

# Emotions, Rejections, and Cooling off in the Ultimatum Game\*

Ronald Bosman<sup>a</sup>, Joep Sonnemans<sup>a</sup>, and Marcel Zeelenberg<sup>b</sup>

**This version: August 2001**

## Abstract

This paper experimentally investigates whether responder behavior in the ultimatum game is related to self-reported emotions. In addition, it is investigated whether responders' experienced emotions or behavior are affected by letting responders cool off for one-hour before they decide. Our results show that (negative) emotions drive the decision to reject an unfair offer. Furthermore, neither behavior nor self-reported emotions are affected by the break. These results show that emotions are robust in terms of their effect on decision making because they show up (again) when one actually has to make a decision.

Key words: emotions, rejection, cooling off, ultimatum game, experiment.

JEL-classification: A12, C72, C91, C92.

<sup>a</sup>CREED/Department of Economics  
University of Amsterdam  
Roetersstraat 11  
1018 WB Amsterdam  
The Netherlands  
E-mail1: bosman@fee.uva.nl  
E-mail2: joeps@fee.uva.nl

<sup>b</sup>Department of Economic and Social  
Psychology  
Tilburg University  
PO Box 90153  
5000-LE Tilburg  
The Netherlands  
E-mail3: m.zeelenberg@kub.nl

\*Comments of Nico Frijda in an early phase of this project are gratefully acknowledged. Furthermore, we thank Frans van Winden for useful suggestions and comments. We are also thankful for the useful comments we received from several colleagues at CREED.

## **1. Introduction**

In the last two decades emotions have become a major area of scientific study in psychology with, by now, a coherent body of theory and data. It appears that emotions play an important role in many psychological processes like, for example, learning, attention, and memory (Izard et al., 1984; Lewis & Haviland-Jones, 2000). Furthermore, research in the field of judgment and decision making shows that emotions may have an impact on what outcomes we prefer (for a review, see Schwartz, 2000). Not only do emotions shape our preferences (almost all human satisfaction comes in the form of emotional experiences), they also have the power to affect decision making itself (Elster, 1996, 1998). According to Loewenstein (2000) contemporary economists have left emotions out of their analyses because their influence is perceived as either transient or too unpredictable and complex to be amenable to formal modeling. However, recently there appears to be growing theoretical interest in the role of emotions on economic decision making. For example, Frank (1988) and Hirshleifer (1987) argue that emotions can be advantageous when dealing with commitment problems. Threats and promises can be credible if they are made by an (emotional) agent who is willing to disregard material self-interest in order to punish or reward others. Loewenstein (1996, 2000) argues that emotions systematically change preferences in ways not accounted for by economic theory and shows how we can deal with these changes in a more formal way. For example, he argues that emotions influence people's immediate behavior more than they think is normatively justified. Furthermore, people tend to underestimate the impact of future emotional factors on their own behavior and on the behavior of others ("hot-cold

empathy gap”). Caplin and Leahy (2001) show that anticipatory emotions may result in time inconsistency.

In our opinion a complex phenomenon as emotions can best be studied in a relatively simple and clean environment. For this purpose, we choose the well-known ultimatum game which is simple and, moreover, of economic interest. In the ultimatum game, two players bargain over an amount of money, commonly referred to as the “pie”. First, one player, the proposer, proposes how the pie is divided. Then the second player, the responder, either accepts or rejects the proposal. If the responder accepts, the pie is divided according to the proposal. If the responder rejects, both players end up with nothing. This game has been studied extensively in the economic laboratory and the results are robust.<sup>1</sup> Typically, the mean offer is 30-40% of the pie, the mode around 50%, and greedy offers (20% or less) are nearly always rejected.

The object of the present study is to investigate experimentally how emotions generate responder behavior in the ultimatum game.<sup>2</sup> Emotions (measured with self-reports) of the responders are hypothesized to be intermediate variables: they are caused by the offer of the divider and they explain the behavior of the responders. Our ‘basic treatment’ is the ultimatum game as it is commonly implemented. This basic treatment allows us to study whether (unfair) offers evoke emotions by the responder and whether these emotions influence rejection behavior. In the ‘cool off treatment’, the responder learns about the offer of the divider immediately but must make the decision whether or

---

<sup>1</sup> For reviews see Camerer & Thaler (1995), Güth & Tietz (1990), and Thaler (1988).

