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THE BEHAVIORAL IMPACT OF EMOTIONS IN A POWER-TO-TAKE GAME: AN EXPERIMENTAL STUDY

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Abstract

The power-to-take game is a simple two player game where players are randomly divided into pairs consisting of a take authority and responder. Both players in each pair have earned an income in an individual real effort decision-making experiment preceding the take game. The game consists of two stages. In the first stage, the take authority decides how much of the earned income of the responder that is left after the second stage will be transferred to the take authority (the so-called take rate). In the second stage, the responder can punish the take authority by destroying (part of) his or her earned income. In this experimental study, we are primarily interested in how emotions influence responder behavior. Our findings are the following. (1) A higher take rate significantly increases the intensity of irritation, contempt, and envy, and significantly decreases the intensity of joy and happiness. Since negative emotions are experienced as painful, there is direct hedonic impact. (2) Irritation and contempt drive punishment behavior. (3) There are discontinuous "jumps" in the behavior of responders. They either choose no punishment (destroy nothing) or the highest level of punishment (destroy everything). (4) Expectations have a significant effect on the probability of punishment but not on the intensity of experienced emotion. This last result is explained in terms of norm-related regulation of emotions.

Keywords: Emotions, punishment, expectations, social norms, experiment

JEL Classification: A12, C72, C91, C92

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1. Introduction

Many people would agree that emotions play a very important role in the decisions they make. Extensive research by psychologists over the last two decades has provided a lot of supportive evidence. It appears that emotions play a significant role in matters like attention, learning, and memory (Izard et al., 1984). Recent neuroscientific research even suggests that emotions are essential for rational decision making (Damasio, 1994; Picard, 1997). If emotions play such an important role in psychological processes, they are also likely to be relevant for understanding economic decision making. Frank (1988) argues that emotions are relevant for economics because they can help us solve important commitment problems. He shows, for example, that players endowed with the emotion guilt can sustain the cooperative outcome of a prisoner's dilemma game.[1] Other recent economic studies focus on the effects of emotions on preferences (Hirshleifer, 1987; Loewenstein, 1996) or on the implications for rationality (Elster, 1996, 1998). However, as yet little work has been done to integrate emotion theory in economic research. Elster (1998) addresses this neglect and hypothesizes that it may have to do with the different explananda of psychology and economics: "Whereas economists mainly try to explain behavior, emotion theorists try to explain emotions. By and large, psychological studies of the emotions have not focused on how emotions generate behavior (p. 47)".

The object of this study is to investigate how emotions generate behavior in a laboratory experiment. As our vehicle of research we use a simple "power-to-take" game. Before this game is played and the subjects receive instructions about it, subjects have to earn an income (Y_i) by doing an individual real effort task on the computer. In the power-to-take game one subject can be considered as the "take authority" (with earned income Y_{take}) and the other subject as the "responder" (with earned income Y_{resp}). The game consists of two stages. In the first stage, the randomly chosen take authority decides on the so-called take rate $t \in [0,1]$, which is the part of the responder's income Y_{resp} left after the second stage that will be transferred to the take authority. In the second stage, the only action that the responder can take is to decide on $d \in [0,1]$, the part of Y_{resp} that will be destroyed. For the take authority the payoff of the game is thus equal to the transfer tdY_{resp}, generating a total earning out of the experiment of $Y_{take} + tdY_{resp}$. For the responder, the payoff equals $(1-t)dY_{resp}$, which also determines his or her total earnings out of the experiment. Note that in this game the responder can only destroy his or her own prior-to-the-take income (Y_{resp}) and not that of the take authority (Y_{take}). Furthermore, it follows that only if $t=d=0$ experimental earnings for both players will be equal to the income earned in the effort task; otherwise, the responder will always get less than Y_{resp}, whereas the take authority gets at least Y_{take}.

In this study we are primarily interested in how emotions influence responder behavior. Emotion theory and self-reports will be used as instruments. We believe that our design provides an

[1] Frank (1988) assumes that people give signals about their emotional commitments or dispositions (for example, via facial expression or the pitch of the voice) that are difficult to simulate. In his prisoner's dilemma model these signals are somewhat perturbed and players only know the probability of cooperation by another player.

interesting environment to study how emotions generate economic behavior. First, to study a complex issue like emotions, a simple experimental game is helpful as a starting point. The power-to-take game is very straightforward. For example, if the responder feels angry about the take authority, then (s)he can punish by destroying income. Punishment, however, is costly for the responder. An interesting feature of this game is that punishment is a continuous variable, since the responder can destroy any part of his or her own (prior-to-the-take) income. In this way it is possible to learn more about how subjects trade off emotional satisfaction of punishment against monetary gain.[2] Second, subjects have to work for their income in our experiment.[3] In most experimental studies endowments are simply given to subjects, like manna from heaven. If it takes effort to get an endowment, subjects are likely to take the game where this endowment is at stake more seriously.

Moreover, the power-to-take game is of economic interest in itself. The game models in a simple, abstract, but fundamental way situations where one agent can (potentially) appropriate part of the endowment (effort) of another agent. A first example that comes to mind concerns taxation. In fact, the game can be seen as an elementary version of the tax model of Aumann & Kurz (1977) (see also Gardner, 1981; Peck, 1986). The take authority can be regarded as a majority coalition (government) that by means of taxation can appropriate a part of the endowment of the minority (the responders). The minority can retaliate by destroying part of the endowment. In case the endowment stands for the returns on the supply of a production factor, "destruction of the endowment" could stand for a diminished supply of the factor. This would imply a new source of efficiency cost of taxation. Another situation resembling the power to take game is monopolistic pricing. In case of a monopoly, the monopolist first decides on how much to take from the surplus by setting the price. Subsequently, the buyer decides how much to buy, given the price chosen by the monopolist. If the buyer feels that the price is outrageous, an emotional response may induce the buyer to punish the monopolist by buying less than the rational "text book" buyer would do. A third important situation that we would like to mention concerns principal-agent relationships. The principal can be seen as the take authority who decides on the incentive scheme for the agent. The agent takes notice of the scheme and subsequently decides on his or her effort level. The agent may feel emotionally urged to punish the principal by choosing a low effort level, which is costly for the agent because it conflicts with the material incentives provided by the principal. These examples show that the power to take game is not only interesting to study from an emotional theoretic but also economic point of view.

