

Gender and Ultimatum in Pakistan: Revisited

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Razzaque (2009) studied the role of gender in the ultimatum game by running experiments on students in various cities in Pakistan. He used standard confirmatory data analysis techniques, which work well in familiar contexts, where relevant hypotheses of interest are known in advance. Our goal in this paper is to demonstrate that exploratory data analysis is much better suited to the study of experimental data where the goal is to discover patterns of interest. Our exploratory re-analysis of the original data set of Razzaque (2009) leads to several new insights. While we re-confirm the main finding of Razzaque regarding the greater generosity of males, additional analysis suggests that this is driven by student sub-culture in Pakistan, and would not generalise to the population at large. In addition, we find strong effect of urbanisation. Our exploratory data analysis also offers considerable additional insights into the learning process that takes place over the course of a sequence of games.

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1. INTRODUCTION

Since the beginning of the twenty first century, thousands of papers have been published on the Ultimatum Game (UG) because it clearly demonstrates the social aspects of decision making in the simplest context possible. In the UG, two players share some money according to a simple set of rules. The proposer is given an amount of money—say \$10—to share with the responder. The proposer makes an offer (i.e. I keep \$7 and you get \$3). If the Respondent accepts, both get the proposed allocation. If respondent rejects then both get \$0.

Economic theory leads to a straightforward solution to this game. The proposer will maximise utility by keeping \$9 and offering the minimal possible amount, \$1. Economic theory predicts that the responder will accept this offer, since \$1 is better than \$0. However, experimental results are strongly in conflict with economic theory. The vast majority of responders reject offers of less than 20 percent, regarding them as unfair. They are willing to suffer a loss, to punish the unfair behaviour of the proposer. Knowing this, the vast majority of proposers offer more than the minimal amount, typically above 30 percent of the total. Thus, both proposer and responder strategies differ greatly from the theoretical Nash equilibrium strategy. Behaviour in the ultimatum game reflects cultural norms related to sharing and perceptions of fairness. Because of this aspect, experiments on this game have been conducted in a vast variety of different cultural contexts. Camerer (2003) provides a convenient summary of the voluminous literature.

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Some materials especially relevant to our topic are also surveyed in Razzaque (2009) and Zataari and Trivers (2007).

In this context, we re-analyse an experimental study originally conducted by Razzaque (2009) to explore gender differences in the ultimatum game. Our main goal is to show that how exploratory data analysis techniques allow for detection of unusual patterns in data. Our analysis also highlights how local cultural patterns among students drive most of the results, which are very different from standard results on effects of gender in the UG.

EDA—exploratory data analysis—is generally not taught to students of econometrics, we note two key points about it. First, the object of an EDA is to generate interesting hypotheses; to find patterns in the data which are worth investigating or exploring further. The standard package of techniques taught in econometrics textbooks consists of Confirmatory Data Analysis (CDA), which is done when hypotheses are in hand and the goal is to prove or disprove them. EDA is often used to supplement CDA rather than replacing it; however, CDA without EDA is seldom warranted [Behrens (1997)]. EDA provides useful insights, and picks up unexpected or misleading patterns even if we have well defined hypotheses at hand. Small samples are not a serious handicap to an EDA, since our goal is not to find significant evidence for or against a hypothesis, but to generate them. The second point is that use of relevant graphical techniques is much more suited to the discovery of patterns. The patterns in the data stand out visually in the boxplots, and are hidden in the tables or in formal models.

Detailed description of the experiment is provided in Razzaque (2009). We summarise the elements relevant to our analysis briefly. Equal numbers of male and female students were selected from universities in five cities to participate as subjects in the experiments. There were fifteen pairs each in Ghizer, Kharan, Rawla Kot and Nawabshah, and ten pairs in Lahore, for a total of 65 males and 65 females. The first two rounds were blind and anonymous, so as to establish a baseline and to allow all students to play as Proposers and as Responders. The third and fourth rounds were played by matched couples. Males were proposers in the third round while females were responders. The roles were reversed in the fourth round. This design creates a confounding effect, since the effects of reciprocity and gender cannot be disentangled. Nonetheless, the experiment yields a substantial amount of interesting information. Parallel to Razzaque, we do an analysis of the results for each of the four rounds.

Offers in Round 1

Razzaque (2009) finds that the pattern of offers of males in the first round differs significantly from that of females. He also finds that the males make larger offers—i.e. they are more generous. This is rather surprising since the typical finding is the reverse of this; females are found to be more generous, and make larger offers. A detailed analysis reveals much more variation, and interesting patterns in the data. One of the key results that emerges from this analysis is that the behaviour of students in the small cities (Ghizer, Kharan and Rawla Kot) differs significantly from that of the larger cities, Nawabshah and Lahore. We first provide a tabulated summary of the data, which is a typical data summary produced by standard statistical packages.

