WZB
Wissenschaftszentrum Berlin
für Sozialforschung

Julia Schmid

Voluntary Industry Standards: An Experimental Investigation of a Greek Gift

Discussion Paper

SP II 2015–206

September 2015

(WZB) Berlin Social Science Center

Research Area
Markets and Choice

Research Unit
Market Behavior

Wissenschaftszentrum Berlin für Sozialforschung gGmbH
Reichpietschufer 50
10785 Berlin
Germany
www.wzb.eu

Julia Schmid
Voluntary Industry Standards: An Experimental Investigation of a Greek Gift

Affiliation of the author:

Julia Schmid
WZB

Wissenschaftszentrum Berlin für Sozialforschung gGmbH
Reichpietschufer 50
10785 Berlin
Germany
www.wzb.eu

Abstract

Voluntary Industry Standards: An Experimental Investigation of a Greek Gift

by Julia Schmid*

One reason for firms to voluntarily increase their environmental or social production standards is to prevent consumers from lobbying for stricter mandatory standards. In this sense, voluntary overcompliance serves as a Greek gift, as consumers might be worse off in the end. Strategically, a Greek gift deteriorates the consumer's incentive for lobbying and, as such, might be unkind. In many experiments it was shown that unkind actions which decrease the other's payoff are punished by negative reciprocal behavior. This paper experimentally investigates whether negative reciprocity can also be observed if unkind behavior is not directed at payoffs but rather at a deterioration of strategic incentives.

Keywords: experiments, voluntary agreements, overcompliance, learning, reciprocity

JEL classification: C72, C92, D83

---

* E-mail: julia.schmid@wzb.eu.
For helpful comments we thank Dorothea Kübler and the seminar participants at the Institute of Technology, Berlin. We are indebted to Wei Min Wang and Mark Henninger for programming the experiment and helping with its conduction, as well as to Jennifer Rontganger for her assistance. Financial support from the Deutsche Forschungsgemeinschaft (DFG) is gratefully acknowledged.

In the European Union there is an ongoing debate on the labeling of foodstuffs. The goal is to provide consumers with the most comprehensive information on the contents and the composition of food products. The background of this discussion is the increasing fraction of the population that is suffering from overweight and obesity. Consumer protection groups favor the implementation of traffic light signpost-type labels that display the nutritional content of the respective product at the front of the pack using the easily recognizable colors red, amber and green. The colors provide information on the level (i.e. whether high, medium or low) of individual nutrients in the product like salt, fat and sugars. This system has already been partly introduced in the UK, and studies show that it helps consumers to judge the healthiness of products. The Confederation of the Food and Drink Industries of the EU (CIAA) however is strictly against the introduction of the traffic light labeling system. Among other things it criticizes that this system is too much of a simplification. Instead, the food industry has developed its own labeling system, the Guideline Daily Amount (GDA). The CIAA recommends its members to provide the GDA information on their foodstuff packages, and indeed over 80% of the products are now labeled in this way. The outgoing president of the German Federation for Food Law and Food Sciences (BLL) can be quoted with a statement from April 2010, that the dedication [of the food industry] to the voluntary implementation of nutrition labeling has to be taken into account in the ongoing legislation debate in Brussels.[1] In June 2010, the European Parliament voted against the statutory introduction of the traffic light labeling system.

Voluntary agreements (VA) such as the GDA labeling can be observed in many industrial contexts. Firms commit to voluntarily reduce emissions, invest in pollution abating technologies, provide certain quality standards, employ handicapped people or use inputs from environmentally friendly production. The motivations for this kind of behavior have been investigated theoretically and are manifold. Some are related to competition and market conditions. For example, firms increase the product differentiation and thus market power by appearing "greener" or "more social" than their competitors (e.g. Arora and Cason (1995), Arora and Gangopadhyay (1995)), or they try to extract rents from consumers willing to pay a premium for environmental soundness, as analyzed for example in Kirchhoff (2000). Another general driving force of overcompliance are strategic considerations. In Innes (2006) the firms' codes of conducts are being constrained due to the threat of a consumer boycott. Maxwell, Lyon, and Hackett (2000) present a similar argument in

[1] Translated quote: "Dieses Engagement zur freiwilligen Nährwertkennzeichnung muss im Rahmen der aktuellen Gesetzgebungsdebatte in Brüssel berücksichtigt werden." Quoted from a press release in April 2010, see BLL (2010).

their model where voluntary self-regulation preempts or weakens political action on the consumers' side. The introductory anecdote is an example in line with this argument. It seems that the food industry tried to prevent the regulation agency from introducing stricter codes of conducts despite the lobbying efforts of the consumer protection groups by voluntarily elevating the existing standard.[2]

Those latter motives for overcompliance require advanced strategic thinking as they affect the incentives of third parties. As such, they are interesting from an experimental point of view. We will experimentally investigate a highly stylized version of the model by Maxwell, Lyon, and Hackett (2000). In our experiment, player A (the firm) can choose which of two symmetric normal-form games is played by the players B and C (the consumers). Using the strategy method, we ask the consumers to choose their action for each of the two games. The actions of the consumers correspond to their effort put into lobbying activities. The equilibria of the stage games are constructed such that in one game the overall effort level of lobbying is very high, whereas in the other one this level is zero. In equilibrium, consumers prefer the outcome of the former game with regard to their payoffs, whereas the firm prefers the outcome of the latter game. However, the firm has to bear some costs if it wants its preferred stage game to be played. These costs can be interpreted as costs for voluntary overcompliance by the firm. Given that consumers play the equilibrium at the stage game, preempting the consumers' political action by voluntarily increasing the standard is profitable for the firm but not without a prize.

