparisons. To generate unequivocal predictions, we chose a design inducing high focal points, namely a large pie under all conditions. If the focal point is larger than most offers -- as it is with equal splits in large-pie ultimatum games -- we will see higher offers and higher rejection rates for given offers as well as more equal splits when responders are informed of the average offer. As the fairness norm becomes established, we expect that information on the average offer will become more important over time. While a focal point may exist faintly in round 1, it will gain importance with the number of rounds of play, leading to an increase in offers over time in our social comparison treatments C and D.

Asymmetric information poses a coordination problem for proposers when the size of the pie remains constant over time. If proposers could coordinate on small offers, they could successfully pretend that the pie is small. However, as with social comparisons, coordination attempts are likely to fail in our large-group, anonymous context without communication. The more repetitions are run, the more likely that participants will become aware of the size of the pie in treatment A as they update their beliefs based on past offers. In treatment C, due to the help of social comparisons, information on the size of the pie will leak out more swiftly. We thus expect a faster and larger increase in offers in treatment C than in treatment A.

228 subjects participated in the experiment. Each treatment condition was conducted in two sessions, typically with 14 bargaining pairs per session. Subjects participated in only one of the treatment conditions. They were randomly assigned the role of proposer or responder, and kept that identity for the duration of the experiment. After the roles were determined, proposers and responders were separated and responders were escorted to a different room. No conversation or other contact was permitted in either room. The players remained anonymous and were only identified by code numbers (double-blind). We ran five bargaining rounds, with subjects randomly paired with a counterpart, with no rematch. At the end of the experiment, both proposers and responders were paid according to their earnings in one randomly chosen round. They also received a show-up fee of $10. On average, subjects earned approximately $23 in this experiment, which took about 1 hour.

III. Experimental Results

Result I:

Information on comparable offers and on the size of the pie independently increase offers and rejection rates for given offers, ceteris paribus. The likelihood that an equal split is chosen is higher if responders learn both types of information.

Our results reject the *Null Hypothesis* that social comparisons have no effect. Our two alternative hypotheses have different implications. Our results reject the *Relative Standing Hypothesis* and support the *Norm Hypothesis*. We discuss how the information given to responders affected the offers they received and the rates of equal splits and rejections. Table 2 presents average and modal offers as well as equal split rates aggregated over all rounds.

Table 2: **Mean offers**, *modal offers* and equal split rates in all rounds

		Responder knows how big the pie is No	 Yes
Responder knows comparable offers	No	**A** **8.12** *5* 23%	**B** **10.75** *10* 25%
	Yes	**C** **10.24** *15* 24%	**D** **12.46** *15* 43%

Both social comparison and pie-size information substantially increase offers over all rounds. Proposers are most likely to offer an equal split of $15 when responders know both the size of the pie and the average offer, i.e., in treatment D.[13] Rejection rates are low in all treatments and decrease with the size of the offers. Figures 1 to 4 present the number of rejections for an offer of a particular size, over all rounds in each treatment.

[13] On the other hand, many more people offer $5, the seemingly fair offer, in treatment A than in any of the other treatment conditions. 41% offer $5 in treatment A, 15% in C, 12% in D, and 10% in B.

Figure 1: Distribution of offers and rejections in treatment A (N=155)

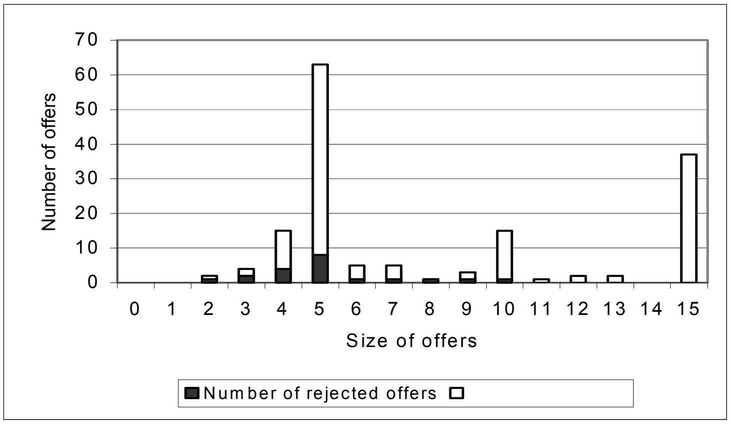


Figure 2: Distribution of offers and rejections in treatment B (N=140)