Although a thorough analysis of the way economic behavior is influenced by emotions is

[2] The frequently studied ultimatum game, where emotions are likely to play a role as well, is less suited for this purpose. In this game punishment is a discrete choice since the responder can either reject (punish the proposer) or accept the ultimatum.

[3] This approach, where subjects earn money in a real effort task, is not entirely new. Van Dijk, Sonnemans & Van Winden (forthcoming) experimentally study how different payment schemes affect real effort in a similar task as used in this paper. In an experimental study of distributive preferences by Rutström & Williams (1997), subjects earn their endowments by solving a computerised version of the Tower of Hanoi problem. Burrows & Loomes (1994) compare bargaining behavior in a treatment where unequal endowments are the result of effort in the so-called Hash game with a treatment where unequal endowments are determined by chance.

lacking, there are a few experimental studies referring to emotions that should be mentioned. In these studies attention is mainly focused on the role of information and intentions in bargaining games. Pillutla & Murnighan (1996), for example, manipulate information about the cake size and outside option in an ultimatum game, and find that responders reject more when offerers 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. Related to this study is Blount (1995) who manipulates intentionality in an ultimatum game by letting a third neutral party make the offer or by using a computer that determines the offer randomly. 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 (1997), showing that emotions play a crucial role in breaking up group bargaining. The organization of the paper is as follows. In section 2 we present our research questions and the experimental design. The results are given in section 3, while section 4 follows with a discussion. Section 5 concludes.

2. Research questions and experimental design

Research questions

Before we discuss our research questions, we first shortly highlight some important features of emotions.[4] 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 fleeing, approaching, or attacking) depends on the so-called regulation phase where the consequences of executing an action tendency (for example revenge or ostracism) 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".

A responder who is faced with a positive take rate must make a tradeoff between the emotional satisfaction of punishment and the satisfaction of monetary gain. An important research question is how responders deal with these conflicting motivations. Two mechanisms of decision making are possible. First, the decision of the responder may be a compromise between these two competing motivations. In this case, the result (generally) would be an intermediate level of

[4] By now, the psychological literature on emotions is quite substantial and a number of general theories have emerged (Frijda, 1986; Lazarus, 1991; Ortony, Clore & Collins, 1988). In the discussion that follows we will focus on some important features of emotions on which there seems to be consensus in this literature.

punishment.[5] Second, the decision of the responder may be dictated by the stronger motivation. In that event, there is either no punishment (desire for money dictates) or full punishment (desire for punishment dictates). Using a metaphor, one may view the decision making of the responder as the outcome of an election with two competing parties. One party is in favor of punishment whereas the other favors income. Behavior of the responder can be seen as the policy resulting after the election. The first mechanism would then resemble a representative election system, and the second one a plurality system.[6] Our experimental design will enable us to discriminate between these two mechanisms of decision making. Other important research questions that we will address are: Which emotions are responsible for punishment?; What is the relationship between the intensity of experienced emotions and the take rate, on the one hand, and the destruction of income, on the other?; What effect does responder's expectation of the take rate have on his or her behavior?

Experimental design

In total 78 subjects, almost all undergraduate students from the University of Amsterdam, participated in the experiment. About half of the subjects (55%) were students of economics. The other half were students from various fields such as chemistry, mathematics, law, planning, and psychology. About 40% of the subjects had participated in an economic experiment, different from this one, before. We framed the take game as neutral as possible, avoiding any suggestive terms like take authority (a translation of the instructions is provided in the appendix). Subjects received a show-up fee of 15 guilders (approximately $ 7.5), independent of their earnings in the experiment. On average, subjects received 28.50 guilders in total. The whole experiment took about one hour and 45 minutes.

Before subjects played the one-shot take game, they first had to participate in an individual two-variable optimization task on the computer for 30 minutes.[7] This task consists of 10 periods, where in each period subjects have to search for a maximum value. This maximum, which varies over the periods, can be imagined as the top of a mountain. The payoff for a period is related to the position on the mountain at the end of the period, with a maximum of 1 guilder and 50 cent. The task was set up such that most subjects were able to find the maximum value within the time limit of three minutes. A pilot experiment suggested that subjects indeed perceive this task as a form of work.[8]

After subjects had completed the computer task, they were randomly divided into two groups. One group was referred to as participants A (the take authorities) and the other as participants B (the responders). Then the instructions for the take game were read, followed by two individual exercises

[5] In economic terms, this compromise entails an outcome where the marginal rate of substitution between punishment and income (or other consumption) equals the price ratio. Note that the price ratio depends on the take rate. If, for example, the take rate is 50 %, then taking a dollar away from the take authority will cost the responder exactly one dollar in which case the price ratio is equal to one.

[6] Emotion theory predicts that the strongest motivation will dictate the outcome (Frijda, personal communication; Tesser & Achee, 1994).

[7] See Van Dijk, Sonnemans, & Van Winden (1998).

[8] Subjects indicated that they experienced the task as rather neutral, in the sense that it was neither very exciting nor very boring, neither very difficult nor very easy, and neither very pleasant nor very unpleasant.

on the computer to check subjects' understanding of the procedures. After these exercises, random pairs of a responder and take authority were formed by letting take authorities draw a coded envelope from a box. The envelope contained a form on which the earnings of a responder from the real effort task were stated. The take authorities then had to fill in a take rate as well as their own earnings, and put the form back in the envelope again. Subsequently, the envelopes were brought to the matched responders who filled in the part of their earnings to be destroyed. The envelopes containing the forms were then returned to the take authorities for their information. Then, we asked subjects to fill out a questionnaire with questions concerning expectations, motivations, and emotions.[9] When subjects completed the questionnaires, the envelopes were again collected and brought to the cashier, who paid out the subjects in private. It is noted that the experimenters were not able to see what decisions subjects made in the take game and how much they earned. Subjects were privately paid outside the laboratory by the cashier who was not present during the experiment. We have chosen for this double blind procedure in order to minimize any possible distortions of subject behavior due to experimenter observation.[10]

We now briefly discuss how we measured emotions. To assess the emotions responders experienced when they learned about the decision of the take authority, we gave them a list of eleven emotion names and ask them to report the intensity of each emotion on a 7-point scale, ranging from "no emotion at all" to "high intensity of the emotion". The list included the following emotions: Irritation, anger, contempt, envy, jealousy, sadness, joy, happiness, shame, fear, and surprise. Note that the list not only includes the (negative) emotions that one may expect to be relevant in our setting. Both positive and negative emotions are included, in order to avoid that subjects are 'pushed' in a particular direction.