One question we ask is whether firms realize which effect their behavior has on the consumers' incentives and, thus, on their own payoff. By implementing two different treatment conditions we investigate whether firms learn over time to choose an action which is unfavorable at first sight but leads to a higher overall payoff by altering the incentives of the consumers.

The second question is related to the consumers' behavior: this type of strategic voluntary compliance can be interpreted as a Greek gift. Coming back to the example above, informing the consumers by providing GDA nutritional information seems to be a responsible contribution to consumers' well-being. However, this seemingly kind step might prevent a stricter (and potentially better) standard in the end by weakening the impact of the consumer lobbying effort. Given that

[2] This type of strategic interaction can be found in many contexts. For example, employers might increase wages by a little bit in order to prevent employees from going on strike. Also, political concessions might be made in order to prevent a referendum.

consumers recognize the dubiousness of the voluntary commitment they might want to punish the firm. Thus, we want to explore how consumers react to the voluntary overcompliance and whether they reciprocate to the firm's behavior.

Reciprocity has been shown to be a strong motivation for human behavior, testified by the results of many experimental studies. Positive reciprocity involves rewarding kind behavior, as studied in gift-exchange games and the sequential prisoner's dilemma (e.g. Berg, Dickhaut, and McCabe (1995), Fehr, Gächter, and Kirchsteiger (1997), Falk, Gächter, and Kovacs (1999) and Clark and Sefton (2001)). Negative reciprocity leads to punishing perceived bad intentions and has been extensively researched with the help of ultimatum games since Güth, Schmittberger, and Schwarze (1982). In all of the studied games, where reciprocal behavior plays a major role, kind or unkind behavior can be easily detected as it directly affects the payoffs of the responders in a positive or negative way. In the game we consider negative reciprocity could be a motivational drive. However, the perception of unkind behavior is more subtle than for example in the ultimatum game. First, it is not aimed at a single but at two agents who interact in a non-cooperative way. Second, unkind behavior does not immediately lower the consumers' payoffs but rather functions through changing their incentives, resulting in an unfavorable equilibrium outcome for them. We investigate whether consumers recognize this indirect unkindness and whether they reciprocate in a negative way.[3] In our setup this means that the consumers would choose to lobby even though the firm intended to preempt political entry of the consumers.

We find that all subjects in the role of the firm learn to voluntarily increase the environmental standard when they are informed about the complete strategies of the consumers. They compare the effects both of their strategies have on the consumers' behavior and, in addition, learn from the past profits in a way suggested by reinforcement learning. In a second treatment where the firm does not learn the complete strategies but only sees the consumers' choices that are relevant in the game some subjects never learn to voluntarily overcomply. The consumers' play converges in both stage games to the Nash equilibrium. There is no indication of negative reciprocal behavior. It seems that the consumers regard the deterioration of their strategic situation not as unkind and thus have no motivation to punish the firm.

The paper is organized as follows. The next section provides an non-technical outline of the theory and introduces the experimental procedures as well as the hypotheses we derive. Section 2

[3] A theoretical model of sequential reciprocity has been provided by Dufwenberg and Kirchsteiger (2004).

presents the results separately for both the firm and the consumers. In section 3 we discuss these results and conclude. In the appendix the instructions of the experiment are provided, exemplarily for one of the treatments.

1 Theoretical Background and Experimental Design

As mentioned, the experiment is inspired by the theoretical model by Maxwell, Lyon, and Hackett (2000) that we shortly sketch in the following. Their model of self-regulation is a three-stage game among consumers and oligopolistic firms. At the first stage, firms choose their voluntary level of pollution abatement. At the second stage both the firm and the consumers decide whether or not to enter a political influence game in order to push the government in the direction of their preferred pollution control level. Given the level of pollution control, the firms compete on the market at the third stage. Pollution abatement is costly to firms and does not increase demand. Hence, ceteris paribus, firms prefer the lowest pollution control level possible. Consumers, on the contrary, have a disutility of pollution. Though they oppose high prices on the product market, they always want the regulation agency to choose a stricter pollution control policy. Individual consumers have increasing costs of their engagement in the political process. In addition, consumers bear their share of the fixed costs that occur when entering the influence game. As the authors point out, these fixed costs can be thought of as costs of political organization, because consumers have to inform themselves, agree on a lobbying strategy and conduct their political campaign. The organizing costs are shared equally among the engaged consumers. Due to these costs and the decreasing utility of pollution control, self-regulation by the firms at the first stage can preempt consumer lobbying and thus government regulation at the second stage. In this case, the final level of pollution control is lower, than without voluntary abatement, and also consumer welfare might be negatively affected.[4] In this sense, self-regulation can serve as a Greek gift. At first sight, self-regulation by the firms seems to be a beneficial act from the point of the consumers. However, if it prevents consumers from lobbying for stricter regulation, they might be worse off in the end.

This is the setting we investigate experimentally by choosing appropriate model parameters such that firms have an incentive to voluntarily install a small pollution control standard, thereby hindering the consumers from government intervention. To focus on the aspects we are interested in

[4] Maxwell et al. provide a sufficient condition for the welfare effect of voluntary self-regulation being positive. However, this condition need not be fulfilled.

and circumvent the confusion of too many effects, we make several simplifications in the experiment compared to the model. First of all, as we are particularly interested in the interaction of self-regulation and the political process, we restrict our experimental analysis to the first and the second stage. The third stage can be thought of as being incorporated in the players' payoffs. Second of all, we do not take into account the market behavior of firms, but instead consider only one firm.[5] Hence, the only decision a firm has to take is whether or not to voluntarily set some level of pollution control. Further, we exclude the firm from the simultaneous influence game as at this stage we are only interested in the consumers' behavior. They face a social dilemma in the influence game, as individually they prefer a low level of pollution, but would prefer others to bear the costs of lobbying. Also, we restrict the number of consumers to two as this number is sufficient to capture the strategic incentives. The possible pollution control levels are set to discrete values, where a higher value is equivalent to a stricter environmental standard.