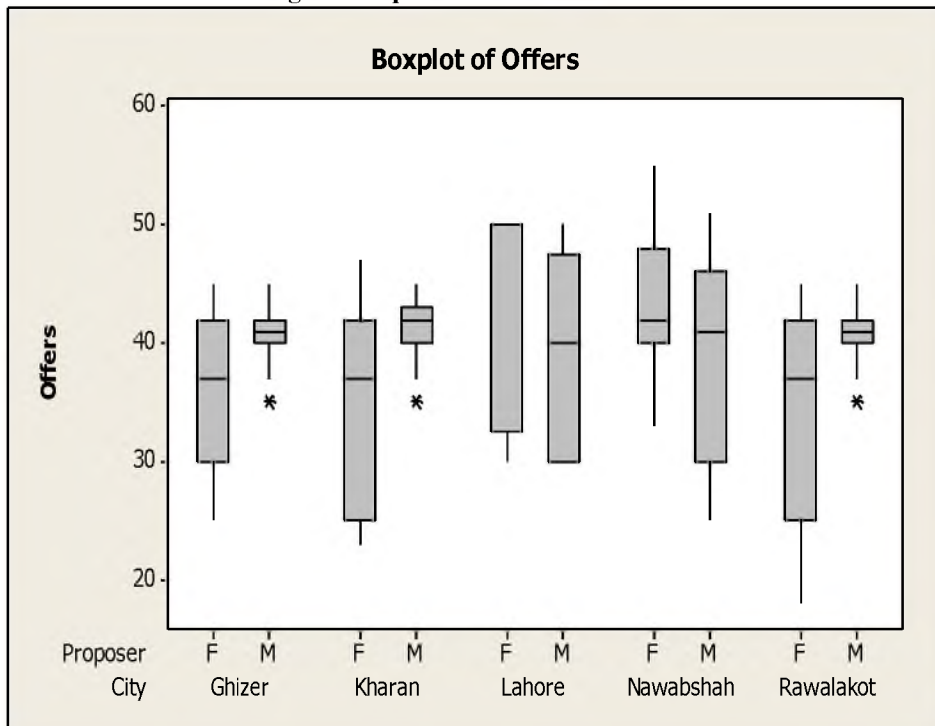
Table 1

Summary Statistics for First Round Offers

City	Gender	N	Mean	SE(M)	StDev	Min	Med	Max
Ghizer	F	15	36.2	1.7	6.6	25	37	45
Ghizer	M	15	40.8	0.7	2.7	35	41	45
Kharan	F	15	35.1	2.2	8.4	23	37	47
Kharan	M	15	41.6	0.7	2.8	35	42	45
Rawla Kot	F	15	34	2.5	9.5	18	37	45
Rawla Kot	M	15	40.8	0.7	2.7	35	41	45
Nawab Shah	F	15	43	1.7	6.4	33	42	55
Nawab Shah	M	15	39.3	2.1	8.3	25	41	51
Lahore	F	5	43	4.4	9.8	30	50	50
Lahore	M	5	39	4	8.9	30	40	50
Small Cities	F	45	35.1	0.604	8.098	10	40	55
Small Cities	M	45	41.1	0.549	7.363	30	45	65
Big Cities	F	20	43.0	1.513	13.533	10	46	100
Big Cities	M	20	39.2	0.709	6.339	25	46	55

Although the patterns that we detect with the boxplot are present in the numbers above, it would require some detective work to find them. However, a boxplot of the data makes these patterns visually obvious, as we can see from the graphs given below.