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 (1988, p. 9), for example, "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

[9] We trust that the information provided by these questionnaires is reliable. Psychologists claim that "subjects have no special reason to disguise their true preferences" (Kahneman & Tversky, 1979). Another concern that readers may have is the lack of financial incentives for reporting expectations truthfully. There is, however, evidence that providing financial incentives for probability estimates does not change the data much: " When one examines subjects' choices and decisions the observed effects of financial incentives were with one exception not dramatic. Subjects with financial incentives appeared to perform somewhat better than their counterparts without such incentives, but the differences were not great, were generally not statistically significant and did not hold in every case" (Grether, 1992, p.54). We will return to these issues later on in the text.

[10] In our take game, for example, subjects may be concerned about being judged as greedy or vengeful by the experimenter. Bolton & Zwick (1995) tested whether a double blind procedure affects behavior in an ultimatum game and concluded that "the small distortion of subject behavior that may be attributed to experimenter observation is not decisive in the sense that the basic character of the data is unchanged when the distortion is filtered out" (p. 113-14). On the other hand, Hoffman et al (1994) found that in a dictator game double blindness does matter, leading to more greedy behavior of the dictator.

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".

3. Results

The individual data are presented in table 1. Concerning the amount responders and take authorities earned in the real effort task that preceded the take game, it turns out that most of the time paired subjects had exactly the same earnings at the start of the take game, and in any case the income of the take authorities was at least as high as that of the responders. As can be observed from this table, take authorities chose considerable take rates. The mean take rate is 58.5, the median 66.7, and the mode 70.0. Furthermore, it appears that eight (21%) of the 39 responders destroyed income. The extent to which they chose to do so leads to our first substantive result.

Table 1: Summary of individual data

Case (#)	Y_{take}	Y_{resp}	t (%)	d (%)	Case (#)	Y_{take}	Y_{resp}	t (%)	d (%)
1	15	15	0	0	21	15	15	70	0
2	15	15	0	0	22	15	15	70	0
3	15	12	0	0	23	15	15	70	0
4	15	13.5	25	0	24	15	13.5	70	30
5	15	15	30	0	25	15	15	70	0
6	15	15	30	0	26	15	15	70	0
7	15	15	30	0	27	15	15	70	0
8	15	15	35	0	28	15	15	70	100
9	15	15	40	0	29	15	15	70	100
10	15	15	50	0	30	15	15	70	0
11	15	15	50	0	31	15	15	70	0
12	15	15	50	0	32	15	15	75	100
13	15	15	50	0	33	15	15	75	0
14	15	13.5	60	0	34	15	15	80	0
15	15	15	65	0	35	15	9	80	99
16	15	15	65	0	36	15	13.5	80	100
17	15	15	65	0	37	15	15	90	100
18	15	15	65	0	38	15	15	90	0
19	15	15	66	0	39	15	15	100	100
20	15	15	66.7	0					

Note: Y_{take} denotes the effort-task income of the take authority, Y_{resp} the effort task income of the responder, t the take rate and d the part of Y_{resp} destroyed by the responder. Cases are ordered by the take rate.

Result 1

The behavior of responders is discontinuous, they typically destroy nothing or everything

Support. As table 1 shows, seven out of eight responders destroying income chose an extreme rate of (almost) 100%.

Intensity score measures concerning the emotions experienced by the responders are presented in table 2. The data show that responders who destroyed as well as those who destroyed nothing experienced a

variety of emotions. Especially, negative emotions, such as irritation, contempt, anger, and envy obtain a relatively high score. In addition, it is noted that anger is strongly positively correlated to irritation, with a correlation coefficient of 0.71 ($p<0.01$), which suggests that anger and irritation refer to a similar underlying emotion. The same holds for happiness and joy (correlation coefficient of 0.94, $p<0.01$), and, although less strongly, for envy and jealousy (correlation coefficient of 0.5, $p<0.01$).

Table 2: Intensity scores of experienced emotions

Emotion	Responders who destroyed (n=8)		Responders who did not destroy (n=31)	
	mean*	stand. dev.	mean*	stand. dev.
Irritation	5.88	1.13	3.58	1.95
Contempt	5.25	1.28	2.42	1.86
Anger	4.00	1.51	3.32	2.04
Surprise	4.25	2.38	3.06	2.13
Envy	4.00	2.07	3.58	1.98
Jealousy	2.75	1.58	3.77	2.25
Sadness	3.00	1.60	2.87	1.84
Happiness	1.75	1.39	2.23	1.78
Fear	1.63	1.06	1.94	1.36
Joy	1.63	1.41	2.19	1.58
Shame	1.63	1.77	1.65	1.28

Note: * The intensity scale ranges from 0 (no emotion) to 7 (high intensity)

Result 2

The intensity of negative (positive) emotions experienced by the responder is positively (negatively) related to the take rate.

Support. We have estimated an ordered logit model for each emotion separately. The results are given in table 3.