<sup>2</sup> Other experimental studies of emotions include Bosman & Riedl (2001; the impact of emotions on bidding behavior in a first-price sealed bid auction), Bosman & van Winden (forthcoming; the impact of emotions on retaliation in a power-to-take game), Bosman & van Winden (2001; global risk, effort, and investment), Offerman, (1998; self serving bias, reciprocity, and emotions), Pillutla & Murnighan (1996; emotional rejections in an ultimatum game, see also this section), Hennig-Schmidt (1999; emotional break-

not to accept this offer after a one hour break. The idea behind this treatment is the following. If the one-hour break were to lead to less intense experienced emotions and fewer rejections of unfair offers, the conclusion would be that although emotions apparently influence rejection behavior, the effect of emotions on decision making is not very robust and probably not very important in many real life economic decisions (where decisions can be postponed and may be less impulsive). However, if we were to find (what we actually did) that responders become *again* emotional after the one-hour break when they have to decide and that these emotions influence rejection behavior, we would have to conclude that the effect of emotions is quite robust and should be considered as a serious factor in economic decision making.

Virtually all models that explain ultimatum bargaining do not refer to emotions as a determinant of responder behavior at all. Generally, responder behavior is explained in terms of some social utility function that describes how the responder values the distribution of payoffs (e.g. Fehr & Schmidt, 1999; Bolton & Ockenfels, 2000). Although one may try to incorporate the impact of emotions by a modification of the utility function, much like Loomes & Sugden (1982, 1987) have done for the emotions regret and disappointment, important features of the phenomenon could be missed. For example, Elster (1998) argues that because emotions are of relatively brief duration they should be viewed as a short-term change of preference. In our view, a better understanding of the emotion process is helpful because it can guide theoreticians to incorporate emotions into formal models. In particular, we need to know how emotions generate behavior and whether their effects on behavior are robust with respect to time.

---

ups in group bargaining, see also this section), and Zeelenberg & Beattie (1997; who studied the effect of the anticipation of regret as well the experience of regret on the proposer's offer).

Although most empirical studies on the ultimatum game do not refer to emotions as a determinant of responder behavior there are a few studies related to our experiment that need to be mentioned. Pillutla & Murnighan (1996) investigate responder behavior in an ultimatum experiment where responders have an outside option that they would receive if they were to reject an offer. In this experiment, information about the pie size (responder either knows the pie size or not) and outside option (divider knows the outside option or not, and the responder is aware of what the divider knows) is manipulated. Pillutla & Murnighan find that responders reject more when dividers know the value of the outside option. Their explanation is that intentional low offers lead to wounded pride, feelings of anger, and, ultimately, spiteful behavior.<sup>3</sup> Related to this study is an ultimatum experiment by Blount (1995) where the offer to the responder is determined by either an interested party, a third neutral party or randomly by a computer. This study shows that intentional low offers lead to more rejections than randomly determined low offers. Finally, we mention an interesting video experiment by Hennig-Schmidt (1999), showing that emotions play a crucial role in breaking up group bargaining.

In short, the aim of the present paper is to study the relation between self-reported emotion and responder behavior in the ultimatum game. To investigate whether emotions and their effect on behavior are robust, we give responders the opportunity to cool off in a one-hour break. The organization of this paper is as follows. In section 2, we discuss

---

<sup>3</sup> This is the only study on the ultimatum game we are aware of where emotions were measured. The responders were asked to answer the open question “how do you feel?” Subsequently, two independent raters coded the responders’ answers on a 6-point scale for the emotion anger. Note that our measurement of emotions differs in two important ways (see also section 2). First, we ask responders directly to report the intensity of experienced anger by giving them a 7-point intensity scale. Second, we do not limit our measurement to anger only but measure other potentially relevant emotions as well. In addition, we measure responders’ expectations of the offer and relate them to the intensity of experienced emotions.

our research questions in more detail and present the experimental design. In section 3, the results are given. Section 4 summarizes and concludes.

## **2. Research questions and experimental design**

### *Research questions*

Before we discuss the research questions, we first highlight some important features of emotions (following Bosman & van Winden, forthcoming). Emotions arise when one evaluates an event as relevant for one's concerns or preferences. If concerns are promoted, positive emotions result. If concerns are damaged, negative emotions arise. Positive emotions, like joy or relief, are experienced as pleasurable whereas negative emotions, such as anger or sadness, are experienced as painful. Emotions thus have a direct hedonic impact (cf. Loewenstein, 1996). An important feature of emotions is that they are "cognitively impenetrable": one cannot choose to have or not have emotions, given certain stimuli or events that are relevant for one's concerns (Frijda, p.468). Another important feature is that emotion implies action tendency, which is the urge to execute a particular action (Frijda, 1986; Lazarus, 1991). Whether or not an action tendency results in action (for example approach or avoidance) depends on the so-called regulation phase where the consequences of executing an action tendency are evaluated. If, however, the intensity of an emotion is very strong it may surpass what Frijda calls "regulation thresholds" or "points of no return". Emotional intensity depends on factors such as the importance of the concern involved, the reality and proximity of the emotion eliciting event, the level of arousal, and the degree of unexpectedness.