Fig. 1. Boxplot of First Round Offers



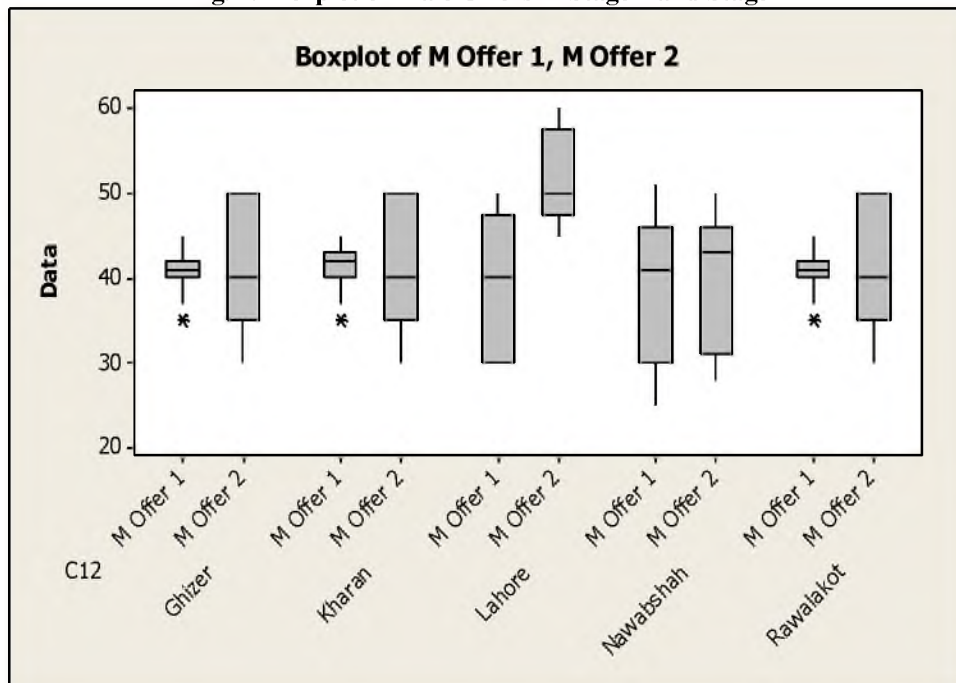
It is immediately obvious visually that male offers in Ghizer, Kharan and Rawala Kot are quite similar to each other, and very different from all other offer patterns. These offers are tightly concentrated around 40 percent. Male offers in the big cities (Lahore and Nawab Shah) also average around 40 percent, but are much more spread out. Male offers differ in small and big cities in terms of variation but not in terms of mean. Female offers show the opposite picture. The mean offer of females is 35 percent, or about 5 percent lower than that of males in the small cities. In the big cities, the mean offer is around 43 percent or about 3 percent higher than that of the males. The spread or variation of the female offers does not show any significant differences among big and small cities.

Our observation of behavioural differences for geographical background or urbanisation were significant in many previous studies; specifically, Barr (2014) shows that urban-born player makes higher offers in the UG, while rural-born player is less certain about sharing norms in UG. Similarly, Paciotti and Hadley (2003) also argued that ethnicity has a greater effect on offers and rejections than individual economic and demographic characteristics. Oosterbeek, Sloof, and Van De Kuilen (2004), on the contrary, found significant differences in respondents' behaviours instead of offers across regions. Botelho, *et al.* (2000), on the contrary, found geographic variable as irrelevant.

Offers in Round 2

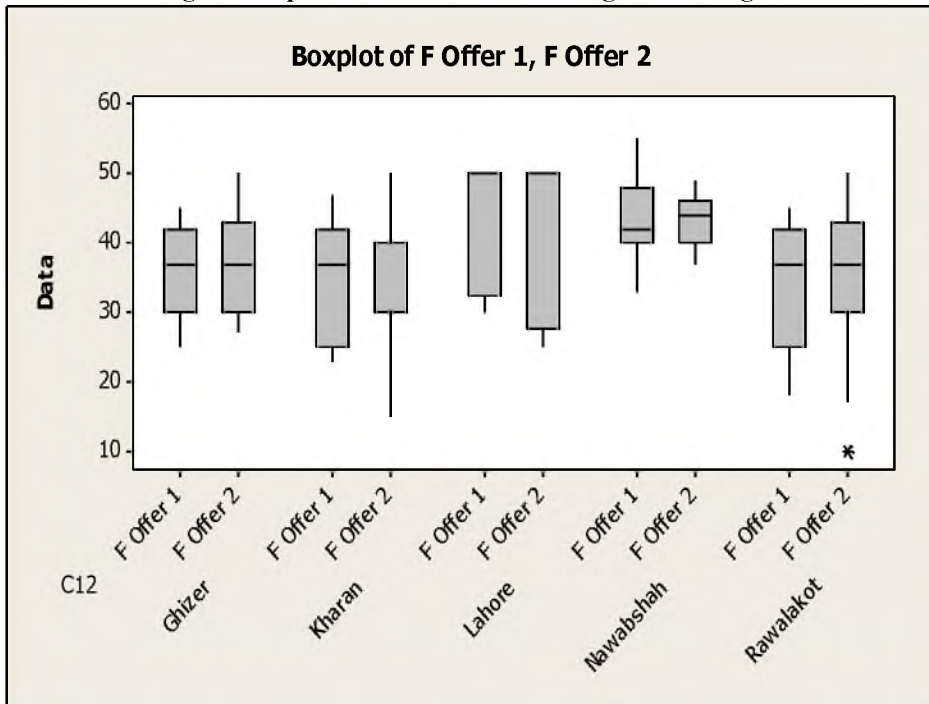
Of course a key question is: why do these differences exist? Before attempting an answer, it is useful to look at the pattern of offers in round 2. Below are the boxplots for the male offers.