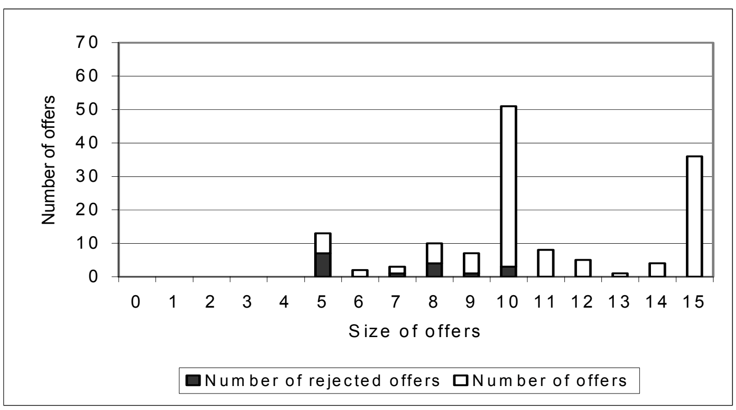


Figure 3: Distribution of offers and rejections in treatment C (N=140)

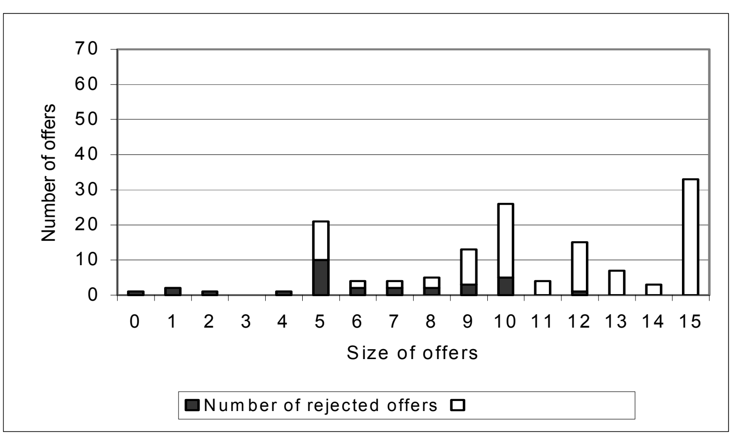
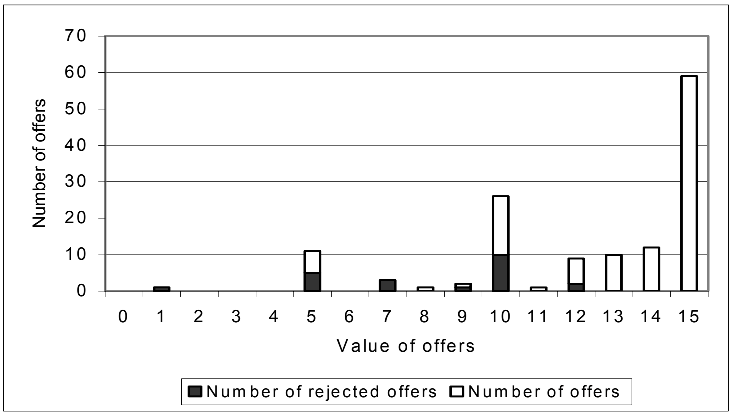


Figure 4: Distribution of offers and rejections in treatment D (N=135)



To determine the optimal offer (based on EMV) in a given treatment, we calculate a proposer's money-maximizing offer by comparing how often an offer of a given size is accepted.[14] In treatment A where no information is provided, it is \$5 ($EV_{prop.}$=\$21.83); in treatment B, where only the pie size is known, it is \$10 ($EV_{prop.}$=\$18.82); in treatment C where comparable offers are known, the offer that maximizes the expected payoff for the proposer is \$10 (EV_{prop}.=\$16.16); and in treatment D where responders know both the size of the pie and the average offer, the money-maximizing offer for the proposer is \$15 ($EV_{prop.}$=\$15).

To estimate the treatment effects more precisely and to determine the relative importance of knowing the average offer compared to knowing the size of the pie, we ran a multiple regression where

Pie size known	= 1 if responder knows the size of the pie (treatments B and D)
	= 0 otherwise (treatments A and C)

[14] Comparisons across treatments are somewhat complicated because the number of offers of a given size varies greatly in the different treatments. For example, while a number of proposers offered less than \$5 in treatment A, there were hardly any offers below \$5 when responders knew the size of the pie. We follow Roth et al. (1991) and include only offers that have been made at least 10 times over all rounds, so we could only include offers of \$5, \$10 and \$15 across our four treatment conditions.