In the ultimatum game, negative emotions, in particular of the anger type, can be expected when the responder is confronted with an unfair offer. Anger typically arises when one's concerns are damaged and another person can be held responsible for this. The action tendency of anger is to react against the person who can be held responsible. In the ultimatum game, the only reaction that is available to the responder is to reject the unfair offer. Our main research question is whether negative emotions (if so, which ones) are related to the decision to reject. In addition, we also investigate the relation between the offer and expected offer, and the intensity of experienced emotion.

Our next research question, which becomes particularly interesting if emotions are important for the decision to reject, is whether responders' experienced emotions and behavior are affected by letting them wait for one hour (cool off) before they decide. Because emotions are typically of short duration, one may expect them to be less strong when time passes. Responders may regulate their emotional experiences by evaluating the negative consequences of rejection. The result would be a lower propensity to reject unfair offers.

### *Experimental design*

The experiments were run in the CREED laboratory in Amsterdam. In total 76 subjects, almost all under graduate students from the University of Amsterdam, participated in the experiments. About 68% of the subjects were students of economics/econometrics. The other 32% were students from various fields such as chemistry, psychology, and planning. Subjects received a show-up fee of 5 Dutch guilders (approximately 2 U.S. dollars) that was independent of their earnings in the experiment. The amount of money

at stake in the ultimatum game was 20 Dutch guilders. On average, dividers earned 15 guilders and 75 cents while responders earned 11 guilders and 60 cents. The whole experiment took about 1 hour and 30 minutes (including the one-hour break in which subjects participated in another experiment).

Figure 1 shows the sequence of events in both treatments. Both treatments start with the divider and responder receiving instructions about the ultimatum game (a translation of the instructions can be found in the appendix). Then the divider decides on the proposal.<sup>4</sup> In the *basic* treatment, the offer is given to the responder after the break of one hour and the responder then must decide whether to accept or reject the offer. In the *cool off* treatment, the offer is immediately given to the responder (before the break). After the break, the responder must decide whether to accept or reject the offer.

[FIGURE 1]

In the break of both treatments, subjects participate in another individual decision making experiment that is unrelated to the ultimatum game.<sup>5</sup> Furthermore, responders are asked to fill out a questionnaire directly after they have made their decision. This questionnaire contains questions about expectations, experienced emotions, and background. Emotions are assessed by giving responders a list of nine emotion names.<sup>6</sup> They are asked to report

---

<sup>4</sup> Dividers in the basic treatment and the cool off treatment received the same instructions. They did not receive any information about the timing of responders' decisions. After making their proposal, they were told that at the end of the experiment they would learn whether their proposal had been accepted or not

<sup>5</sup> In this experiment it is investigated how subjects form price expectations without them having any knowledge of the underlying market equilibrium equations (for more details about this experiment, see Hommes et al., 2000). Because subjects earned money in the break, it is possible that cash balance influenced emotions after the break. In the next section we come back to this issue.

<sup>6</sup> Although assessing emotions with the help of self-reports may seem problematic to some economists, emotion theorists think it is a valuable method of measurement. According to Ortony, Clore, and Collins

the intensity of each emotion on a scale of 1 (no emotion) to 7 (high intensity). The following emotion names are included: fear, envy, anger, sadness, happiness, shame, irritation, contempt, and jealousy.<sup>7</sup> Note that the list not only includes the (negative) emotions that are likely to be important in our set-up. By giving the responders a variety of emotion names it is avoided that they are driven in a particular direction.

### 3. Results

#### *Behavior*

Table 1 shows the individual behavior of dividers and responders. The average offer to the responder is 6.9 (34.5% of the pie) in the basic treatment and 7.2 (36% of the pie) in the cool off treatment. In the basic treatment, three responders reject the offer and in the cool off treatment two offers are rejected. Furthermore, it appears that responders only reject offers that are equal to or lower than 5. The hypothesis that responder behavior is the same in both treatments cannot be rejected (Fisher exact test,  $p=0.632$ , two-sided).

[TABLE 1]

---

(1988, p. 9), quoted in Bosman & van Winden (forthcoming), “There is as yet no known objective measure that can conclusively establish that a person is experiencing some particular emotion, just as there is no known way of establishing that a person is experiencing some particular color. In practice, however, this does not normally constitute a problem because we are willing to treat people’s reports of their emotions as valid. Because emotions are subjective experiences, like the sensation of color or pain, people have direct access to them, so that if a person is experiencing fear, for example, that person cannot be mistaken about the fact that he or she is experiencing fear”.