Table 3: Relationship between intensity of emotion and the take rate

Dependent Variable	Explanatory Variable	Coefficient	P-value	Chi-square
Irritation	Take rate	0.058	0.000	17.50**
Happiness	Take rate	-0.048	0.001	12.41**
Joy	Take rate	-0.047	0.001	12.12**
Envy	Take rate	0.026	0.039	4.35*
Contempt	Take rate	0.031	0.062	4.11*
Anger	Take rate	0.020	0.126	2.33
Sadness	Take rate	0.015	0.227	1.50
Surprise	Take rate	-0.017	0.181	1.81
Shame	Take rate	-0.012	0.471	0.50
Fear	Take rate	-0.006	0.680	0.17
Jealousy	Take rate	0.002	0.887	0.02

Note: Ordered logit estimates for each emotion; n=39; *p<0.05; **p<0.01

With regard to the negative emotions irritation, envy, and contempt, the estimated coefficients are all significantly positive. For anger, the coefficient is also positive but only significant at p=0.13. An increase in the take rate thus leads to a higher intensity of these negative emotions. With regard to the positive emotions happiness and joy, the estimated coefficients are significantly negative, which means that an increase in the take rate leads to a lower intensity of these emotions.

Result 3

The probability of destroying income is positively related to the intensity of experienced negative emotions.

Support. We have estimated a binary logit model for each emotion separately. The dependent variable "Destroy" equals 1 if a responder destroyed income, and 0 otherwise. The results are given in table 4. It turns out that only for irritation and contempt significant results are obtained. An increase in the intensity of these emotions significantly increases the probability that a responder will destroy income. Note that the effects for envy, happiness, and joy are not significant. Although the intensity of envy, happiness, and joy are related to the take rate , these emotions ultimately do not affect behavior. It is irritation and contempt that influence behavior. A Mann-Whitney test gives further support for this finding: responders who destroyed income experienced significantly more irritation and contempt than those who destroyed nothing.[11] With regard to the other emotions, differences in experienced emotion show no statistically significant effect on behavior.

Table 4: Relationship between destroying income and intensity of emotion

Dependent Variable	Explanatory Variable	Coefficient	Constant	Chi-square
Destroy (0 or 1)	Contempt	0.880**	-4.830**	13.12**
Destroy (0 or 1)	Irritation	0.953*	-6.075**	10.64**
Destroy (0 or 1)	Surprise	0.251	-2.273	1.88
Destroy (0 or 1)	Jealousy	-0.244	-0.563	1.54
Destroy (0 or 1)	Joy	-0.303	-0.786	1.01
Destroy (0 or 1)	Anger	0.186	-2.038	0.80
Destroy (0 or 1)	Happiness	-0.197	-0.966	0.56
Destroy (0 or 1)	Fear	-0.213	-0.978	0.40
Destroy (0 or 1)	Envy	0.111	-1.776	0.29
Destroy (0 or 1)	Sadness	0.042	-1.477	0.03
Destroy (0 or 1)	Shame	-0.011	-1.336	0.00

Note: Binary logit estimates for each emotion. The logit function is $f(x)=1/[1 + \exp-(a +bx)]$; n=39; *p<0.05; **p<0.01

Result 4

The probability of destroying income is positively related to the take rate

[11] The significance level is 0.004 for irritation and 0.001 for contempt, using a two-tailed test.

Support. To test the corollary of the previous two results, we used another binary logit model where the dependent variable is "Destroy" (0 or 1) and the explanatory variable the take rate. The estimated coefficient (0.14) and constant (-11.29) are both significant at the 5% level.

We have also investigated whether behavior or experienced emotion is influenced by gender, education (economics or not), or experience in economic experiments. It turns out that none of these factors have an effect on behavior or experienced emotions

The role of expectations

Figure 1 provides some information about responders' expectations of the take rate and the actual rates chosen by the take authorities. A proportion of the responders explicitly reported not to have any expectation. Consequently, the analysis of expectations that follows is based on a smaller number of observations (n=22). From figure 2 we see that for most responders expectations were not consistent with the actual take rate . Responders above the 45° line were too optimistic: they expected a lower take rate than the actual rate. Responders under the 45° line were too pessimistic: they expected a higher take rate than the actual rate. The figure also shows which responders destroyed income (squares). Interestingly, only responders who were too optimistic destroyed income.

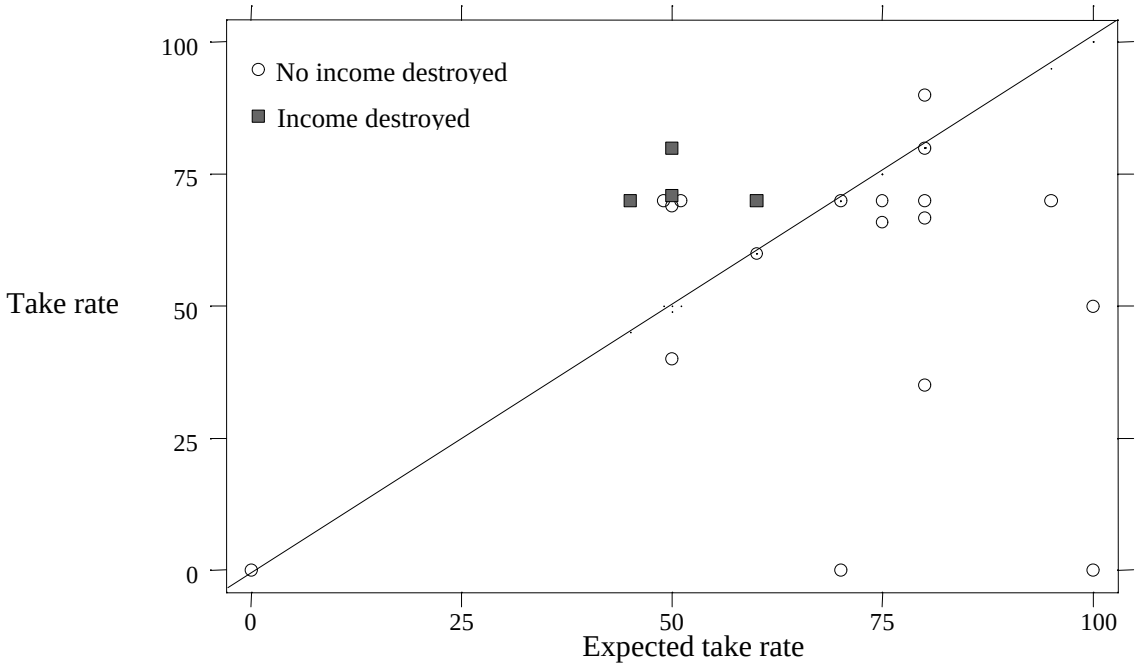

Figure 1: Scatter diagram of actual and expected take rates

Because expectations were assessed after the take game, it is possible that responders who were too optimistic found it hard to admit that they were wrong. These responders may have been inclined to

present themselves as realistic or perhaps even as pessimistic. Therefore, we checked whether responder's expectations of the take rate are correlated to the take rate. It turns out that the correlation between the take rate and expected take rate is very low (correlation coefficient of 0.12) and not significant (p=0.60). We conclude that there is no systematic bias in responders' reported expectations of the take rate .