The experimental design is as follows. At the beginning, the firm decides to voluntarily implement an environmental standard of 1, or to abstain from voluntary implementation, i.e. choose 0. Then consumers choose individually and simultaneously their level of lobbying effort. Possible effort levels are 0, 1, or 2. For simplicity, each unit of effort increases the mandatory standard for the firm by one. Hence, the maximum environmental standard that can be installed is five (1 by the firm plus 2 by each consumer). In the experiment, the firm has the following payoff function Π, depending on the level of the final environmental standard S:

$$\Pi(S) = 36 - 5S.$$

The total standard S is composed of the level set by the firm, $s \in \{0, 1\}$, and the lobbying effort level set by the consumers, $e_{i,s}$, $i \in \{1, 2\}$, where the individual effort level is equivalent to the standard implemented by the consumer's lobbying activity. Hence, the overall standard is $S = s + e_{1,s} + e_{2,s}$. Consumers have a concave utility function $U(S)$. Specifically, their utility depends on the environmental standard S in the following way:

$U(0)$	$U(1)$	$U(2)$	$U(3)$	$U(4)$	$U(5)$
0	23	34	45	52	54

[5] Maxwell, Lyon, and Hackett (2000) distinguish between competitive and collusive market behavior of the firms. Depending on the firms' strategies, preempting the consumers from intervening in the regulatory process is more or less costly. Dawson and Segerson (2003) look at potential free-rider problems on the firms' side.

The organizing costs for the consumers amount to $F = 28$. Hence, if both consumers are active in the political process, each of them bears a burden of $F/2 = 14$. If only one consumer puts effort $e_{i,s} > 0$ into lobbying after the firm chose s, she pays the full amount. In addition, for each consumer there are individual effort costs that equal 4, when effort is high (i.e. $e_{i,s} = 2$), and zero otherwise. Given those parameter values, table 1 displays the payoff matrices for the consumers depending on the choice of the firm.

firm chooses no voluntary standard ($s = 0$)				
		consumer 2		
	$e_{i,0}$	0	1	2
	0	$0, 0$	$23, -5$	$34, 2$
cons. 1	1	$-5, 23$	$20, 20$	$31, 27$
	2	$2, 34$	$27, 31$	$34, 34$

firm chooses a voluntary standard ($s = 1$)				
		consumer 2		
	$e_{i,1}$	0	1	2
	0	$23, 23$	$34, 6$	$45, 13$
cons. 1	1	$6, 34$	$31, 31$	$38, 34$
	2	$13, 45$	$34, 38$	$36, 36$

Table 1: Consumers' payoff matrices

The experiment therefore comes down to a simple game. The firm chooses the normal form game the consumers are facing, by setting $s = 0$ or $s = 1$. Hence, the firm's strategy consists only of one action. In the following, the matrix for $s = 0$ will be termed "Game 0", and for $s = 1$ "Game 1" analogously. The strategic incentives for the consumers concerning the effort levels differ in these two stage games. If the firm chooses $s = 0$, consumers have a weakly dominant strategy to play $e_{i,0} = 2$, which is the Nash equilibrium strategy in Game 0, i.e. in the left matrix of table 1. This leads to an overall standard of $S = 4$. On the contrary, if the firm chooses $s = 1$, the consumers' equilibrium choice in Game 1 is $e_{i,1} = 0$, resulting in $S = 1$. Applying the concept of backward induction, the subgame perfect equilibrium of the game is $(s; (e_{1,0}, e_{1,1}); (e_{2,0}, e_{2,1})) = (1; (2, 0); (2, 0))$. The total standard resulting from this equilibrium is $S = 1$ and consumers are preempted from political action. Another Nash equilibrium of the game, yet not subgame perfect, is $(s; (e_{1,0}, e_{1,1}); (e_{2,0}, e_{2,1})) = (0; (2, 2); (2, 2))$. This equilibrium entails the incredible threat of the consumers choosing a high effort if $s = 1$.

The Nash predictions in both of the two stage games are quite strong, as in either stage game the equilibrium is in weakly dominant strategies. Thus, a number of common behavioral strategies lead to the same equilibrium prediction: maxmin strategies; best response of one consumers to the other playing naive; best response of one consumer believing the other thinks she herself plays naively; best response to assumed optimistic play by the other consumer; best response to the belief, the other plays dominated strategies with zero probability. In this sense, the equilibrium predictions are robust. Hence, if the subject in the role of the firm thinks about the incentives of the consumers at all, she should come to the conclusion, that it is optimal to set $s = 1$, even if at first sight this diminishes the firm's payoff as it is decreasing in S.

1.1 Game Theoretic and Behavioral Hypotheses

On the one hand, we are interested in the behavior of the player in the role of the firm. We experimentally investigate, whether and, if so, how quickly the firm learns to act against its apparent interest in order to achieve an advantageous overall situation. For this purpose we introduce two treatments, each consisting of 40 rounds. In the full information treatment INF, the subject in the role of the firm is ex post informed about the complete strategies of the two consumers. That is, after each round she learns what consumers did when faced with the matrix chosen by her. In addition, she receives the information which standard the consumers would have chosen if she had decided otherwise. This makes learning particularly simple. In the more restrictive treatment condition NoINF she only learns what the consumers' decision was for the particular standard she chose. As learning is more difficult in the second treatment, our first hypothesis is related to learning.

Learning Hypothesis More firms learn to play $s = 1$ in treatment INF than in treatment NoINF.

On the other hand, we are interested in the consumers' reaction to the choice of the firm. In both treatments we apply the strategy method, i.e. we ask the consumers to choose their effort levels for both stage games. Whereas the firm is only fully informed in treatment INF about the complete strategies of the consumers, the consumers always know the complete strategy of their counterpart. Regarding the consumers' behavior, we develop two hypotheses.