<sup>7</sup> The order of emotion names here is the same as that in the questionnaire.

Because fair offers (10 or more) are nearly always accepted in the ultimatum game, it may be informative to consider unfair offers only. In that case the null hypothesis again cannot be rejected by using a Fisher exact test ( $p=0.306$ , two-sided).

[TABLE 2]

To further explore responder behavior, we pool the data and estimate a binary logit model with as dependent variable the decision of the responder (1=reject; otherwise 0) and as explanatory variable the offer. The result is given in table 2. It turns out that there is a significant negative relation between the offer and the probability of rejection. To investigate whether behavior differs between the treatments, we add a dummy (equal to 1 for the cool off treatment; otherwise 0) to the offer. It turns out that this dummy is not significant ( $p=0.89$ ). Furthermore, we have added an interaction term (offer\*dummy) to the offer which also turns out not to be significant ( $p=0.93$ ). Finally, it turns out that gender and the responder's expectation of the offer have no significant effect on the probability of rejection ( $p=0.14$ ). We summarize these findings in our first result.

*RESULT 1: There is a significant negative relation between the offer and the probability of rejection; there is no evidence of responder behavior being affected by the break*

### *Emotions*

Intensity scores of experienced emotions in the two treatments are shown in table 3. As can be seen from this table, negative emotions like anger, contempt, irritation, and envy

obtain a relatively high score. To investigate whether responders cool off during the break, we test whether the means of table 3 are different. It turns out that the null hypothesis cannot be rejected for any of the 9 emotions that we asked responders to report (Mann-Whitney test, two-sided,  $p > 0.10$ ). The next result bears this out.

[TABLE 3]

RESULT 2: *Responders do not appear to cool off since there is no significant evidence of self-reported emotions to be affected by the break.*

Because we neither find a difference in behavior nor in reported emotions when responders have the opportunity to cool off the data of both treatments are pooled in the analysis that follows.

[TABLE 4]

To further explore emotions, we have estimated an ordered logit model for each emotion separately, with as dependent variable the emotion score and as explanatory variable the offer. Table 4 shows the logit results. A significant negative relation between the offer and intensity is found for anger, contempt, irritation, envy, sadness, and jealousy. A significant positive relation is found for happiness. Furthermore, we look whether the responder's expectation of the offer has an effect on emotional intensity. To that purpose we compare each model in table 4 with a model that includes both the offer and the

expected offer. Interestingly, it turns out that the expected offer has predictive value for envy (coefficient=0.39,  $p=0.018$ ), anger (coefficient=0.44,  $p=0.012$ ), and irritation (coefficient=0.40,  $p=0.013$ ). Marginal significant results are obtained for sadness (coefficient=0.30,  $p=0.086$ ), contempt (coefficient=0.32,  $p=0.071$ ), and jealousy (-0.29,  $p=0.076$ ). It thus appears that expecting a high offer increases the intensity of experienced negative emotions (except for jealousy where the coefficient is negative). The next result summarizes these logit results.

*RESULT 3: The intensity of negative (positive) emotions is negatively (positively) related to the offer. In addition, the responder's expectation of the offer is positively related to the intensity of anger, irritation, and envy.*

Why are responders' expectations related to emotional intensity? There are two mechanisms that may play a role here. First, expectations can influence the intensity of emotion because of a 'surprise' effect (Ortony, et al., 1988, p. 60; Mellers, 2000). Second, expectations can be related to social norms, in particular fairness norms concerning the division of the pie (Kahneman, et al., 1986), that operate as a concern or goal to the responder. According to Frijda (1986, p. 311) norm violation is an important determinant of emotions of the anger type. Which of these two mechanisms is most important in the ultimatum game seems an interesting issue for future research.

Finally, we look whether the responder's earnings of the experiment in the break are related to experienced emotions. We compare each model in table 4 with a model that includes the earnings of the experiment in the break. Marginal significant results are

obtained for contempt (coefficient=-0.05,  $p=0.062$ ) only. Because the coefficient is small and only marginally significant, we conclude that the cash balance of the experiment in the break is not very important for the experienced emotions in our ultimatum game experiment.

Now that we have established a link between the offer and expected offer on the one hand and experienced negative emotions on the other hand, we investigate whether emotions are related to the decision to accept or reject the offer. We have estimated a binary logit model for each emotion separately. The dependent variable Reject equals 1 if a responder rejects an offer, and 0 otherwise. The regression results, shown in table 5, can be summarized as follows.

*RESULT 4: The probability of rejection depends positively on the intensity of anger, irritation, contempt, sadness, and envy.*

[TABLE 5]

An increase in anger, envy, sadness, irritation, or contempt significantly increases the probability of rejection. Note that happiness and jealousy are not significant. While these two emotions are related to the offer, they are not important for the decision to accept or reject an offer.

