What Limits Emotional Escalation? – Varying Threat Power in an Ultimatum Experiment ⋆

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Abstract

Threat power is the ability to impose a great loss on someone else at relatively low own cost and can be measured by the ratio of other's and own loss. It can be varied by assuming that rejecting an ultimatum reduces the payoff of the proposer to its λ–share and that of the responder to its $(1-\lambda)$–share where $0 \leq \lambda \leq 1$. Results demonstrate that proposers become more greedy when λ is high whereas responders adjust to threat power, but punish greed to a high extent irrespective of own rejection cost.

Keywords: Bargaining, Fairness, Punishment, Emotions, Threat Power

JEL-classification: C78, C91

1 Introduction

Behavior in experiments is often described by illustrating how it differs from rationality (see, e.g. Thaler, 1988, who refers to such discrepancies as anomalies). Situations in which (commonly known) rationality fails to predict actual behavior are typically those where rational behavior would trigger strong emotions. There is, however, also experimental evidence showing that emotional reactions are rather unusual when their "cost–benefit relation" is unfavorable. What this suggests is that an emotional impulse has to pass an acceptability

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filter before it becomes active. Imagine a situation where someone wants to buy a house she really likes. As a buyer she might be upset by a sales price proposal that is far too high. Before turning away angrily, though, she may reconsider whether to risk missing such a chance. Thus, it seems that emotions are filtered before leading to action.

In ultimatum experiments (see Roth, 1995, for a survey) unfair offers often inspire a desire for revenge and rejection (see Kagel et al., 1996, for a study with a particularly high rejection rate). Related evidence is found in Stackelberg market experiments – when first movers sell too much, second movers sell more than their best reply (see Huck and Müller, 2000; Huck et al., 2001). In equal punishment experiments where responders can impose the same fine on both, proposer and responder, threat power is low, however. Ahlert et al. (2002) observed only small fines which nearly vanished in the repetition.

This suggests that threat power is crucial: responders only punish when they can seriously hurt the proposer at relatively low own cost. If proposers anticipate this behavior, they should refrain from low offers in case of substantial threat power.

Let X be the proposer and Y be the responder. Play starts with X's proposal (x, y), with $x, y \geq 0$ and $x + y = 1$, how to divide the unit pie between X and Y. If Y accepts the proposal, X receives his demand x and Y the offer y. If Y, rejects, however, the conflict payoff vector $(\lambda x, (1-\lambda)y)$ with $0 \leq \lambda \leq 1$ results.

To see how this fits into a larger class of ultimatum games assume that Y's veto results in the conflict payoff vector $(\lambda x, \delta y)$ with $0 \leq \lambda, \delta \leq 1$. Whereas Suleiman (1996) and, subsequently, Güth and Kovacs (2002) concentrated on $\lambda = \delta$, yielding a continuous transition from the ultimatum ($\lambda = \delta = 0$) to the dictator game ($\lambda = \delta = 1$), we analyze the situations on the other diagonal $\delta = 1 - \lambda$ in the unit square of Figure 1.

Insert Figure 1 about here

The two polar cases on this $\delta = 1 - \lambda$–diagonal are the no–veto–cost game ($\lambda = 0$) with no punishing cost for Y, and the impunity game ($\lambda = 1$), experimentally studied earlier (Bolton et al., 1998; Güth and Huck, 1997).

In our experiment we only consider intermediate values of λ with $0 < \lambda < 1$ and allow only for unfair offers y in the range $0 < y < 1/2$. Given such restrictions, the relation

$$v(\lambda, y) = \frac{(1-\lambda)x}{\lambda y} = \frac{(1-\lambda)(1-y)}{\lambda y} = \frac{\text{X's cost of rejection}}{\text{Y's cost of rejection}} \qquad (1)$$

of losses due to a rejection by Y is always well–defined.[1] Y's threat power is higher, the lower the offer y and the smaller the λ–parameter, as can be seen by exploring its limits:

$$\lim v(\lambda, y) = \begin{cases} \to \infty & \text{for } y \to 0 \\ \to \frac{1-\lambda}{\lambda} & \text{for } y \to \frac{1}{2} \\ \to \infty & \text{for } \lambda \to 0 \\ \to 0 & \text{for } \lambda \to 1 \end{cases} \tag{2}$$