Since the equilibrium predictions of the stage games are quite strong, consumers' strategies might converge to the equilibrium prediction of the stage games over time. However, if the firms learn to play $s = 1$ the game that becomes payoff relevant for the consumers is characterized by an unfavorable equilibrium output for them. Given the consumers perceive this move as unkind, one could expect that they reciprocate in a negative way and punish the firm for the choice of $s = 1$. A way of punishing the firm is not to play the subgame perfect equilibrium strategy but instead $e_{i,1} = 2$ in Game 1. A high standard chosen by the consumers diminishes the firm's payoff. At the same time $e_{i,1} = 2$ is the cooperative action in Game 1. Hence, punishment can be induced by cooperation among the consumers. When both consumers act in a cooperative way, this punishment strategy is even costless, as it induces the Pareto-optimal outcome with an individual payoff of 36 for both of them.[6] Both the will to reciprocate and the will to cooperate go in the same direction. Thus, we expect to see a substantial and persistent portion of players who choose $e_{i,1} = 2$.

Reciprocity Hypothesis A substantial portion of consumers plays $e_{i,1} = 2$ in Game 1 in order to punish the firm for choosing $s = 1$.

As noted, this kind of reciprocal reaction presumes that consumers recognize the firm's behavior as a Greek gift and therefore judge it as unkind. Moreover, they must overcome the incentives through the dominant strategy of $e_{i,1} = 0$ in Game 1, which requires a strong desire for reciprocity and/or a strong belief in the other consumer's willingness to cooperate. Given that the respective other consumer does not follow the reciprocity strategy, this strategy is not costless, since in this case a punishing consumer in Game 1 receives a payoff of 13 instead of 23 when playing $e_{i,1} = 2$ instead of $e_{i,1} = 0$. Alternatively, one could think of a different, less costly dynamic of the consumers' play. Given the firms learn to choose Game 1, consumers should realize that they prefer Game 0 in terms of equilibrium outcomes of the stage game. Hence they could play a strategy of promise by choosing $e_{i,0} = 0$ in Game 0, thereby tempting the firm to choose $s = 0$, even though $e_{i,0} = 2$ is the weakly dominant strategy in Game 0. Unlike the reciprocity strategy, this kind of temptation strategy can only work in the treatment where the firm learns the complete strategy as it relies on off-equilibrium behavior.

Temptation Hypothesis Consumers choose lower than equilibrium efforts in Game 0 in order to tempt the firm to choose $s = 0$.

If the reciprocity and/or the temptation hypothesis turn out to be at least partly true, the proportion of firms who choose zero should increase towards the end of the game.

[6] Mason and Nowell (1998) experimentally investigate subgame perfect play using an entry deterrence game. They find that a significant proportion of entrant players enters the market even if the incumbent has chosen the entry barring output. Hence, these players do not adhere to the subgame perfect strategy even if this implies losses. In this light, an even higher portion of players is expected to choose the efficient but off-equilibrium strategy in Game 1.

1.2 Procedure

The experiment was run in the computer lab of the Berlin Institute of Technology using the software tool kit *z-Tree*, developed by Fischbacher (2007). Students of various fields were recruited as subjects via the recruiting tool ORSEE, developed by Greiner (2004). We ran four sessions for each treatments with 18 subjects per session, with a total of 144 subjects. Upon arrival in the lab, the subjects were randomly assigned to their computer terminal. They received written instructions on the experiment, including a test of understanding (provided in the appendix). We did not start the experiment until all subjects had answered all of the quiz questions. The instructions used a neutral language, similar to the one we use in the analysis in Section 2. Specifically, we avoided value-laden terms as "boycott" or "pollution control". Players were named A, B, C, where "A" corresponded to the firm and "B" and "C" to the (symmetric) consumers. The roles were randomly assigned to the subjects before the first round, and kept throughout the experiment. We asked the subjects to individually choose their "input", and it was described in detail how the sum of the inputs and its composition would determine their respective income in one round. Subjects in the role of consumers were asked to make their input choice for the case where the firm chose an input of 0 as well as for the case where the firm chose of an input of 1, i.e. we applied the strategy method. After each round the subjects were informed about the strategies of the other players according to the description of the treatments above. They also learned their earnings in points. The earnings of the other players were not explicitly mentioned but could be inferred from the matrices and tables given to the subjects. In order to encourage the firms to think about the strategic incentives of the consumers, we displayed the relevant stage game to them every time the consumers made their input decisions.

Each session consisted of 40 rounds out of which seven were randomly selected after the experiment determining the subjects' payoffs.[7] The sum of points reached in these seven rounds was converted into Euros with an exchange rate of € 1 for 10 points. Each round, the subjects were matched randomly in groups of three within matching groups of nine, such that we have eight independent observations per treatment.[8] This was all common knowledge to the subjects, except that we did not mention the size of the matching group but just told them they were matched randomly. Sessions lasted about 90 minutes and average earnings amounted to € 18.10.

[7] In order to avoid income effects, we only paid the subjects for a selected number of periods.

[8] We chose to match the group members randomly in order not to provoke reputation effects that are not in the focus of this study.