[TABLE 6]

Finally, we look whether responders who reject the offer differ in terms of the intensity of experienced emotions from responders who accept the offer. Table 6 shows the emotion scores for responders who reject and for responders who accept the offer. It turns out that those responders who reject experience significantly more anger, contempt, irritation, envy, and sadness than responders who accept (Mann-Whitney test,  $p < 0.05$ ).

#### **4. Summary and conclusion**

In this paper the influence of emotions on economic decision making is studied in the relatively simple environment of the ultimatum game. We found that the lesser the responder is offered, the stronger are negative emotions like anger, contempt, irritation, envy and sadness experienced by the responder. In addition, negative emotions are positively related to responders' expectations of the offer. Furthermore, it turns out that the intensity of negative emotions significantly increases the probability of rejecting an offer.

In the cool off treatment responders received the proposal of the divider before a one-hour break and could only react to the offer after the break. Neither experienced emotions nor behavior are affected by this break. Because during the break subjects participated in an individual decision making experiment that is unrelated to the ultimatum game, it is unlikely that responders constantly experienced intense emotions during the break. It seems more likely that they experienced the negative emotions *again* when they had to decide after the break. So, although emotions are typically of short duration, this result suggests that they are robust in terms of their effect on decision

making because they show up (again) when one actually has to make a decision. This result seems in line with one of Frijda's (1988) laws of emotions, saying that it is not time but repetition that softens emotions: "Time does not really soften emotions (...) Emotional events retain their power to elicit emotions indefinitely, unless counteracted by repetitive exposures that permit extinction or habituation, to the extent that these are possible (p.354)".

The observation that responders reject positive amounts of money in an ultimatum game, which is inconsistent with the standard model, has puzzled economists for many years. The explanations that have been offered in the recent literature assume that individuals are not only motivated by their own payoffs but also by considerations of fairness and equity (Bolton & Ockenfels, 2000; Fehr & Schmidt, 1999). The results of our study suggest that emotions are an important determinant of responder behavior, even when decisions are delayed (as may be the case in many economic decisions outside the laboratory). While generally these fairness/equity models are consistent with our finding that responders reject 'unfair' positive offers, other (potentially) important features of emotions are missed. For example, our results show that the responder's expectation of the offer matters for the intensity of experienced emotions.

In the context of bargaining, we see several directions for future research. First, to enhance validity, emotions could be measured in other ways than the use of self-reports (for example, by measuring facial expressions, heart rate, galvanic skin response, or hormonal patterns; cf Burnham, 1998 or Jakobs et al, 1999). Second, the role of expectations could be further explored. For example, it would be interesting to investigate whether the emotional response can be affected by manipulating these expectations (e.g.

give responders information about offers in previous experiments). This would shed some more light on whether expectations operate as a “surprise” effect on emotional intensity or whether they are related to norms that operate as a concern to the individual (see result 3). Third, features of the experimental situation can be changed such that emotions are more likely to arise without changing the economic (financial) context. For example, it is well known that the propensity of getting emotional is higher when people are tired and the (room) temperature is high (van Goozen et al., 1994).

## References

- Blount, S. (1995). “When Social Outcomes Aren’t Fair: the Effect of Causal Attributions on Preferences”, *Organizational Behavior and Human Decision Processes*, 63, 131-44.
- Bolton, G. & A. Ockenfels (2000). “ERC: A Theory of Equity, Reciprocity and Competition”, *American Economic Review*, 90, 166-93.
- Bosman, R. & A. Riedl (2001). “Emotions and economic shocks in a first-price sealed bid auction experiment”, working paper, University of Amsterdam.
- Bosman, R. & F. van Winden (forthcoming). “Emotional hazard in a power-to-take game experiment, *Economic Journal*.
- Burnham, T. (1998). “Testosterone and Negotiations”, working paper, John F. Kennedy School of Government, Harvard University.