For the sake of more complete data, we employ the strategy method for both, proposers and responders, and restrict choices to the few (λ, y) constellations in Table 1[2]. By not allowing for a 'fair split', all offers should annoy responders.[3] This should guarantee emotional impulse which may, however, not always lead to rejection. According to Table 1 the loss ratio decreases with increasing λ and y. Particularly for $\lambda = \frac{5}{6}$ threat power is close to or smaller than one. Game theory (assuming common knowledge that players only care for own monetary payoffs) predicts that proposers will only choose the lowest possible offer ($y = \frac{1}{10}$), and that responders will accept all offers regardless of the λ–value, and thus completely neglects threat power.

Insert Table 1 about here

In contrast, we expect that responders do not mind relatively low costs for demonstrating their willingness to punish and will reject mainly when $v(\cdot)$ is large. Proposers should offer more when λ is low. Altogether, we expect higher offers y in case of lower λ–values *(Hypothesis 1)* and more willingness to reject offers with higher threat power $v(\cdot)$ *(Hypothesis 2)*.

2 Experimental setup

In the classroom experiment, altogether 98 students from two introductory courses in innovation economics at Friedrich Schiller University Jena volunteered for participation. Time requirement was 20 to 30 minutes, subjects earned on average 8.2 Euros ($SD = 4.31$).

[1] Yang et al. (2001) employ an equivalent measure, which they call punishment efficiency, to evaluate behavior in four different stick–and–carrot games.
[2] Since the unit pie is 120 ECU (experimental currency unit), the possible offers are 12, 30 and 48.
[3] One could also argue otherwise: unfairness is unintentional and unavoidable and could therefore be less upsetting.

After randomly assigning the roles of proposers and responders and reading the instructions, participants answered several control items to be checked privately by the experimenters. [4] In case of wrong answers, participants revised them until every control item was answered correctly.

Then, proposers X selected one of the three possible offers y (12, 30 or 48) for each value of λ. Responders Y decided for each of the nine possible combinations of parameter λ and offer y between acceptance and rejection. At the end of the experiment the value of λ was determined by throwing the dice. The thereby determined earnings followed from the strategies of each pair (the randomly matched proposer and responder participant). After one week subjects collected their earnings privately.

3 Proposer Behavior

The offer distribution for all three values of λ in Figure 2 provides a first overview. The modal offer is 12 except for the intermediate value of $\lambda = \frac{1}{2}$. [5] From Table 2 it is evident that, on average, the lowest possible offer of 12 was chosen most frequently (53.1%). For all values of λ many proposers offer the minimal possible amount of 12 – unlike in usual ultimatum experiments (e.g. see the survey of Roth, 1995). One reason might be that in our experiment equity was not possible: if unfairness is unavoidable, equity concerns seem to lose much of their influence (see also Güth et al., 2001).

Insert Figure 2 about here

We can nevertheless reject the hypothesis that offers do not depend on the parameter λ (χ^2 Goodness–of–fit test: ${\chi^2}_{df=4} = 29.6, p < .01$): Proposers adjust their offers strategically to λ. According to Hypothesis 1 an offer of 48 should be most frequent in case of $\lambda = \frac{1}{6}$, and an offer of 12 in case of $\lambda = \frac{5}{6}$, which is supported by evidence in Table 2.

Although, the frequency of 12–offers increases (44.9% to 77.6%) and the frequency of 48–offers decreases (34.7% to 14.3%) comparing $\lambda = \frac{1}{6}$ and $\lambda = \frac{5}{6}$, evidence for the intermediate value of λ is ambiguous: There are slightly less offers of 12 than in case of $\lambda = \frac{1}{6}$, and significantly more offers of 30 (Binomial test: $z = 2.76, p < .01$), contrary to our intuitive expectations. Remarkably, the majority of proposers (44.9%) offers the smallest amount when $\lambda = \frac{1}{6}$

[4] Instructions, control items and decision forms are available from the authors upon request.