2 Results

The histogram in figure 1 displays the fractions of the strategies the different player types choose, separated for both treatments. The dotted bars represent the equilibrium action of the respective game. Both in the stage games as well as in the whole game, the equilibrium actions are most frequently played. When learning for the players in the firm's role is easy, as in treatment INF, 77% of their actions correspond to the equilibrium strategy "1", whereas when learning is more difficult, as in treatment NoINF, the equilibrium strategy is chosen in 68% of the cases. This difference is, however, not significant when controlling for the dependency of the observations.[9]

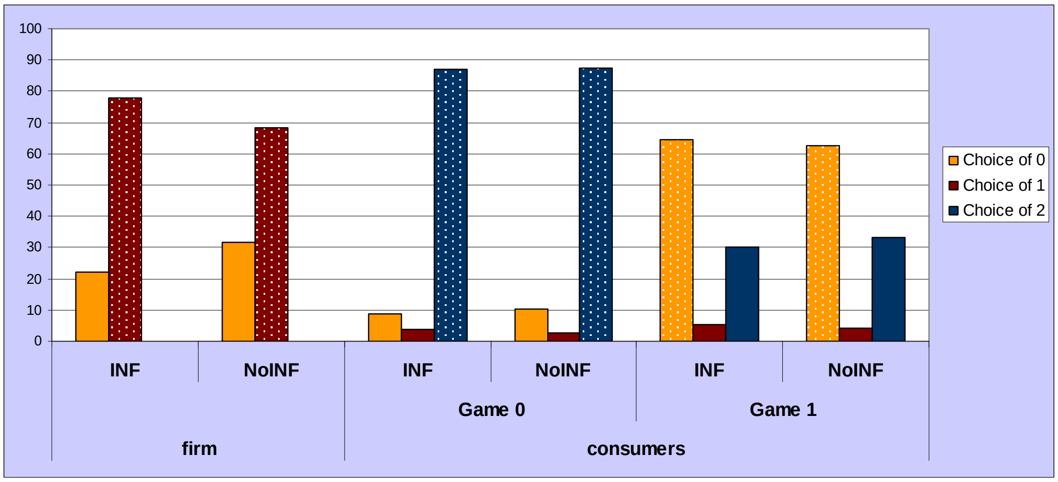

Figure 1: Fraction of the players' strategies

The information conditions in the two treatments are the same for the players in the roles of the consumers, except that they possibly react to the fact that in INF the firm can observe the result in the stage game not chosen by her. As can be inferred from Table 1, the aggregate behavior of the consumers does not differ across treatments. None of the statistical tests revealed a significant difference on the aggregate level. Across the two treatments, 87% of the actions chosen in Game 0 are the equilibrium action "2". Action "0" is played in almost 10% of the cases, and the strictly dominated action "1" in 3%. In Game 1, also the equilibrium action - in this game action "0" - is chosen most frequently (63%). Second is the proportion of the cooperative action "2" with 31.72%. This implies on average 14.70% of the outcomes to be cooperative, starting from

[9] A Mann-Whitney test with each firm-player taken as an independent observation gives a p-value of 0.45.

22% during the first 10 periods and dropping over the course of the game.[10] 4.79% of the actions chosen are the dominated action "1".[11]

In both treatments, the average sum of efforts in Game 0 exceeds the average sum in Game 1 by more than one unit (3.56 vs. 1.31 in treatment INF; 3.53 vs. 1.41 in treatment NoINF). Choosing "1" is therefore profitable for the firm, on average. In fact, action "1" is at least as profitable as action "0" in 78% of the decisions.

2.1 Behavior of the Players in the Role of the Firm

A closer look at the data reveals that the 9% difference between the firm's equilibrium play in the two treatments, is solely due to 4 players, who choose "1" in at most two periods in NoINF. Two of them never even try to see what the outcome of the game would be if they chose "1". Apparently they are certain that "0" is the better choice and do not appear to reason about the incentives of the consumers. Thus, 4 out of 24 subjects that are in the role of the firm in the NoINF treatment do not manage to learn to choose the subgame perfect equilibrium action "1". Categorizing the subjects therefore as "Non-learners" and "Learners", we can reject the Null-Hypothesis that the allocation of these two types within the treatments is random on a 1%-significance level, using a Chi2-test ($X^2 = 6.81$, $p < 0.001$).[12] Players in the role of the firm who did not learn to play "1" earned on average € 4.10 or about 25% less than "Learners".

In the following we assess what determines the tendency of a player in the role of the firm to choose the equilibrium action "1", in particular with respect to the treatment differences. We run a robust probit regression clustered for matching groups with the firm's decision as the dependent variable. We expect the choices made by the firms to be sticky, in the sense that a player is more likely to play the equilibrium action in a particular period when she has done so the period before.

[10] These rates are lower than the ones in the study by Cooper (1996) who finds average cooperation rates in the one-shot prisoner's dilemma of 38% in the first ten rounds with stranger matching. Though cooperation is declining over time, the cooperation rate was found to be over 20% in all 40 periods. Our rates are also much lower than what is reported in a meta-study on the behavior in prisoner's dilemma games by Jones (2008) who states average cooperation rates of 43%.

[11] Costa-Gomes and Weizsäcker (2008) state results concerning the frequency of play of dominated actions in one-shot games. They report an average proportion of 12%, which resembles our results in the first periods in both treatments. Dominated actions are chosen less often in later rounds of our experiment.

[12] Fisher's exact test gives a p-value of 0.054; according to this test, the hypothesis of random allocation can be rejected on a 10%-level.

To control for this effect, we include the variable a_{t-1} in the regression, that is equal to the firm's choice in the preceding period. This variable should have a strong effect once the players learn to choose the equilibrium action and stick with it.

Even though on the aggregate the difference in the fraction of equilibrium choices by the firms is not significant across treatments, one would expect different dynamics in learning. In the INF treatment, each player in the role of the firm can judge after each round whether the choice she made was indeed the optimal one given the actual behavior of the consumers in both stage games. In the NoINF treatment, learning from the outcome of the alternative action is not possible. To capture this effect, we construct a dummy variable *opt*, that equals one when playing "1" was at least as good as playing "0" for the firm in the respective preceding period, i.e. when the equilibrium choice was indeed (weakly) optimal the period before. As in NoINF the comparison of alternative actions is impossible, we expect treatment differences and thus include an interaction term $treat * opt$. The variable $treat$ represents a dummy that is one for treatment NoINF and zero otherwise. Treatment INF is our baseline treatment.