Social comparisons known = 1 if responder knows the average offer (treatments C and D)

= 0 otherwise (treatments A and B)

Pie size and social comparisons known = 1 if responders know average offer and pie size (D)

= 0 otherwise (A, B, C)

We ran OLS regressions for offers and Probit regressions for rejection rates and equal split probabilities, controlling for possible round and subject-fixed effects. Table A.1 in the Appendix presents the regression results. It shows that social comparison and pie information each increases offers by more than $2 and each increases rejection rates for a given offer by more than 10 percent, *ceteris paribus*. Rejection rates fall by almost 4 percentage points with every additional dollar offered. Over 5 rounds, the effects of both informational conditions—average offer and pie size—are statistically and economically significant and of comparable size. Responders are significantly better off if they have either type of information available to them. The probability of an equal split is only higher if responders have both, information on the average offer and on the size of the pie (treatment D). In the other social comparison treatment, C, there are competing focal points, an equal split of the large and an equal split of the small pie. Finally, offers generally increase over time, with significantly larger offers in round 5 than in round 1. However, dynamic effects may vary in the different treatments.

Result II:

The difference between offers in treatments with and without social comparisons increases over time. Equal splits become more likely over time in treatment D. Unconditional rejection rates do not vary over time.

Tables A.2-4 in the appendix present offers, equal split and (unconditional) rejection rates for each round. A Wilcoxon test reveals significantly larger offers in later rounds for treatments with (C and D) than without social comparisons (A and B).[15] Equal splits are more likely in treatment D than in treatment B, starting in round 3.[16] There are no significant differences in unconditional rejection rates in any of the rounds.

We expected that information about pie size would leak over time, more quickly with social comparisons. Offers in treatment A remain low in all rounds, with only a slight, non-significant increase in offers over time. Average offers are significantly higher in treatment B than in A in all rounds, while the differences between treatments D and C are only significant in early rounds.[17] In fact, by the fifth round, responders in treatment C have almost caught up with responders in D. More striking, they earn more than responders in treatment B, who know the pie size. While this difference between treatments C and B does not reach significance (Z=-1.625, p=0.10), it supports our previous finding when comparing treatments D and B: knowledge of comparable offers provides more than pie-size information.

The increasing differences in offers with and without social comparisons over time are driven by identifiable forces: An increase in offers from round 1 to round 5 in treatment C where responders learn about the size of the pie as they learn about comparable offers, and a decrease in offers in treatment B, the basic ultimatum game. Offers also increase over time in the other social comparison treatment D, but the differences between the first and the last rounds are only significant in B and in C.[18] The decrease in offers over time in the basic ultimatum game is in line with standard results. Most studies find a slight tendency of offers to decrease over time (Camerer

[15] For treatments A and C, we find for rounds 1: Z=-1.21, p=0.23, 2: Z=-2.28, p=0.02, 3: Z=-1.99, p=0.06, 4: Z=-2.48, p=0.01 and 5: Z=-2.55, p=0.01. For treatments B and D, we find for rounds 1: Z=-0.35, p=0.73, 2: Z=-1.23, p=0.22, 3: Z=-2.50, p=0.01, 4: Z=-2.74, p<0.01 and 5: Z=-2.43, p=0.02.

[16] For treatments B and D, we find for rounds 3: chi^2=4.70, p=0.03, 4: chi^2=3.62, p=0.05, 5: chi^2=4.89, p=0.03.

[17] For treatments A and B, we find significant differences for rounds 1 (Z=-3.54, p<0.01), 2 (Z=-3.31, p<0.01) and 3 (Z=-2.24, p=0.03), and marginally significant differences for rounds 4 (Z=-1.99, p=0.05) and 5 (Z=-1.96, p=0.05). For treatments C and D, we find significant differences for rounds 1 (Z=-2.39, p=0.02), 2 (Z=-2.32, p=0.02) and 3 (Z=-2.57, p=0.01) but not for rounds 4 (Z=-1.75, p=0.09) and 5 (Z=-1.41, p=0.16).

[18] The results of a Wilcoxon Signed Ranks Test, comparing rounds 1 and 5, are for treatment B: Z=-2.139, p=0.032, and for treatment C: Z=-3.029, p<0.01.

2003). We expected an increase in offers in both social comparison treatments, C and D, but found a significant increase in C only. Perhaps more repetitions would have led to a larger increase in offers in D as well. Based on our present experiment, we conclude that social comparisons lead to an especially large increase over time if they allow responders to learn what comparable others earn as well as the size of the pie.

IV. Discussion and Conclusions

When deciding whether to accept or to reject a specific offer, responders take into account information on offers to other responders. Proposers anticipate this when making their offers. In our ultimatum game experiments, proposers made higher offers and responders were more likely to reject a given offer when social comparisons were provided than when they were not. This rejects the *Null Hypothesis* that social comparisons do not affect behavior. It also rejects the *Relative Standing Hypothesis,* where responders dislike payoff differences between themselves and other responders. Our findings support the *Norm Hypothesis,* where responders dislike deviations from the norm of equity—for their own sake or because they signal a proposer's unkind intentions.