[5] $\lambda = \frac{1}{2}$ is comparable to Suleiman's (1996) $\lambda = \delta = \frac{1}{2}$, who generally observes equal splits as modal behavior, and many fair offers when $\lambda = \delta \leq 0.5$. Although the modal offer in our experiment is never 48 (the closest to a fair offer), the modal offer of 30 for $\lambda = \frac{1}{2}$ remarkably parallels Suleiman's result.

in spite of the particularly high value of $v(\cdot)$. It seems that often the fear of rejection is too low to become prohibitive.

Insert Table 2 about here

On the individual level, we find that 22 proposers adjust their offers monotonically to λ, i.e., they reduce their offer as λ increases. Thirteen subjects react to the different λ–values in a non–monotonic way, 13 proposers act strategically with an offer of 12 irrespective of λ. Only one subject always offers 48.

Overall, proposers adjust their offers to different λ–values but mainly between the two 'extreme' cases of λ: Behavior shifts from less greedy (44.9% offers of 12 for $\lambda = \frac{1}{6}$) to more greedy (77.6% offers of 12 for $\lambda = \frac{5}{6}$) as λ increases and in turn switches from more generous (34.7% offers of 48 with $\lambda = \frac{1}{6}$) to less generous (14.3% offers of 48 with $\lambda = \frac{5}{6}$). This partly confirms our expectations that proposers react to Y's threat power $v(\cdot)$. Our intuition is, in question, however, due two other observations. First, the fraction of lowest offers is high even when threat power is high. Second, several proposers react non-monotonically leading to the ambiguous findings for $\lambda = \frac{1}{2}$.

4 Responder Behavior

The distribution of acceptance rates is displayed in Figure 3, whereas Table 3 shows the absolute and relative frequency of rejected offers. The highest rejection rate (51%) is due to the lowest λ–value and offers of 12 and 30. The fraction is considerably lower for offers of 48 but still substantial.[6] Rejection rates diminish for offers of 12 and 30 as λ increases. More generally, we find a significant positive correlation between rejection rates and threat power $v(\cdot)$ (Spearman's $\rho = .773, p = .02$), confirming that high threat power inspires emotional escalation. This result mirrors the finding of Yang et al. (2001) that using the 'stick' is positively correlated, whereas using the 'carrot' is negatively correlated to punishment efficiency.

Insert Figure 3 about here

As suggested by $v(\cdot)$, one expects higher rejection rates in the upper left region of Table 1, which is partially confirmed by the data: in case of $\lambda = \frac{1}{6}$ the lowest and the intermediate offer are turned down by a slight majority of responders which considerably exceeds the rejection quotas for all other combinations of λ and y. However, some of the remaining cells in Table 3 do not reflect the expected pattern: rejection rates do not always react monotonically to threat power $v(\cdot)$ as postulated.

[6] Although 48 is the best offer to receive, it is still not always accepted, probably because it is not yet an equal split.

Insert Table 3 about here

On the individual level, we can classify responders in four broad categories: Fourteen responders act strategically and accept all amounts irrespective of λ, whereas only one responder never accepts. Fourteen subjects respond monotonically, i.e. they adjust their acceptance threshold to λ. The remaining 20 subjects display non–monotonic behavior.

In summary, even a high λ–value does not prevent escalation after a low offer. This does not necessarily contradict our intuition that such emotions are filtered by considerations of threat power. If there is variety in emotional reactions, unfair offers may upset some responders more than others. How threat power affects behavior on the individual level is illustrated by the number of participants who accept all offers: it increases from n=20 for $\lambda = \frac{1}{6}$ to n=23 for $\lambda = \frac{1}{2}$ to n=27 for $\lambda = \frac{5}{6}$. Although Hypothesis 2 cannot be confirmed by corresponding cell–to–cell comparisons, there is strong evidence that (i) very unfair offers trigger negative emotions and rejections, and that (ii) these negative responses are strongly geared by the values of λ. If costs of rejection are high, escalation is less likely even though not entirely confirmatory for Hypothesis 2.