Another type of variable that is likely to influence the choice of action is associated with the reinforcement learning effect. In defining a variable capturing this effect, we closely follow the approach suggested in the learning model by Roth and Erev (1995). The authors argue that actions become more attractive, and are thus more likely to be played in the future, when these actions yield an average payoff higher than the past average payoffs from all actions, including the equilibrium action. Hence, we define the regressor $\Delta\pi_{all}$ as the difference between the average profit generated by the equilibrium action and the average profits of all past actions. According the the idea of reinforcement learning, the likelihood of a player choosing the equilibrium action should increase in the payoff difference $\Delta\pi_{all}$. To control for treatment differences, we include an interaction term $treat * \Delta\pi_{all}$.

With several actions available, contrasting the returns from one action with the experienced returns from all actions in order to judge an action's profitability is reasonable, as done in the process of reinforcement learning. In our setting, however, for the firms there are just two actions available. It seems thus tractable and more natural to compare the past profits of one action to the past profits of the other. This can be seen as a variant of the reinforcement learning process. To evaluate this effect, we construct a regressor $\Delta\pi_0$ representing the difference between the past

equilibrium action	Coef.	Std. Err.	Coef.	Std. Err.
a_{t-1}	1.114***	0.187	0.878***	0.189
opt	0.817***	0.154	0.699***	0.164
$treat * opt$	-0.550**	0.220	-0.578**	0.244
$\Delta\pi_{all}$	0.146***	0.038		
$treat * \Delta\pi_{all}$	-0.014	0.043		
$\Delta\pi_0$			0.110***	0.021
$treat * \Delta\pi_0$			-0.005	0.024
period	0.016***	0.005	0.010*	0.005
treat	0.389**	0.193	0.437*	0.241
constant	-0.907***	0.138	-0.822***	0.173
Pseudo R^2	0.412		0.447	
N	1872		1872	

Notes: robust standard errors are clustered for matching groups,

*,**,*** Significant at 10-, 5-, 1-percent level.

Table 2: Probit regression for the firm's equilibrium choice

average profit obtained by action "1" and the past average profit obtained by action "0". In order to capture treatment differences, we add an interaction term $treat * \Delta\pi_0$ to the regression.

Subjects become more familiar with the game over the course of time. Thus, we include the variable *period* to help explain the evolution of choices with time-related influences that go beyond learning. Lastly, we include a treatment dummy *treat* to check for treatment differences after having controlled for learning effects. The results of the regression are given in table 2. The left panel shows the results for the probit regression with the standard measure of reinforcement learning $\Delta\pi_{all}$, and the right panel displays the results with the alternative measure $\Delta\pi_0$.

In both regressions in table 2 the coefficient of a_{t-1} is large and significant. The probability of choosing the equilibrium action indeed hinges heavily on the choice made in the preceding period. Also, the coefficient *opt* is significant and positive in both regressions. The INF treatment enables the players in the role of the firm to ascertain whether the choice of "1" is the better option in terms of payoffs compared to "0". If this is the case, the likelihood of choosing "1" in the next period increases significantly. Apparently, players learn from an alternative they have not chosen, and undertake an effort to compare the consequences of both the chosen and the alternative action. This implies, that reciprocal (or cooperative) behavior by the consumers might have an impact on the firm's choice. Also tempting the firm to select Game 0 by playing "0" in this game works in the right direction, i.e. making Game 0 more attractive by choosing lower effort levels in this game increases the likelihood of this game to be chosen.

When players do not have the possibility to explicitly learn their opportunity costs, as in NoINF, the effect of *opt* vanishes; in both regressions the hypothesis that *opt* and $treat * opt$ neutralize each other cannot be rejected at any reasonable significance level. In this sense, the learning dynamics in the two treatments differ.

The results in table 2 are supportive of the reinforcement learning model for both types of measures. The probability of choosing "1" increases significantly as the return from this action compared to the return from all actions ($\Delta\pi_{all}$) or from the "0"-actions ($\Delta\pi_0$) raises. This holds for both treatments, as the coefficient of the respective interaction terms are insignificant. This is very reasonable, as the learning conditions concerning the past are the same across treatments. It seems that the measure $\Delta\pi_0$ has more predictive power than $\Delta\pi_{all}$, as the Pseudo R^2 of the regression in the right column is higher than the one in the left, everything else equal. Furthermore, when both $\Delta\pi_{all}$ and $\Delta\pi_o$ are included in the regression, $\Delta\pi_{all}$ is no longer significant. Hence, in this simple task, subjects tend to compare the profitability of actions directly rather than comparing one action with the average profits from both actions.

The coefficient of *period* is positive and significant. Subjects' decisions change over time in a manner that is not fully explained by learning. The quantitative effect, however, is small. Computing the marginal effects shows that an additional period increases the probability of a subject choosing "1" by 0.6%, respectively, by 0.3% in the two panels. Including an interaction term of period and treatment does not qualitatively change the results.

The regressions reveal a difference in intercepts between INF and NoINF, as the coefficient of *treat* is significant in both regressions. At the very beginning it seems that subjects in NoINF are more prone to choose "1". This might be due to some subjects in NoINF thinking harder in the beginning, as they do not learn immediately, whether their decision was the optimal one. As experience and the possibility of comparing the actions' payoffs comes into play, the probability of a subject playing "1" increases more in INF.