Fig. 2. Boxplot of Male Offers in Stage 1 and Stage 2



Because both rounds one and two were conducted under anonymity, there should have been no systematic difference in the results. However, observations turned out differently. In all three small cities, the male offers spread out over a wider range, while the mean remains the same at around 40 percent (Table 1 in Appendix). The spread of these offers is similar to the spread of the offers in all other cases. From the brief interviews conducted it seemed that the male students relaxed, and became more comfortable with game environment—a “game learning effect”. It seems plausible that in small cities, male students suffered from performance anxiety on initial contact in environments where they were together with females as subjects in an experiment. Roth and Erev (1995) in their learning model also showed that small initial differences between subjects become larger as subjects gain experience with the UG. However, big cities in our sample did not show any learning effect. In Nawab Shah, there is no change in the male offers. In Lahore, there is dramatic shift upwards in the offers. Exploring this, we find from the experimenter that due to an accident, the male subjects in Lahore learnt that their offers were going to females. This clearly caused a dramatic shift upwards in the male offers. Again there was a strong and clear response to gender; males increased their offers hugely. While the pattern and its explanation seem clear through an analysis via boxplots, similar patterns are very hard to find and explain in standard regression analyses run on aggregated data. Indeed, there is no mention of these patterns in the original analysis of Razzaque. Again this highlights the merits of an exploratory data analysis. Next we look at the analysis of the female offers in round 2. The boxplots are presented below:

Fig. 3. Boxplot of Female Offers in Stage 1 and Stage 2



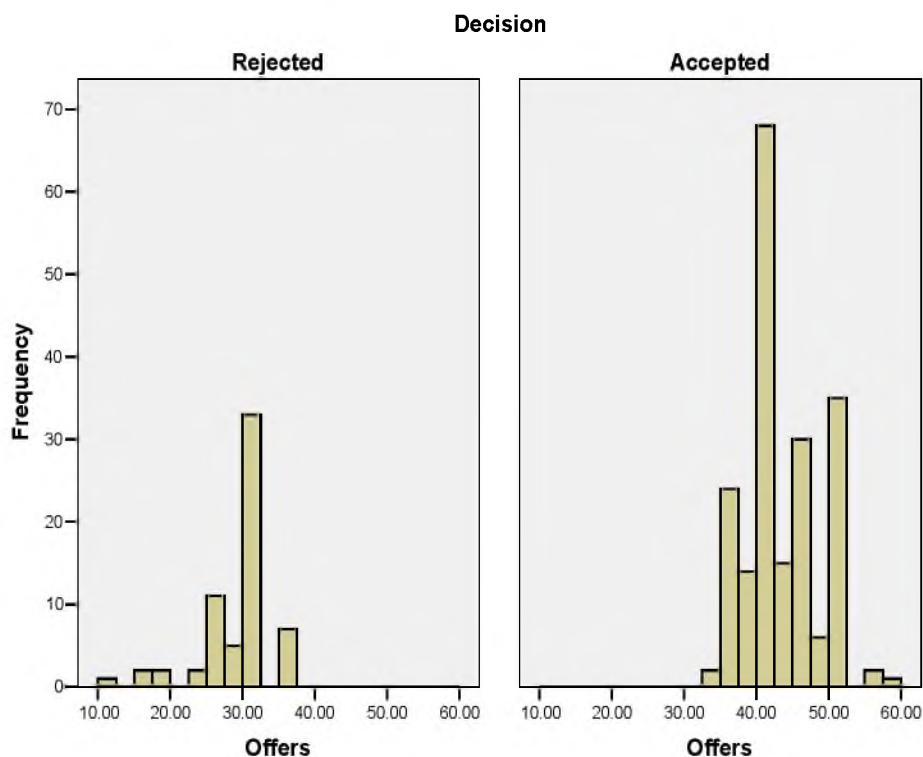
There is not much change in female offers in moving from round 1 to round 2. The means in the small cities remain at 35 percent, well below male mean offers of 40 percent. In Lahore and Nawab Shah, the mean offers of the females remain the same, around 43 percent. This is as one would expect, given that there is little change in conditions going from round 1 to round 2. Whereas female offers were more generous than males in the big cities, this pattern no longer holds in Lahore because of the gender revelation which occurred to males in Lahore. The Lahore offers jumped in response to this, making it appear as if females are less generous. However, this pattern of hyper fair offers is highly unusual, and would likely not be observed in cultural contexts other than cross-gender interactions among students.

An important finding of the first two rounds, when UG was played in anonymity, is that female proposers remained less generous than the male proposers, even if we exclude the Lahore data where male proposers by experimental error proposed hyper fair amounts. This is contrary to typical finding that females are more generous [Andreoni and Vesterlund (2001); Eckel and Grossman (2001); Piper and Schnepf (2008); Naeem and Zaman (2013)] also show that Pakistani females are more generous in giving charity. This creates a puzzle: why are females in small cities offering significantly less than their counterparts in the big cities? The small offer of females is contrary to both local cultural patterns, as well as typical findings of greater generosity of females. Again a plausible explanation stems from the finding of Croson and Gneezy (2009) and Della Vigna, *et al.* (2013) that females are more prone to social norms and social pressure and so they react more to such phenomenon. In small cities where cross gender interactions are not frequent, females are wary and on their guard in an experimental environment where they are interacting with male students. We saw that males in the small cities were also not comfortable in making offers, though the effect of male offers vanished in the second round. In large cities, cross gender interaction is a commonplace, so females behave normally in such environments.