5 Discussion

To test how emotional response is affected by threat power we experimentally studied a one–parameter class of ultimatum games providing a smooth transition from the no–veto–cost game to the impunity game. Applying a between subjects design we examined proposer and responder behavior by comparing a low, intermediate and high λ–value and three more or less unfair offers y. The variation of λ and y resulted in different levels of threat power $v(\lambda, y)$ measured by the cost ratio of a rejection. We mainly confirmed our intuition that higher threat power or, respectively, a lower λ–value, triggers more rejections and, as expected by proposers, more generous offers.

Surprisingly, proposers frequently offer the lowest possible share which is – in contrast to previous studies – the modal offer. Restricting offers to amounts below the equal split seems to trigger particularly low offers: As one cannot be fair anyhow, even the lowest offer seems to be less bold. Responders, however, reject the lowest offer sufficiently often, to rendering it, on average, as unprofitable. Still, proposers anticipate threat power and choose the lowest offer less frequently when their own potential losses due to rejection are particularly high ($\lambda = \frac{1}{6}$). The main adjustments are due to the polar cases of λ: The frequency of high offers decreases and the frequency of low offers increases as λ increases from $\lambda = \frac{1}{6}$ to $\lambda = \frac{5}{6}$. Responders generally reveal quite high rejection rates even for the highest though still unfair offer. However, rejection rates are considerably lower for low threat power, indicating that responders strongly react to threat power $v(\cdot)$, even though the reaction is often not strictly monotonic.

Altogether, punishment and thus emotional response adjusts to threat power, which supports our basic hypothesis that negative emotions are filtered by an acceptability test before leading to escalation.

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Figure 1: Representation of the (λx, δy) conflict payoff vector