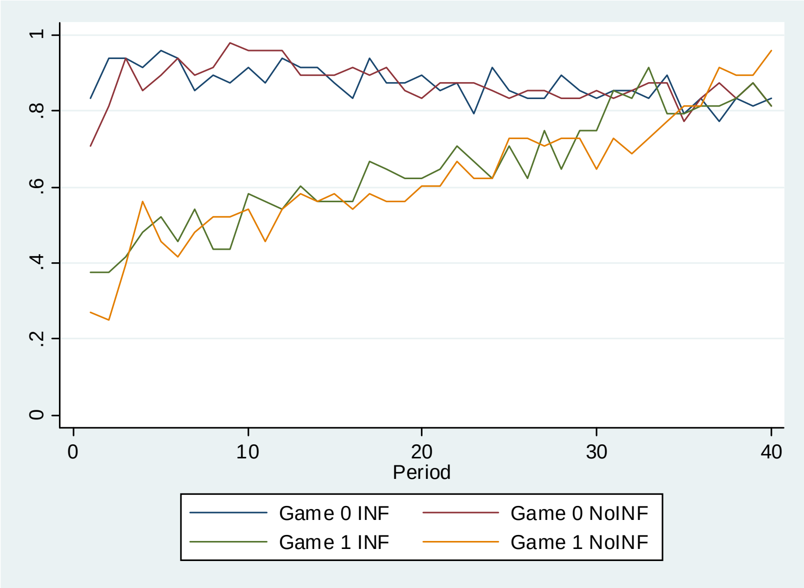

Figure 2: Fraction of equilibrium actions of the consumers

Our hypothesis with regard to the firms' learning can be confirmed. Indeed, a substantial number of subjects do not learn to play the counterintuitive action "1" in the NoINF treatment, where learning is more difficult. Also, the learning process differs in the treatments due to differences in the information condition according to the regression results. The prerequisites for the temptation hypothesis to work are given, as players compare the outcomes of their actions if possible. However, a more frequent choice of "0" can not be observed towards the end of the experiment. Thus, either there was too little reciprocal and/or tempting behavior by the consumers, or the firms did not react appropriately.

2.2 Behavior of the Players in the Role of the Consumers

The equilibrium predictions of the stage games Game 0 and Game 1 are quite strong, but the consumers have incentives to deviate from equilibrium behavior, as argued above. To give an impression of the evolution of their play over time, we present figure 2.

The two upper lines in figure 2 show for both treatments the fraction of subjects in the role of the consumers, who chose action "2" in Game 0, i.e. the equilibrium action of this stage game. Analogously, the two lower lines display for both treatments the fraction of equilibrium play in Game 1, i.e. action "0". The evolution of equilibrium play in the two treatments is statistically indistinguishable. In both treatments, there is a trend in the development of equilibrium play in both of the stage games; the frequency of equilibrium actions in Game 0 is decreasing over time, whereas it is increasing in Game 1.

To extract the driving forces of the choice of the equilibrium action by the consumers, we run a probit regression for both stage games separately. The respective regressand is a dummy variable equal to one, when a consumer chooses the equilibrium action of the stage game j in this period, and zero otherwise, where $j \in \{0, 1\}$.[13] Again, we cluster for matching groups. As in the regressions for the firm we include the consumers' lagged equilibrium decision $equ(j)_{t-1}$. In both regressions, this dummy variable equals one when the player in the role of a consumer chose the equilibrium action of Game j in the preceding period, and zero otherwise. For the regression of Game 0, this means $equ(j)_{t-1}$ is one when the subject chose "2" in Game 0 the period before, and, analogously, it is one in the regression of Game 1, when the subject's preceding choice was "0" in Game 1.

Further, we expect the players to react to their partner's choice, even though subjects are randomly matched with each other within their matching group. In particular, in Game 1 the players experience a drop in payoffs if they choose the Pareto-optimal choice "2" instead of choosing "0" or "1", and their partner opts for the equilibrium action. This experience probably increases their willingness to choose the equilibrium action themselves in future periods. Hence, we include the dummy variable $p\_equ(j)_{t-1}$ that is one when a player's partner chose the equilibrium action of Game j in the preceding period, and zero otherwise.

Furthermore, to identify the effect of understanding strategic interaction, we add the dummy variable $equ(k)_{t-1}$ to the regression. This variable is one when a player chooses the equilibrium action in the respective other stage game in the preceding period, i.e. in the regression for Game j the variable $equ(k)_{t-1}$ equals one when the player chose the equilibrium action in Game k, where $k \in \{0, 1\}; j \neq k$, and zero otherwise. We hypothesize that players who select the equilibrium action in one of the stage games will do so also more often in the other.

Players might have a preference to play the same strategies in both stage games, for example because this is an easy thing to do. Alternatively, playing action "2" in both games, might indicate

[13] At this point, we are not particularly interested in the specific deviating action. Generally, deviation from equilibrium means in Game 0 choosing a lower than equilibrium effort level and in Game 1 choosing a higher one.

preferences for efficiency. A player who chooses "2" in Game 1 might want to choose "2" in Game 0 not because it is the equilibrium action but because this action leads to an efficient result for the consumers. In order to investigate these hypotheses, we include a dummy variable $same(k)_{t-1}$ that is one when the player chose the same action in Game k as the equilibrium action in Game j in the preceding period.[14] That is, the variable $same(k)_{t-1}$ is equal to one in the regression for Game 0, when the player chose action "2" in Game 1 before. Notice, that action "2" is the equilibrium action in Game 0. Analogously, $same(k)_{t-1}$ is equal to one in the regression for Game 1, when the player selected action "0" in Game 0, and zero otherwise.[15]

In addition, we add the lagged choice of the firm, a_{t-1}, that determines which stage game became payoff relevant in the preceding period. Also, we again include a variable that captures the difference between the past payoffs of the equilibrium action and all other actions in the respective stage game. Hereby, we look at the theoretical payoffs, as obviously only one of the two stage games per period became payoff relevant through the choice of the firm. But as the consumers always learn the outcome of both stage games, the players can judge whether their chosen actions were potentially profitable ones.[16] In order to evaluate the firms' influence on the play of the consumers beyond the direct impact on their own payoffs, we include the lagged earnings of the firm, $\pi\left(A\right)_{t-1}$, in the regression.