Result 5

Responder's expectation of the take rate has a significant effect on the probability of destroying income but not on the intensity of experienced emotion.

Support. To investigate whether expectations influence the intensity of experienced emotion, we compared each model in table 3 with a model that includes both the take rate and the responder's expectation of this rate. Somewhat surprisingly, it appears that expectations have no predictive value for the intensity of the (negative or positive) emotions. Further, we analyzed whether expectations influence behavior. To that purpose, two logit models were estimated with "Destroy" again as the dependent variable (equal to 1 if a responder destroyed income, and zero otherwise). For both models the number of observations is smaller than the full sample, because we have only included those responders who explicitly reported an expectation. The regression results, given in table 6 below, show that model 2, including expectations, is significantly better than model 1, which does not include expectations.[12] It thus appears that expectations influence behavior but not emotions. In the next section we will attempt to explain this rather surprising result.

Table 6: Comparison of logit models with and without the expected take rate

	Dependent Variable	Explanatory Variables	Coefficient	P-value	Log Likelih.
Model 1 (n=22)	Destroy (0 or 1)	Constant	–5.7518	0.1666	18.322
		Take rate	0.0639	0.2701	
Model 2 (n=22)	Destroy (0 or 1)	Constant	–3.3714	0.0600	11.000
		Take rate – expected take rate	0.1677	0.0665	
Model Comparison	Significance of Log LR p< 0.01				

Note: The logit function is f(x)=1/[1 + exp-(a +bx)]

[12] Using the estimated model 2 it is easy to calculate that for the probability of destroying income to exceed 50% the difference between the actual and the expected take rate should be larger than 20 percentage points. We have also estimated the coefficients of the take rate and expected take rate separately for model 2. The coefficient of the take rate is then equal to 0.17 (p=0.11) and the coefficient of the expected take rate -0.17 (p=0.08).

Motives reported by subjects

Finally, we want to give a short informal impression of the motives that subjects reported in the debriefing questionnaire for their decisions. Take authorities typically say that their objective is to maximize their individual payoff. In general, they do not show much concern for the well-being of the responders. That they do not choose an extremely high take rate is because they expect responders then to destroy their earnings.[13] Some take authorities suggest that a take rate of 50% is fair since they are in the position to take 100%. Others justify high take rates by saying that the responder would do the same in their position. But there are also take authorities who chose low take rates either because in their view they had no right to take from the income responders worked for, or because they were concerned with the income of the responders. Most of the responders indicate not to have destroyed their income because it would have cost them money. According to some the temptation to destroy their income was very great indeed, but because they desperately needed the money they destroyed nothing. Note that this is in line with the idea that the stronger motivation dictates the outcome: the desire for money in this case dominates the desire for punishment and dictates the decision of the responder. In general, responders who actually destroyed their income indicate that a high take rate is very unreasonable, and that they did not want the take authority to have anything of the income they earned in the effort-task experiment.

4. Discussion of the results

In this section we first discuss the puzzling result that the expectations of responders appeared to significantly influence their behavior but not the intensity of emotions. Subsequently, we investigate to what extent existing economic models can explain our results.

Expectations

An important feature of emotions is the urge to execute a particular form of action, a so-called action tendency. Whether or not an action tendency results in action, depends on the regulation phase. Regulation is a more deliberate process where the individual evaluates the consequences of carrying out an action tendency. Regulation can suppress as well as amplify emotional urges (Frijda, p. 401; Lazarus, p. 114). According to Frijda, concerns due to social considerations (norms) play a very important role in the regulation process. Consider for example a married man who has romantic feelings for another woman. The action tendency of love is to approach the person one has feelings for. The married man, however, may not give in to his urges because of the social norm that says it is inappropriate for married people to have affairs. In this example the norm inhibits the action tendency. There are other instances where the norm augments or justifies the action tendency. For example,

[13] On the one hand, we have found a positive correlation between the take rate and the probability reported by take authorities that the responder will destroy a large share (50% or more) of income; on the other hand, there is a positive correlation between actual destruction and this reported probability.

when one is intentionally injured or insulted, one feels the urge to react to the person who is responsible. However, the response should be in line with the standard of what is appropriate in such a case, which may vary from community to community (see Averill 1982, for a discussion about social norms related to anger).

Expectations can influence a decision where emotions play a role in two ways. First, expectations may influence the intensity of experienced emotion because of an "unexpectedness" effect. In our case, this effect does not seem to play an (important) role, since we have not found any significant relation between expectations and emotion. The second way is through regulation. It is our conjecture that expectations of the take rate are related to norms (standards) and influence decision making through regulation. Evidence from an empirical study on fairness in the market place by Kahneman et al. (1986) supports the claim that expectations are closely related to norms: "(…) the gap between the behavior that people consider fair and the behavior they expect in the marketplace tends to be rather small (p. 731)". Furthermore, they note that people agree on general principles of fairness but can have disagreement about specific cases.[14] This may explain the variation in the reported expectations of responders (see figure 1). If the take authority violates the responder's norms, then the responder will judge this behavior as inappropriate.[15] This may justify or even amplify the action tendency to punish the take authority. When the individual has two conflicting motivations, which do not differ much in strength, the amplification of one motivation need not be large to cause a "jump" in behavior. This is suggested by our finding that the responder either destroys all income from the effort-task experiment, or nothing. The stronger motivation seems to dictate behavior (cf. the discussion pertaining to our research questions in section 2). This may explain our observation that expectations have no significant effect on the intensity of emotions but a significant effect on behavior. The amplification of the action tendency by the norm is too small to measure any additional effect on experienced emotion, but large enough to cause a "jump" in behavior by letting the motivation to punish dictate decision making.