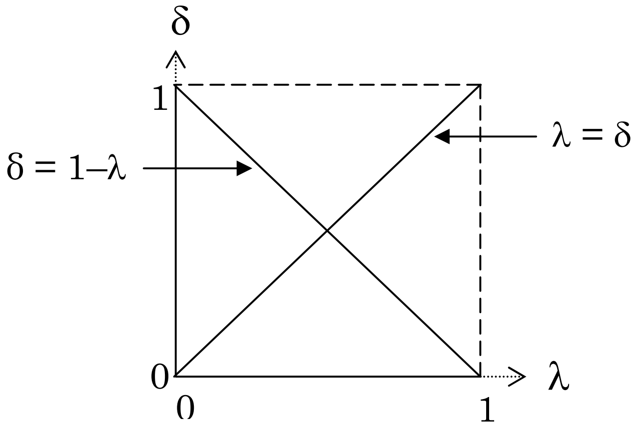

Figure 2: Offer distribution for all three values of λ

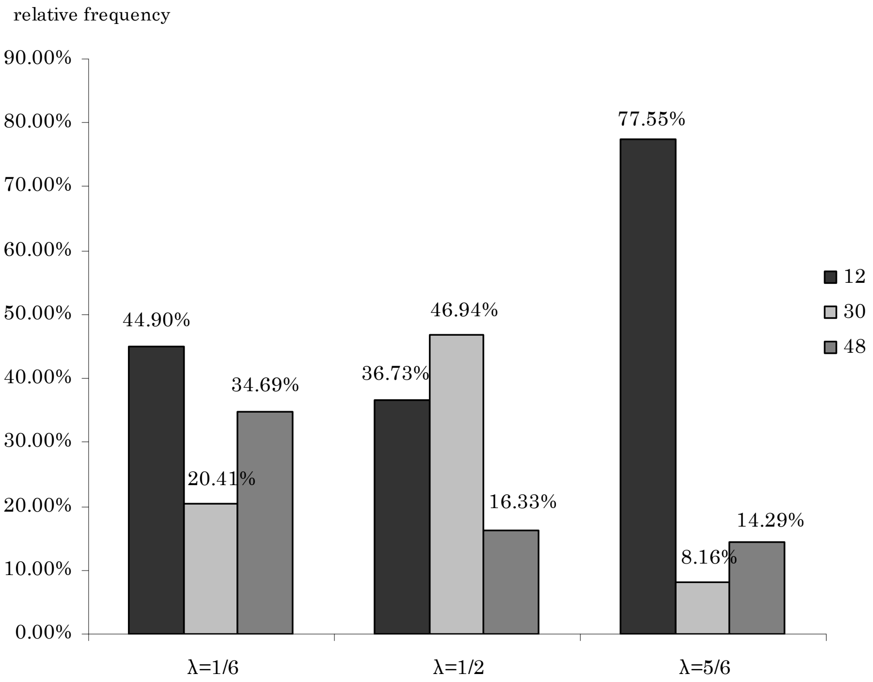

Figure 3: Acceptance rates of offers for all three values of λ

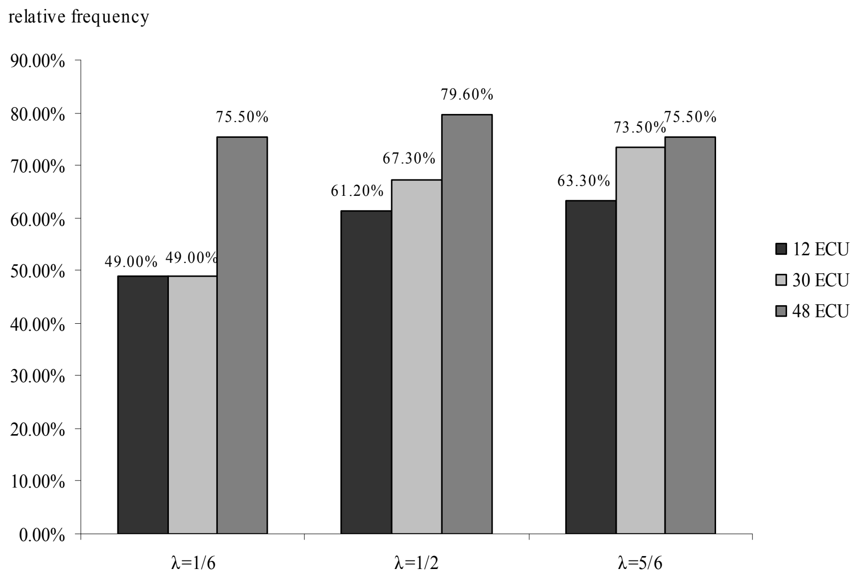

Table 1: All possible λ,y-constellations and corresponding values of threat efficiency v(λ, y)

	y = 1/10	y = 1/4	y = 4/10	average
$\lambda = 1/6$	45	15	7.5	22.5
$\lambda = 1/2$	9	3	1.5	4.5
$\lambda = 5/6$	1.8	0.6	0.3	0.9

Table 2: Absolute and relative frequencies of offers y for all λ-values

	y =12 ECU	y = 30 ECU	y = 48 ECU
$\lambda = 1/6$	22 (44.9%)	10 (20.4%)	17 (34.7%)
$\lambda = 1/2$	18 (36.7%)	23 (46.9%)	8 (16.3%)
$\lambda = 5/6$	38 (77.6%)	4 (8.2%)	7 (14.3%)
average	26 (53.1%)	12.33 (25.2%)	10.67 (21.8%)

Table 3: Absolute and relative frequencies of rejected offers y for all λ-values

	y =12 ECU	y = 30 ECU	y = 48 ECU
λ = 1/6	25 (51.0%)	25 (51.0%)	12 (24.5%)
λ = 1/2	19 (38.8%)	16 (32.7%)	10 (20.4%)
λ = 5/6	18 (36.7%)	13 (26.5%)	12 (24.5%)
average	20.67 (42.2%)	18 (36.7%)	11.33 (23.1%)