- Camerer, C. & R. Thaler (1995). "Ultimatum, Dictators, and Manners", *Journal of Economic Perspectives*, 9, 209-19.
- Caplin, A. & J. Leahy (2001). Psychological expected utility theory and anticipatory feelings. *Quarterly Journal of Economics* CXVI, 55-81.
- Damasio, A. (1994). *Descartes' Error: Emotion, Reason, and the Human Brain*, Putnam, New York.
- Dufwenberg, M. & G. Kirchsteiger (1998). "A Theory of Sequential Reciprocity", working paper, CentER, Tilburg University.
- Elster, J. (1996). "Rationality and The Emotions", *The Economic Journal*, 106, 1386-97.
- Elster, J. (1998). "Emotions and Economic Theory", *Journal of Economic Literature*, 36, 47-74.
- Fehr, E. & K.M. Schmidt (1999). "A Theory of Fairness, Competition, and Cooperation", *Quarterly Journal of Economics*, 114, 817-68.
- Frank, R.H. (1988). *Passion Within Reason*, W.W. Norton & Company, New York.
- Frijda, N. (1986). *The Emotions*, Cambridge University Press.
- Frijda, N. (1988). "The Laws of Emotion", *American Psychologist*, 5, 349-58.
- Van Goozen, S, N. Frijda, M. Kindt & N. Van de Poll (1994). "Anger proneness in women", *Aggressive Behavior*, 20, 79-100.
- Güth, W. (1995). "On ultimatum bargaining experiments- A personal view", *Journal of Economic Behavior and Organization*, 27, 329-44.
- Hennig-Schmidt, H. (1999). *Bargaining in a Video Experiment: Determinants of Boundedly Rational Behavior*, Springer-Verlag, New York, 1999.

- Hirshleifer, J. (1987). "On Emotions as Guarantors of Threats and Promises", In Dupré, J. (ed) (1987). *Latest on the Best: Essays on Evolution and Optimality*, MIT Press, Cambridge.
- Hoffmann, E., McCabe, & V. Smith (1996). "On Expectations and the Monetary Stakes in Ultimatum Games", *International Journal of Game Theory*, 25, 289-301.
- Hommes, C., Sonnemans, J., & H. van de Velden (2000). "Expectation formation in a cobweb economy: some one person experiments", In Gatti, D.D., Gallegati, M., and A. Kirman (eds) (2000). *Interaction and Market Structure*, Berlin: Springer.
- Izard, C.E., Kagan, J. & R.B. Zajonc (eds) (1984). *Emotions, Cognitions, and Behavior*, Cambridge University Press, Cambridge.
- Jakobs, E., Manstead, A.S.R. and A.H. Fischer (1999). "Social Motives and Emotional Feelings as Determinants of Facial Displays: The Case of Smiling", *Personality and Social Psychology Bulletin*, 25, 424-35.
- Kahneman, D., Knetsch, J.L., & R. Thaler (1986). "Fairness as a Constraint on Profit Seeking: Entitlement in the Market", *American Economic Review*, 76, 728-41.
- Lazarus, R.S. (1991). *Emotion and Adaptation*, Oxford University Press, New York.
- Lewis, M. & J.M. Haviland-Jones (2000). *Handbook of Emotions*, 2<sup>nd</sup> Edition. New York: Guilford.
- Loewenstein, G. (1996). "Out of Control: Visceral Influences on Behavior", *Organizational behavior and Human decision Processes*, 65, 272-92
- Loewenstein, G. (2000). "Emotions in Economic Theory and Economic Behavior", *American Economic Review, Papers and Proceedings*, 90, 426-32.

- Loomes, G., & R. Sugden (1982). "Regret Theory: An alternative theory of rational choice under uncertainty", *Economic Journal*, 92, 805-24.
- Loomes, G., & R. Sugden (1987). "Testing for regret and disappointment in choice under uncertainty", *Economic Journal*, 97, 118-29.
- Mellers, B.A. (2000). "Choice and the relative pleasure of consequences," *Psychological Bulletin*, 126, 910-24.
- Offerman, T. (1998). "Hurting hurts more than helping helps: the role of the self serving bias", working paper, University of Amsterdam.
- Ortony, A., Clore, G.L. & A. Collins (1988). *The Cognitive Structure of Emotions*, Cambridge University Press, Cambridge.
- Picard, R. (1997). *Affective Computing*, The MIT Press, Cambridge.
- Pillutla, M.M. & J.K. Murnighan (1996). "Unfairness, Anger, and Spite: Emotional Rejections of Ultimatum Offers", *Organizational Behavior and Human Decision Processes*, 68, 208-24.
- Rabin, M. (1993). "Incorporating Fairness into Game Theory and Economics, *American Economic Review*, 83, 1281-1302.
- Roth, A.E. & F. Schoumaker (1983). "Expectations and Reputations in Bargaining: An Experimental Study", *American Economic Review*, 73, 362-72.
- Schwarz, N. (2000). "Emotion, Cognition and Decision Making", *Cognition and Emotion*, 14, 433-40.
- Slonim, R. & A. E. Roth (1998). "Learning in High Stakes Ultimatum Games: An Experimental Study in the Slovak Republic", *Econometrica*, 66, 569-96.

Zeelenberg, M. & J. Beattie (1997). "Consequences of regret aversion: 2. Additional evidence for effects of feedback on decision making", *Organizational Behavior and Human Decision Processes*, 72, 63-78.