Other theories

We now turn to the issue whether existing economic models of behavior are able to explain our experimental data. A first candidate is the standard game-theoretic approach, assuming rational self-interested behavior. This model predicts that the responder will not destroy any income if the take rate is less than 100% and is indifferent between all percentages of destruction if the rate is 100%. Since subjects have to choose integers in the experiment, there is a subgame perfect equilibrium in which

[14] It is possible that subjects are confused about which norm applies to the power-to-take game because of its rather abstract nature. This may explain why a substantial proportion of the subjects reported not to have any expectations.

[15] The bimodal distribution of the expectations suggests that two standards apply to the power-to-take game. First, a split-the-difference rule (27% expected a take rate of 50%), and, second, something like a split-the-difference `squared' rule (23% expected a take rate of 80%). The latter may have been activated by the following reasoning: Since a take rate of at least 50% should be feasible, the real issue is the appropriate take rate in the interval [50, 100]. Interestingly, only one subject expected a rate of 0%, at which both subjects would leave the experiment with the same earnings.

the take authority selects a take rate of 99% and the responder destroys nothing, while the responder would destroy everything if the take rate were 100%. In addition, there are other subgame perfect equilibria in which the take authority chooses a take rate of 100% and the responder destroys with zero or some positive probability (such that the take authority does not want to switch to a take rate of 99%). Our data (see table 1) show that 21% of the responders destroyed income at take rates considerable lower than 100%. In fact, 27% of the responders who faced a take rate of 70% already destroyed income. Furthermore, responders who destroyed income typically destroyed everything. These extreme and discontinuous choices of responders at take rates considerably lower than 100% cannot be reconciled with the standard model.[16] Moreover, we have found other evidence that behavior in the power-to-take game is inconsistent with the standard model. According to our estimated logit model (see table 6) the difference between the actual take rate and the expected take rate determines the probability of destruction. This model suggests that responders would even destroy income at rates lower than 70%. For example, when the take rate is 50% and the expected take rate 20%, the probability of destruction is 84%. In the standard model responders' expectations of the take rate play no role at all.

We next turn to economic models where it is assumed that individuals are not only motivated by their own payoffs. One motive that is often referred to in the literature concerns altruism: People may be motivated by "taking pleasure in others' pleasure" (Dawes & Thaler, 1988). In our game altruism does not adequately describe behavior, since it cannot explain why responders destroy income.[17] Recently, some models have been developed where it is assumed that people may be motivated by considerations of fairness or equity. In one approach it is assumed that players are not only motivated by their own payoff but also by a "relative" payoff, measuring how their own payoff compares to that of the other player(s). Another approach assumes that players' concern with the distribution of payoffs depends on the intentions of the other player(s). [18]

The equity or inequality aversion model of Fehr & Schmidt (1999) falls in the first category.[19] It is assumed that people exhibit inequality aversion and are willing to give up money in order to have less inequality. However, they show a self serving bias in the sense that they are prepared to give up more money to redress disadvantageous inequality than advantageous inequality. Applied to our power-to-take game, this model does not predict the behavior of take authorities very well. We observe much higher take rates than predicted by this model.[20] The behavior of responders is better

[16] The cooperative game model of Aumann & Kurz (1977), which was referred to in the introduction, is not very successful either, because it predicts a split-the-difference outcome (that is, a take rate of 50%) with no destruction of income.
[17] Another potentially relevant motive that is mentioned in the literature is envy (see, e.g., Feldman & Kirman, 1974). Although we indeed find a positive relationship between the take rate and envy (cf. table 3), there appears to be no effect of envy on the behavior of responders (cf. table 4).
[18] In addition to these approaches, Levine (1995) developed a model that incorporates both distributional and intentional concerns.
[19] A similar model in this category is that of Bolton and Ockenfels (forthcoming).
[20] For example, the model of Fehr & Schmidt predicts that 40% of the take authorities will choose a take rate of zero percent. Furthermore, it is predicted that take authorities will never choose a take rate higher than 66.7%. In the experiment only 7.7% of the take authorities choose a take rate of zero percent and 48.7% choose a take rate equal to or higher than 70%.

predicted. According to this model responders will never destroy when the take rate is below 50%, and (generally) they will either choose a destruction rate of 0% or 100%. These predictions are in line with our observations. Furthermore, the probability of punishment according to this model is roughly in line with our (logit) estimates. However, our finding that expectations have a significant impact on the probability of punishment is not captured by the Fehr & Schmidt model, since expectations do not play a role in their model.

In the model of Fehr & Schmidt responders, in particular those types who very much dislike inequality, destroy because it diminishes inequality. According to emotion theory responders punish because the action tendency to punish dominates other motivations, such as the desire for money. In the Fehr & Schmidt model the marginal rate of substitution between punishment and income is always the same for a given type. Only those types that are willing to give up relatively much income for punishment will destroy income. Our findings suggest that the marginal rate of substitution between punishment and income depends on the intensity of experienced emotion. If the intensity is relatively low, the marginal rate of substitution is low as well. In this case the "desire for money" dictates the decision. However, if the intensity is relatively high, the marginal rate of substitution makes a "jump" and becomes high as well. In this case the motivation to punish dictates behavior. Fehr & Schmidt do not model the behavioral processes underlying the preference for equity. Although their model captures an important aspect of emotions–the fact that people are willing to sacrifice resources to punish unfair behavior–other potentially important aspects are neglected. For example, individual emotions differ with respect to their eliciting conditions and action tendencies. Our results show that in the power-to-take game, punishment is driven by irritation and contempt. In order to elicit these anger related emotions in a person, it is necessary that another person harms the interest of this person *and* can be held responsible. In other words, intentions matter for these emotions, and, thus, for punishment. Although to date the experimental results on the role of intentions are somewhat mixed, there is evidence that intentional harm leads to more negative reciprocity than harm caused by nature (Blount, 1995; Offerman, 1998). Another important aspect of emotions is that they typically have a brief duration. The person under the influence of emotions may be viewed as having a short-term change of preferences (cf . Hirshleifer, 1987). The time constraint under which decision making takes place may thus affect behavior when emotions play a role.