Responder Behaviour in Rounds 1 and 2

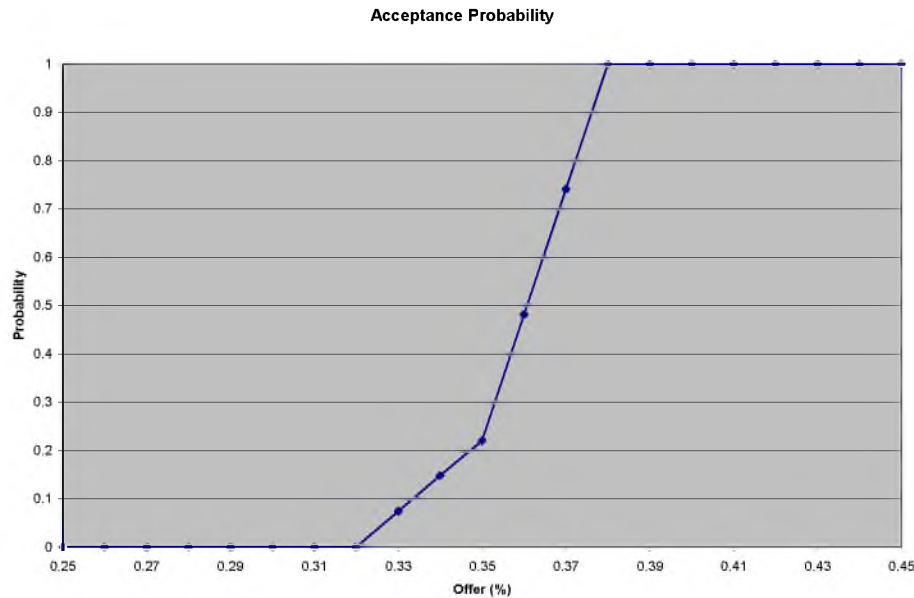
Regarding responder behaviour, Razzaque (2009) uses logistic regressions to come to conclusions similar to what we observe, using EDA methods. However, a direct data analysis of the type that we do here provides clear evidence, since it is not based on unnecessary auxiliary assumptions required by more formal statistical methods. In analysing the behaviour of responders, a straightforward analysis shows that there are no significant differences by gender or by city or by round. In fact the responders' behaviour is very clear: All offers of less than 33 percent are rejected in both rounds. All offers of above 37 percent are accepted in both rounds. Only in the very narrow range of offers between 33 to 37 percent do we see any differences in rejection behaviours. Among the total of 260 offers in the two rounds (130 each per round), only 33 offers lie within critical range of 33 percent to 37 percent. Within these 33 offers, there are exactly 6 rejections; the remaining 27 offers are accepted. There are no significant differences in behaviour of responders by gender or by city or any other observable factor.

Fig. 4. Bar-plot of Decisions in Stage 1 and Stage 2



We can be misled if we look at overall rejection rates, instead of focusing on the critical region of 33 percent–37 percent. For example, in small cities, the median offer of females is around 35 percent which lies within this critical region. The median offer of males is around 40 percent, which lies above this region. Thus, even though responder behaviour is identical, overall rejection of female offers would be higher than overall rejection of male offers. For example, 30 out of 48 rejections in small cities are by females—the rejection ratio is 62.5 percent for female responders compared to $18/48=37.5$ percent for male responders. But within these 48 rejected offers, 39 originate from females. Also, the experimental design is such that in the second round there are only FF and MM pairings, while in the first round FF and FM pairings are approximately equal in number. Among the 130 offers made to females, 35 are made by males, while 95 are made by females. Thus the dramatic difference of 62.5 percent for female rejections compared to only 37.5 percent for males is not due to any differences in responder behaviour by gender. It is due to a combination of two factors. Females offer less, and the experimental design is such that FF pairings are $95/130 = 73$ percent of total pairings with female responders.