**Basic treatment:** Responder decides immediately after receiving offer

Dividers	Instructions	Proposal	Break (1 hour)			Payment
Responders	Instructions		Break (1 hour)	Receive proposal	Decision to accept or reject	Payment

**Cool off treatment:** One-hour delay between receiving offer and making the decision to accept or not

Dividers	Instructions	Proposal		Break (1 hour)		Payment
Responders	Instructions		Receive proposal	Break (1 hour)	Decision to accept or reject	Payment

Note: In the break subjects participated in an individual decision making experiment that was unrelated to the ultimatum game experiment.

Figure 1: *The sequence of events in the basic and cool off treatment.*

Table 1: *Summary of individual behavior*

Basic Treatment (16 pairs)		Cool Off Treatment (22 pairs)	
Offer	Accept	Offer	Accept
1	no	3	yes
3	no	5	no
5	no	5	no
5	yes	5	yes
5	yes	5	yes
5	yes	5	yes
5	yes	6	yes
7	yes	7	yes
7	yes	7	yes
8	yes	7.5	yes
10	yes	7.5	yes
10	yes	8	yes
10	yes	8	yes
10	yes	8	yes
10	yes	8	yes
10	yes	8	yes
		8	yes
		8	yes
		9	yes
		9	yes
		10	yes
		10	yes
		10	yes

Note: All offers are in Dutch guilders; the pie equals 20 guilders in both treatments.

Table 2: *Relationship between rejection and offer*

Dependent Variable	Explanatory Variable	Coefficient	Constant	Chi-square
Reject (0 or 1)	Offer	-1.10*	4.26	13.08**

Note: Binary logit estimate. The logit function is  $f(x)=1/[1 + \exp-(a +bx)]$ ; n=38; \*p<0.05;\*\*p<0.01

Table 3: *Intensity scores of experienced emotions of responders*

Emotion	Basic Treatment (n=16)		Cool off treatment (n=22)	
	mean	stand. dev.	mean	stand. dev.
Fear	1.31	0.70	1.90	1.55
Envy	2.67	2.15	3.05	1.77
Anger	2.75	2.29	3.10	2.17
Sadness	2.00	1.86	2.19	1.63
Happiness	2.75	1.77	2.48	1.75
Shame	1.38	1.02	1.50	1.06
Irritation	2.75	2.46	2.95	2.01
Contempt	2.73	2.52	2.55	1.74
Jealousy	2.06	1.73	2.95	2.15

Note: The intensity scale ranges from 1 (no emotion) to 7 (high intensity)

Table 4: *Relationship between intensity of emotion and the offer (data of both treatments pooled)*

Dependent Variable	Explanatory Variable	Coefficient	P-value	Chi-square
Fear	Offer	0.042	0.791	0.07
Envy	Offer	-0.511	0.001	13.18**
Anger	Offer	-0.447	0.002	10.40**
Sadness	Offer	-0.693	0.000	18.01**
Happiness	Offer	0.621	0.001	14.95**
Shame	Offer	-0.135	0.421	0.65
Irritation	Offer	-0.564	0.000	15.86**
Contempt	Offer	-0.548	0.000	14.37**
Jealousy	Offer	-0.358	0.018	6.34*

Note: Ordered logit estimates for each emotion; n=38; \*p<0.05; \*\*p<0.01

Table 5: *Relationship between rejection and intensity of emotion*

Dependent Variable	Explanatory Variable	Coefficient	Constant	Chi-square
Reject (0 or 1)	Fear	0.101	-2.03	0.08
Reject (0 or 1)	Envy	0.720	-4.592	6.98**
Reject (0 or 1)	Anger	0.649	-4.481	7.27**
Reject (0 or 1)	Sadness	0.612	-3.543	5.89**
Reject (0 or 1)	Happiness	-0.539	-0.730	2.32
Reject (0 or 1)	Shame	0.150	-2.113	0.12
Reject (0 or 1)	Irritation	0.678	-4.631	8.60**
Reject (0 or 1)	Contempt	0.695	-4.398	8.44**
Reject (0 or 1)	Jealousy	-0.123	-1.591	0.22

Note: Binary logit estimates for each emotion. The logit function is  $f(x)=1/[1 + \exp-(a +bx)]$ ; n=38; \*p<0.05; \*\*p<0.01

Table 6: *Intensity scores of experienced emotions of responders who reject and accept*

<i>Emotion</i>	<i>Responders who reject (n=5)</i>		<i>Responders who accept (n=33)</i>	
	mean	stand. dev.	mean	stand. dev.
Fear	1.80	1.30	1.63	1.29
Envy*	5.00	1.41	2.56	1.79
Anger*	5.40	1.14	2.56	2.08
Sadness*	4.00	1.87	1.81	1.51
Happiness	1.60	0.89	2.75	1.80
Shame	1.60	1.34	1.42	1.00
Irritation*	5.60	1.52	2.45	1.97
Contempt*	5.20	1.30	2.22	1.86
Jealousy	2.20	1.79	2.63	2.06

Note: The intensity scale ranges from 1(no emotion) to 7 (high intensity); pooled emotion scores of both treatments; Emotion that are indicated by an asterisk are significantly higher for those who reject than for those who accept.