The model of Rabin (1993) takes intentions into account. In this model it is assumed that people are willing to sacrifice their own material well-being to help those who are intentionally kind and to hurt those who are intentionally unkind. Whether or not person A perceives person B as intentionally kind or unkind depends on person A's second order beliefs, that is, A's beliefs about B's beliefs about A's strategy. In an equilibrium both players maximize utility and their higher order beliefs match to actual behavior. Since the model applies to games in normal form only, we can not directly apply it to our sequential take game. However, Duwfenberg & Kirchsteiger (1998) have adopted the model for sequential games. If we apply their model, then, for a certain range of take rates

(above 50%), there can be multiple equilibria where responders destroy nothing, some part, or everything of their income. Thus, according to this model it is possible that responders choose an intermediate amount of punishment. Our results, however, show that responders (almost) never choose this option. They either do not punish at all or choose the highest level of punishment. Moreover, we find if expectations deviate from reality, they have a significant effect on the probability of punishment. As holds for the Fehr & Schmidt model this last result is not captured by the model of Rabin.

Furthermore, Rabin assumes that if the material payoffs become very large, players are no longer willing to sacrifice their own material well-being any more in order to punish (reward) unkind (kind) behavior. Although we have not tested what happens in the power-to-take game when the stakes are increased, it is questionable whether emotional urges only play a role when the stakes are low. Experimental research on the ultimatum game by Slonim & Roth (1998) shows that even when the financial stakes are very high (62.5 times the hourly wage) subjects still behave reciprocally and reject unfair (but still substantial) offers.[21] From an emotional point view this makes sense. After all, emotions arise when one's interests are damaged. High stakes may therefore even increase the intensity of emotions. On the other hand, when the stakes are high the costs of giving in to one's emotional urges become high as well. The effect on behavior when financial stakes are increased thus depends on the balance of these two effects.

5. Conclusion

The aim of this study was to investigate the influence of emotions on economic decision making. To that purpose we used a simple two player power-to-take game. Before this game is played both players first have to earn an income. In the first stage of the game, one of them (the take authority) decides how much to take from the earned income of the other player (the responder). In the second stage, the responder can punish by destroying (part of) his or her earned income. In this study, we were primarily interested in the (emotional) behavior of the responder. First, we found that a higher take rate significantly increases the intensity of irritation, contempt, and envy, and significantly decreases the intensity of joy and happiness. Since negative emotions are experienced as painful, there is a direct hedonic impact. Second, only irritation and contempt have a significant effect on the probability of punishment. In other words, punishment seems to be driven by these two emotions. Third, there are "jumps" in the behavior of responders. They typically either choose no punishment (destroy nothing) or the highest level of punishment (destroy everything). Thus, it appears that of the two conflicting motivations–a "desire for money" and a "desire for punishment"–the stronger motivation dictates the decision. Finally, we found no effect of the responders' expectations of the take rate on experienced

[21] Hoffman et al. (1996) find that ultimatum game behavior does not significantly change when the pie is increased from $10 to $100.

emotions, but a significant effect on the probability of punishment. In the previous section we offered an explanation of this result in terms of norm-related regulation of emotions.

Our experiment demonstrates that emotions and norms can have an impact on behavior which is not accounted for by standard economic models. Since the power-to-take game captures important aspects of economic reality, as discussed in the Introduction, this is an important outcome. Some may argue that in our experiment the majority of responders did not destroy any income and thus behaved rationally. So, why pay so much attention to emotions? There are several reasons. First, although the percentage of responders who destroyed earned income (21%) is not that large, it is certainly not negligible. Second, our experiment shows that if emotions influence behavior, the impact can be quite substantial. So, even when the number of agents whose behavior is influenced by emotions is relatively small, the effect on aggregate can be quite large because of these agents' "extreme" choices. Third, because of the hedonic impact of emotions, they may have to be accounted for in welfare analyses. Fourth, the amount of emotional behavior observed in our experiment may represent a lower boundary. Remember that subjects played the take game anonymously and were not able to identify one another. When people deal with each other face to face, emotions are likely to play a greater role because the situation is less abstract. Moreover, people can easily reinforce each other's emotions and get trapped in a downward spiral. A simple difference in opinion, for example, can easily turn into a heated debate. Fifth, a better understanding of the emotion process may provide a means to affect economic behavior. Our results, for example, suggest that responders' expectations of the take rate play a significant role. We argued that they influence behavior through the regulation of emotional urges. What people expect of others, however, depends on the institution they behave under. In our experiment, responders were on average too pessimistic, they expected higher take rates than the ones chosen by the take authorities. If responders were, for instance, informed about the take rates in other sessions, or if the game were repeated, different behavior might be observed. Related to this issue is that emotions may be an important mechanism to sustain equilibria that otherwise would not be sustainable (cf. Frank, 1988). In the power-to-take game, take authorities take the reaction of responders into account when choosing a take rate. They realize that the higher the take rate the more likely it is that responders destroy their earned income. To have emotions is thus an advantage for responders in the sense that it prevents take authorities from choosing (very) high take rates.

An important issue for future research is how emotions interact with social norms and the expectations that they generate. We have argued that norms may influence decision making through the regulation of emotional urges, but more research is necessary to substantiate this conjecture. Through the manipulation of information or the use of experienced subjects, further light may be thrown on this issue (cf. Roth & Schoumaker, 1983). Furthermore, it would be interesting to find out whether the "jumps" in responder behavior in our experiment can be observed in other experimental games as well. Also, to obtain further evidence on emotion, in addition to self-reports, it may be useful

to measure emotions physiologically. Measures like heart beat, blood pressure, or the galvanic skin response may provide additional information about emotional activity (cf. Burnham, 1998).