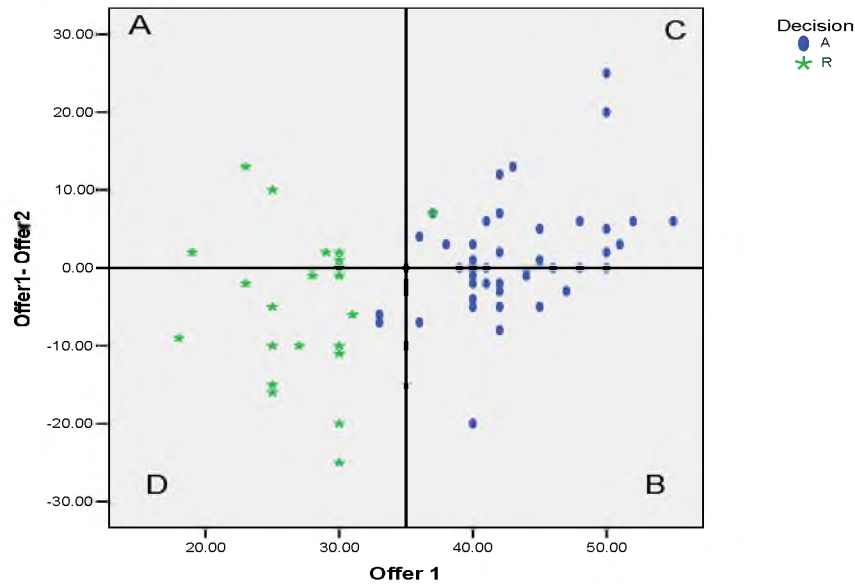
Given that responder behaviour is identical across genders and cities, we can directly plot the probabilities of rejection of offers from the data on the 260 offers as follows:

Fig. 5. Acceptance Probability

Empirically, probability of acceptance of an offer of 32 percent is zero, while at 38 percent the probability climbs to 100 percent. Within this range, we look at the data for the rejection rates and use linear interpolation. This data-based curve is better than the logistic curve plotted to the same data by Razzaque (2009) because it does not impose an arbitrary functional form.

Learning from Experience

Over the course of a repeated sequence of games, people learn from experience. We examine how subjects learn in going from round 1 to round 2 of the ultimatum game under study. We only consider how the proposers learn; the question of how responders learn is very complicated and cannot be considered here—see Camerer (2003) for some discussion of this issue. If the offer of the proposers is too low, it will be rejected. Learning means that the proposers should raise their offers to prevent rejections in the future. If the proposer keeps the same offer, or lowers it, then he or she has failed to learn from the rejection. If the offer of the proposer is high enough, it will be accepted. In this case, profit maximisation means that the proposer should keep the offer the same, or else lower it, trying to keep a bigger share. Lowering the offer corresponds to experimenting to see if you can make a bigger profit. Increasing the offer corresponds to not learning, since acceptance of the current offer means that the same offer should also be acceptable in the future. Making the same offer will generate a larger share for the proposer, while an increased offer will lead to a smaller share. In light of these considerations, the following graph looks at the difference $D = \text{Offer}(1) - \text{Offer}(2)$ on the y-axis, plotted against $\text{Offer}(1)$ on the x-axis. The rejected $\text{Offers}(1)$ are plotted as stars, while the accepted $\text{Offers}(1)$ are plotted as solid dots:

Fig. 6. Scatter Plot of First Round Offers with Of1-Of2

Region A: Rejected Offer is decreased—shows lack of learning. Region B: Accepted Offer is increased—Lack of learning. Region C: Accepted Offer is decreased: Learning. Region D: Rejected Offer is increased: Learning.

Learning from Rejections: Note that the x-axis is centred at 35 percent. Nearly all of the stars (rejected round 1 offers) are on the left hand side of the x-axis. Furthermore, most of these stars are in the lower quadrant, where $\text{Offer}(1) - \text{Offer}(2) < 0$, meaning that $\text{Offer}(2)$ is bigger than $\text{Offer}(1)$. This means the most subjects whose offers were rejected, learned from this experience and increased their offers on the next round. There are a total of 27 rejections in the first round; of these, 6 are male offers while 21 are female offers. Among these, 18 subjects increase their offers in the second round, while 9 subjects decrease, so we could say that 66.7 percent of the subjects learned, while 33.3 percent failed to learn from the first round rejection. If we subdivide by gender, we find that 13 out of the 18 subjects who increased their offers are females, while 5 are males. So this seems to suggest the females learned more, as Razzaque (2009) writes. In fact, of the total of 6 males who were rejected, 5 of them learned from the experience and revised their offers upwards, leading to a learning percentage of $5/6 = 83$ percent. Of the 21 females who were rejected, 13 increased their offers, leading a learning percentage of only $13/21 = 62$ percent. The sample size is too small to derive firm conclusions, but the null hypothesis that females and males learn equally from rejections cannot be rejected. The stronger tendency of learning in rejected offers in our experiment can be attributed to loss-aversion [Kahneman and Tversky (1979)].