## **Appendix: Instructions ultimatum game**

(translated from Dutch)

### **Instructions responders**

In this experiment all participants are divided into pairs. The experimenter provides a fixed amount of money a single time that must be divided between you and another participant of the experiment. In the experiment you are ‘participant B’ and the other participant ‘participant A’. The fact that you are participant B was determined randomly (by picking a card in the reception room).

The amount that must be divided between you and participant B is 20 guilders. The money is divided according to some procedure that consists of two phases. It is not possible to communicate with participant A during this procedure. Dividing the money is done anonymously.

#### *Phase 1*

In the first phase participant A proposes to you how the 20 guilders are to be divided between you and participant A. Participant A is free to propose any possible division of the 20 guilders.

#### *Phase 2*

In the second phase you learn about the proposal of participant A. You must decide whether to accept or reject the proposal. If you accept the proposal, the 20 guilders will be divided according to the proposal. The division procedure is finished and the experiment ends. If you reject the proposal, participant A does not receive anything. In that case you also do not receive anything. The division procedure is finished and the experiment ends.

#### *Example*

We will illustrate the division procedure with the help of an example. Suppose participant A makes the following proposal: 10 guilders for participant A and 10 guilders for participant B. If participant B accepts this proposal, then participant A and B both receive 10 guilders. The division procedure is now finished and the experiment ends. If participant B rejects the proposal, then participant A does not receive anything. In that case participant B does not receive anything too. The division procedure is now finished and the experiment ends.

#### *Announcement in the Basic Treatment*

You have read the instructions of this experiment. You are about to participate in another experiment that is planned for today. When that experiment ends, the division experiment of which you have read the instructions will start.

### *Announcement in the Cool off Treatment*

You have read the instructions of this experiment. You are about to learn the proposal of participant A whom you are paired with. After learning about this proposal, you will participate in another experiment that is planned for today. When that experiment ends, the division experiment will continue.

### **Instructions dividers**

In this experiment all participants are divided into pairs. You participate in an economic negotiation a single time. There are two negotiators: negotiator A and negotiator B. In this experiment you are negotiator A and your opponent negotiator B.

The negotiation consists of dividing an amount of 20 guilders that is provided by the experimenter. The negotiation consists of two phases.

### *Phase 1*

In the first phase you (negotiator A) proposes to negotiator B how the 20 guilders are to be divided between you and negotiator B. You can make a proposal only once. In your proposal any possible division of the 20 guilders is allowed. Note that the amount allocated to yourself and the amount allocated to your opponent sums up to 20 guilders. For example, if you allocate 19 guilders to yourself, then the remaining guilder is allocated to your opponent. If you allocate 17 guilders to yourself, then the remaining 3 guilders are allocated to your opponent

### *Phase 2*

In the second phase negotiator B learns about your proposal and must decide whether to accept or reject the proposal. If negotiator B accepts your proposal, the 20 guilders will be divided according to the proposal. The negotiation is finished and the experiment ends. If negotiator B rejects the proposal, then you and negotiator B both do not receive anything. The negotiation is finished and the experiment ends.

### *Example*

We will illustrate the negotiation with the help of an example. Suppose negotiator A makes the following proposal: 18 guilders for negotiator A and 2 guilders for negotiator B. If negotiator B rejects this proposal, he or she does not receive anything. In that case negotiator A does not receive anything too. The negotiation is now finished and the experiment ends. If negotiator B accept the proposal, then negotiator B receives 2 guilders and negotiator 18 guilders. The negotiation is now finished and the experiment ends.

### *Anonymity*

Anonymity is guaranteed in this experiment. You do not know who is negotiator B and negotiator B does not know who you are. After this experiment and the other experiment in which you participate are finished, all participants will be paid in a separate room one by one. Other participants do not know your earnings in the experiments.

*Announcement (Basic and Cool off Treatment)*

You have read the instructions of this experiment. You must now make a proposal to negotiator B. You do this with the help of the form that you received together with the instructions. On the form you indicate how the 20 guilders are to be divided. At the end of the experiment you will learn whether your opponent has accepted or rejected the proposal.