The emotion process is clearly a complex one. Many issues are still unresolved. Nevertheless, it appears that emotions play an important role as a determining factor of economic behavior. Economist should therefore be interested to learn more about emotions. By doing so, we may get a better picture of the determinants of economic behavior, the welfare consequences thereof, and the ways to deal with it.

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Appendix

Instructions of the power to take game

Two phases
This part of the experiment consists of two phases. In phase 1 only participant A must make a decision whereas in phase 2 only participant B must make a decision. Every participant thus makes one decision.

Phase 1: participant A chooses percentage
In this phase, each participant A will be paired with a participant B. This will be done by letting participant A draw a coded envelope. With the help of the code only we know which seat numbers are paired. Both participant A and B are thus anonymous. The envelope contains a form which says how much participant B earned in part I of the experiment. Participant A must choose a percentage and fill this in on the form, together with A's own income from part I of the experiment. This percentage determines how much of participant B's income after phase 2 will be transferred to participant A. The percentage chosen by participant A must be an integer in the interval [0, 100].

When participant A has completed the form, it must be put in the envelope again. After this we will collect the envelopes en bring them to the participants B who are paired with the participants A by means of the code.

Phase 2: participant B chooses percentage
In this phase participant B has to fill in on the form which percentage of his or her *own* income from part I of the experiment will be destroyed. The percentage chosen by participant B must be an integer in the interval [0, 100]. The transfer from participant B to participant A will be based on the income of participant B that is left. Note that the transfer equals the percentage chosen by participant A of the income of participant B that is left after phase 2.

When participant B has completed the form, it must be put in the envelope again. After this we will collect the envelopes and bring them to the participants A who are paired with the participants B. Participant A will take note of the decision of participant B and, subsequently, puts the form back into the envelope. Finally, the envelopes will be collected for the payment procedure which will be clarified below.

Example how to determine one's payoffs
We will now give an example for the purpose of illustration. Suppose that in part I of the experiment participant A earned 15 guilders and participant B 12 guilders. In phase 1 of part II of the experiment, participant A decides that *60%* of the income of participant B will be transferred to him or her

(participant A). In the second phase, participant B can destroy part or everything of his or her income from part I of the experiment. Suppose participant B decides to destroy zero percent of his or her income. The transfer from B to A is then equal to 7 guilders and 20 cent (60% of 12 guilders). The total payoff for B at the end of the experiment is equal to 19 guilders and 80 cent (namely, the show-up fee of 15 guilders plus the 12 guilders of part I minus 7 guilders and 20 cent of part II). The total payoff for A at the end of the experiment is equal to 37 guilders and 20 cent (namely, the show-up fee of 15 guilders plus 15 guilders of part I plus 7 guilders and 20 cent of part II)

Now suppose that in this example participant B had decided to destroy 50% of his or her income. In this case the transfer from B to A is only 3 guilders and 60 cent (namely, 60% of the remaining income of participant B after phase II, which is 60% of 6 guilders). The total payoff for A at the end of the experiment is equal to 33 guilders and 60 cent (namely, the show-up fee of 15 guilders plus 15 guilders of part I plus 3 guilders and 60 cent of part II) and for participant B 17 guilders and 40 cent (namely, the show-up fee of 15 guilders plus the 12 guilders of part I minus 9 guilders and 60 cent of part II (of which 6 guilders are destroyed and 3 guilders and 60 cent transferred)

In summary

In phase 1, each participant A will be paired with a participant B by drawing an envelope. The envelope contains a Form which states the income of participant B from part I of the experiment. Participant A fills in his or her own income from part I of the experiment and the percentage that indicates how much of participant B's income will be transferred to participant A after phase 2. When participant A has completed the form, it will be brought to participant B. In phase 2, participant B decides which percentage of his or her *own* income from part I of the experiment will be destroyed, and fills this in on the Form. Subsequently, the Form will go to participant A who takes note of the decision of participant B. Then, the Form will be collected and the payment procedure follows. Note, that the pairing is anonymous so that nobody knows whom he or she is paired with.

Other information

Completing the Form

The decision of both participant A and B will be filled in on a Form. You have received a specimen of this Form. In phase 1, participant A completes the blue block. In this block the income of participant B is stated. Participant A fills in his or her own income and the percentage. In phase 2, participant B completes the yellow block. In this block, participant B states which part of his or her own income will be destroyed. The Forms must be completed with the pen that you find on your table in the laboratory. If a Form has been completed with another pen, the Form will be invalid and you will not be paid. Finally, for making calculations you can make use of the electronic calculator that is on your table.

The payment procedure

When participant A has taken note of the decision of participant B in phase 2, the envelope containing the Form will be collected and brought to the cashier. Next, the participants will go to the reception room of the laboratory one by one. The cashier, who will not be present during the experiment, will pay the participants in the reception room. The cashier determines the payment of each participant with the help of the Form and the codes that are linked to the seats. In this way, anonymity is secured with regard to who earned what.

Exercises

We ask you to do two exercises on the computer in order to become familiar with the procedures. These exercises consist of completing the Form for an imaginary situation and determining the payoffs. You are not actually paired with another participant during these exercises. Your earnings in these exercises will not be paid out to you. When the exercises have been finished, the computers will be switched off and you again have the opportunity to ask questions. After this the experiment will start.

Finally
To secure anonymity, participants A and B will be partially divided by a sliding wall. The instructions on the table will be available to you during the experiment. At the end of the experiment you are asked to fill in a short questionnaire. Anonymity is again secured. After this, you are asked you leave the laboratory one by one. You must be silent and refrain from communication with others until you have left the laboratory.

Code: xxx

FORM

<u>Participant A fills in this block</u>:

Income of participant A from part I: …….

Income of participant B from part I: xxx

I (participant A) decide that ……. % of the income of participant B will be transferred to me.

<u>Participant B</u> fills in this block:

I (participant B) destroy ……. % of my income of part I of the experiment.