Learning from Acceptances: A visual examination of the accepted offers in the above graph shows that they seem spread out equally over the upper and lower half. The

upper half corresponds to learning, where the accepted offer is reduced. The lower half corresponds to failure to learn, where the accepted offer is increased. There are a few outliers in the upper right quadrant corresponding to the hyper fair offers made by males in Lahore. In general the graph shows that there is no learning from acceptances, and that this tendency is also equal among males and females. In an experiment, Brenner and Vriend (2003) show that high general acceptance leads to significantly lower offers. Slonim and Roth (1998) in a high stake experiment also find that proposers learned to make lower offers with experience; however, our experiment does not show this learning effect—acceptances do not lead to lower offers. This may be because there was too little time—too few rounds were played. Also, only the first two rounds could really be considered to judge learning effects, because the face-to-face with opposite gender created a vastly different environment. Analysing the learning by gender, we find that among the 59 accepted offers of males, only 24 decreased their offers, leading to a learning ratio of $24/59 = 40$ percent. If offers are changed at random than they would be increased by 50 percent, implying that there is no learning going on at all. Similarly, 16 out of 42 females with accepted offers decreased their offers, again showing no learning. There is no difference by gender or city in learning from acceptances.

Analysis of Rounds 3 and 4

Third Round Male Offers

The third and fourth rounds were played by matched pairs sitting across the table, but not allowed to communicate in any other way. In the third round, all males made offers to females, while in the fourth round, the roles were reversed. We first consider the offers in the third round, all of which are male offers by the design of the experiment.

In the first two rounds, male offers averaged around 41 percent in both rounds and in all cities—the solitary exception was Lahore in round 2, which has an average male offer of 50 percent, due to accidental revelation of gender of responders. In the third round, average male offers increased to 49 percent, in all cities, which shows a strong and significant response to gender. Again, the solitary exception was Lahore, where the average male offer jumped to 67 percent and nearly all males made hyper fair offers.

As discussed earlier, the experiment design has certain confounding factors built in. Here, we cannot assess whether the increased offer is due to gender, or due to lack of anonymity. It is well established that subjects care about approval of the experimenter, as well as the approval of other subjects. For example, offers decrease substantially in anonymous Dictator games, compared to situations where the offer of the Dictator can be seen by others [Hoffmann, *et al.* (1994) and Franzen and Pointner (2012)]. Thus we can expect offers to increase from anonymous and blind setting of the first two rounds, when the responder sitting across the table changes. Thus, in the current experiment, it is impossible to say whether the increase in offer was a response to gender, or just a response to a human responder sitting across the table. In fact, there are three possible explanations for the clearly observed increased offer by males in round 3.

- (1) Desire to please the opposite party, as well as the experimenter, in conformity with standards of chivalry and courtesy.

- (2) According to local cultural norms, males are responsible financially for females. Recognition of this responsibility led to higher offers to females.
- (3) Courtship gestures, in conformity with the student culture governing cross gender interactions.

It seems likely that a mix of all three motives was involved. Bicchieri (2006) argues that all forms of human interactions are governed by social norms, at least to some degree.

Third Round Female Responses

As we saw, all responders behaved in the same way regardless of gender or city in the first and second rounds. However, in the third round, the females clearly shifted the minimum acceptable offer upwards. Summary of the data evidence in this regards is as follows.

In the first and second round, there are $43/130 = 33$ percent and $46/130 = 35$ percent offers below 38 percent. Rejections are $29/130 = 22.3$ percent and $34/130 = 26$ percent respectively. In this respect, there is not much difference between rounds 1 and 2. However, the male offers show a substantial increase from 40 percent to 49 percent in going from round 2 to round 3. This leads to a total of only $9/130 = 7$ percent offers below 38. All 9 of these offers were rejected—the minimum acceptable offer for females is 40 percent in the third round. In rounds 1 and 2, 10 females accepted offers of 38 percent or less, so the higher level of rejection in round 3 is a clear response to the treatment.

Why did females raise their minimum acceptable offer to 40 percent? The simplest explanation is that low offers were viewed as discourteous, violating previously mentioned norms of chivalry. It is well known that social norms are maintained by punishing violators within communities [Bicchieri (2006)]. So any perceived violation of local cultural norms was punished by rejections, even at cost to self-interest.

Fourth Round Female Offers

In fourth round females were asked to make offers within same pair to males. Average offers increased from 38 percent in first two rounds to 43 percent. It is clear that female offers increased significantly due to the treatment. Qualitatively, the number of females who increased their offers ($105/130 = 81$ percent) is similar to the numbers of males who increased their offers ($114/130 = 88$ percent). Quantitatively, the magnitude of the increase by females is around 5 percent, which is significantly less than the 9 percent increase by males.