We find that social comparisons activate the norm of equity: Responders expect to be treated like others in like circumstances. In an ultimatum game, where there is no economic context that suggests what an appropriate or equitable division of a surplus might be, the equal-division point will be significantly advantaged as a possible focal point. Thus, we expected and found that social comparisons made offers of an equal split of the pie more likely if responders knew the size of the pie.

Knowing comparable offers increases offers by a similar magnitude as does knowing the pie size. Social comparisons gain in importance over time, especially when responders do not know the size of the pie. They enable responders to hold proposers accountable to the norm of equity, both with respect to other responders and with respect to the share their proposer's keep. Our results do not suggest that responders do not care about their bargaining counterpart but they do suggest that in addition to these considerations, responders are also concerned that they be treated equivalently to others in like circumstances and that proposers are aware of this.

Our preliminary conclusion, based on a limited number of experiments, is that social comparisons facilitate attention to the social norm. In our design, the social norm, an equal split, improved the responders' lot. More generally, social comparisons decrease the distance between an offer and the norm. Whether social comparisons favor proposers or responders, employers or workers, sellers or buyers, will depend on a variety of contextual factors that help establish norms. Retailers lure buyers by offering a discount off what they hope to establish as the norm, the manufacturer's list price; salesmen seek to convey the impression that their buyer of the moment is getting a special low price; and proposers of marriage try to convey the impression that the responder is regarded more highly and loved more dearly than anyone the proposer has ever met. Both players know that if the proposal is viewed as being favorable relative to the norm, the prospects for acceptance are considerably enhanced.

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Table A.1: The influence of social comparisons and pie-size information on offers, equal split and rejection rates

	Offer	Prob. of equal split	Rejection rate
Social comparisons Known	2.127 **	-0.003	0.172 ***
	(0.957)	(0.113)	(0.042)
Pie size known	2.641 ***	0.020	0.110 ***
	(0.890)	(0.108)	(0.0391)
Social comparisons x pie size known	-0.462	0.174*	-0.053
	(1.200)	(0.103)	(0.036)
Offer			-0.037 ***
			(0.004)
Round 2	0.412	-0.008	-0.006
	(0.282)	(0.036)	(0.034)
Round 3	0.404	-0.010	-0.012
	(0.349)	(0.042)	(0.030)
Round 4	0.561	-0.018	-0.007
	(0.352)	(0.035)	(0.034)
Round 5	0.640*	-0.018	-0.002
	(0.373)	(0.036)	(0.034)
Constant	7.713 ***		
	(0.768)		
Pseudo R-squared		0.025	0.261
R-squared	0.151		
Observations	570	570	570

*significant at 10% level, ** significant at 5% level, *** significant at 1% level, standard errors in parentheses
OLS regressions for offer and probit regressions for rejection rate and prob. of equal split, clustered for subjects

Table A.2: Size of offers

	Absent (N=31)			**B**asic (N=28)		
	Mean	Median	Mode	Mean	Median	Mode
Round 1	7.71	5	5	11.64	10.5	15
Round 2	7.84	5	5	11.39	10.5	15
Round 3	8.26	5	5	10.46	10	10
Round 4	8.35	5	5	10.14	10	10
Round 5	8.42	6	5	10.14	10	10

	Comparable (N=28)			**D**ouble (N=27)		
	Mean	Median	Mode	Mean	Median	Mode
Round 1	8.82	9	10	11.74	14	15
Round 2	9.89	9.5	15	12.48	14	15
Round 3	10.04	10	15	12.78	15	15
Round 4	11.07	10.5	15	12.59	14	15
Round 5	11.39	12	15	12.52	13	15

Table A.3: Percent of proposers choosing an equal split of the large pie ($30)

	Absent (N=31)	**B**asic (N=28)
Round 1	22.58%	32.14%
Round 2	22.58%	32.14%
Round 3	25.81%	21.43%
Round 4	22.58%	21.43%
Round 5	22.58%	17.86%

	Comparable (N=28)	**D**ouble (N=27)
Round 1	25.00%	40.74%
Round 2	25.00%	37.04%
Round 3	21.43%	48.12%
Round 4	25.00%	44.44%
Round 5	21.43%	44.44%

Table A.4: Unconditional rejection rates

	Absent (N=31)	**B**asic (N=28)
Round 1	19.35%	15.66%
Round 2	16.12%	7.14%
Round 3	6.45%	10.71%
Round 4	9.68%	10.71%
Round 5	12.90%	7.14%

	Comparable (N=31)	**D**ouble (N=28)
Round 1	28.57%	14.81%
Round 2	21.43%	18.52%
Round 3	21.43%	14.81%
Round 4	21.43%	14.81%
Round 5	17.86%	18.52%