Due to experimental design we cannot differentiate between the following possible causes for the increase in the female offers in the fourth round:

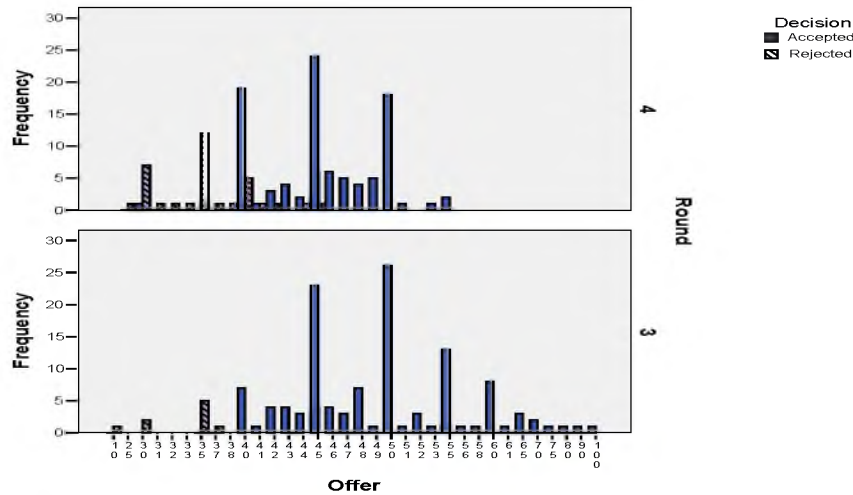
- Revelation of gender i.e. purely gender effect
- Effect of being face to face i.e. peer pressure
- Reciprocity just because of hyper fair offers in the third round as the pairs remained same for third and fourth round

While males made generous offers in the third round, they were not fully reciprocated by females on the fourth round. Razzaque (2009) mentions the most likely reason for the somewhat subdued response by females: high offers would be considered as forward and flirtatious behaviour, which is not socially acceptable within local cultural norms. Strong evidence for this is provided by the fact that there were 38 hyper fair offers by men, but only 4 hyper fair responses by females. All of the four female hyper fair responses were 55 percent, which is only slightly over the 50 percent boundary, while males offered 100 percent, 90 percent and similarly high proportions.

Fourth Round Male Responses

The acceptance/rejection behaviour by males in round 4 is shown in Figure 7. For comparison, this is super-imposed on top of the female acceptance/rejections in round 3. In general, the two pictures are similar. Overall, the males also increased their minimum acceptable offer to 40 percent, just like the females.¹ While females accepted all offers of 40 percent or above, among the males we find some rejections of offers between 40 percent and 45 percent. A total of 48 percent of offers lie in this area, 85 percent of these are accepted and only 15 percent are rejected.² In all such cases, the males made large offers (greater than 40 i.e., minimum accepted offers) and obviously expected reciprocation (this was also stated in post experiment interviews).

Fig. 7. Offers in Last Two Rounds



CONCLUSIONS

Overall, the goal of this article was to advocate the use of exploratory data analytic techniques, and graphical methods for obtaining an intuitive and visual understanding of

¹There is one exceptional case: an offer of 30 is accepted by the male. In the previous round the male offered 30 to the female and was rejected. The female made the same offer back, which was accepted by the male.

²Out of these 9 offers, 3 were hyper fair offers, one was fair offer. Three of these cases were very unique in the sense that last offers were within similar ranges and were accepted.

the data. As we have seen, these techniques provide a lot of new insights into the data set for ultimatum and gender previously handled by Razzaque (2009) using standard regression techniques, and formal statistical methods.

Some of the key new findings were that there is a strong effect of urbanisation—probably related to ease and comfort of cross-gender interactions on campus. The earlier finding of Razzaque (2009) that men are more generous than women is called into question; this behaviour is restricted to cross gender interactions in small cities, and may not generalise to the population as a whole. There is strong evidence of reciprocity, and strong gender effects of different types, which have been discussed in detail earlier.

Because samples were small and non-random, and there were many untreated confounding factors, none of these results can be taken as conclusive. Indeed, this is one of the virtues of the exploratory data analysis techniques—it generates interesting hypotheses to explore in subsequent work. As we have seen, a number of hypotheses are generated by graphical analyses of the data. With a sharp hypothesis in hand and a pilot sample, it becomes possible to design a more scientific study with a randomised sample of planned size and careful controls for potential confounders. The confirmatory data analysis techniques which are studied in conventional econometrics courses are much better adapted to deal with such studies, as opposed to observational studies of the type done by Razzaque (2009).

APPENDIX

Table 1

Comparison of Male Offers during First Two Rounds

C12	N	Mean	SE	StDev	Min	Q1	Med	Q3	Max
Ghizer R1	15	40.8	0.7	2.65	35	40	41	42	45
Ghizer R2	15	40.5	1.9	7.37	30	35	40	50	50
Kharan R1	15	41.6	0.7	2.77	35	40	42	43	45
Kharan R2	15	41.3	1.9	7.43	30	35	40	50	50
Lahore R1	5	39.0	4.0	8.94	30	30	40	47.5	50
Lahore R2	5	52.0	2.5	5.70	45	47.5	50	57.5	60
Nawab Shah R1	15	39.3	2.1	8.27	25	30	41	46	51
Nawab Shah R2	15	39.4	2.0	7.80	28	31	43	46	50
Rawala Kot R1	15	40.8	0.7	2.65	35	40	41	42	45
Rawala Kot R2	15	40.5	1.9	7.37	30	35	40	50	50

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