In the course of the game some players in the role of the firm learned very quickly to choose Game 1 and stuck with this decision in the remaining periods, whereas others learned it late in the game or even never. Hence, there are differences in the matching groups with respect to the firms' behavior. In matching groups where the firms' choice of Game 1 was made at an early stage and was stable thereafter, we expect the matched consumers to react strongest to the behavior by the firm. To put it differently, the best chance to see evidence for the reciprocity and the temptation hypothesis is within matching groups, where the firms select (almost) always Game 1.[17] Hence, we

[14] We include the lag of this variable in order to avoid confounds with the ongoing period.

[15] Note that we now include two out of the three actions of Game k in the regressions. Hence, the coefficients of $equ(k)_{t-1}$, and $same(k)_{t-1}$ have to be interpreted in relation to action "1" chosen in Game k in the preceding period.

[16] We also tried payoff measures with only the payoff relevant outcomes, as well as a measure constructed from the payoff differences between the equilibrium choices and all past actions. The measure presented in this regression had the strongest explanatory power, and results did not qualitatively change with other measures.

[17] In fact, there was not a single firm-player, who persistently changed back to action "0" after some periods of "1". So if there was an attempt to make the firm choose "0" by playing "0" in Game 0, it did not make the firm-players change their minds later in the game. Aside from the four subjects in the role of the firm who almost never chose

constructed a dummy variable *group*, that is one for all the matching groups, where the three firms that belong to this matching group constantly chose "1" at latest after the 16th period. Matching groups with at least one firm switching between "0" and "1" till late in the game, or never choosing "1", were labeled zero in *group*. Lastly, we again included *period* and *treat* in the regression. The results are shown in table 3.

equilibrium action dummy for Game j	Game 0 Coef.	Game 0 Std. Err.	Game 1 Coef.	Game 1 Std. Err.
$equ(j)_{t-1}$	1.777***	0.143	1.487***	0.086
$p\_equ(j)_{t-1}$	0.110	0.122	0.470***	0.091
$equ(k)_{t-1}$	0.551***	0.124	0.760***	0.101
$same(k)_{t-1}$	0.335**	0.146	0.803***	0.092
a_{t-1}	-0.201**	0.086	0.092	0.066
$\pi\,(A)_{t-1}$	-0.020**	0.10	-0.003	0.005
$\Delta\pi$	0.038***	0.006	0.020***	0.003
period	-0.005*	0.003	0.013***	0.002
group	-0.115	0.126	0.279***	0.078
treat	-0.022	0.125	0.002	0.082
constant	-0.062	0.635	-2.043***	0.169
Pseudo R^2	0.370		0.359	
N	3744		3744	

Notes: robust standard errors are clustered for matching groups,

*,**,*** Significant at 10-, 5-, 1-percent level.

Table 3: Probit regression for the consumers' equilibrium choice

In both regressions the coefficients of $equ(j)_{t-1}$ are large, positive and significant. Similarly to the firms, the consumers are more prone to play the equilibrium of the respective stage game if they have done so the period before.

In line with theory, the coefficient of $p\_equ(j)_{t-1}$ for the regression in the right panel is insignificant, as the equilibrium action in Game 0 is a dominant strategy and thus independent of the partner's choice. However, in Game 1 the players seem to be influenced by their preceding

"1", all the others did it in the end at least regularly.

partner's action, though the equilibrium of Game 1 is in weakly dominant strategies. Still this seems reasonable, as only in this stage game is there a conflict between the efficient and the equilibrium action. A player who has experienced her partner choosing the equilibrium action in Game 1, is more prone to choose this action herself in the next period instead of choosing the efficient action.

The variable $equ(k)_{t-1}$ is significantly positive for both stage games. This indicates that players are more likely to play the equilibrium strategy in Game 0 if they did so in Game 1 in the period before, compared to the case when they choose action "1", and vice versa. Hence, some players seem to have an understanding of strategic interaction in a game theoretic sense.

Also highly significantly positive in both regressions is the coefficient of $same(k)_{t-1}$. As noted above, several reasons might apply for this finding. In the regression for Game 0, the positive influence by $same(k)_{t-1}$ could imply that players have preferences for efficient outcomes. Having chosen the efficient action "2" in Game 1 makes them apparently more likely to choose the efficient action "2" in Game 0, that is at the same time the equilibrium action of this stage game. Thus, some players may choose the equilibrium strategy in Game 0 not for strategic reasons, but because they want to opt for the efficient strategy. The significant impact of $same(k)_{t-1}$ in the regression for Game 1 could be interpreted as an attempt to make Game 0 more attractive to the firm compared to Game 1. This interpretation implies that this effect exists only in the INF treatment as only in this treatment the firm can directly compare the outcomes of the stage games. However, if we include an interaction term $treat * same(k)_{t-1}$ the influence does not vanish. Hence, the alternative explanation that players like to choose the same strategy in both games probably due to simplicity, seems to have at least some explanatory power.[18]

The variable a_{t-1} is only significant in the regression for Game 0. This possibly indicates that the consumers choose less often the equilibrium strategy in Game 0 because they experienced this game not to be payoff relevant. If the firm has chosen Game 1 in the preceding period, the consumers might expect this to happen again. With this viewpoint, their choice in Game 0 is irrelevant. But, following this argument, it is not obvious that the coefficient of a_{t-1} should be significant, as a deviation from equilibrium in a game that does not matter is not strictly the best response. Alternatively this coefficient could indicate that players try to make the choice of Game 0 more favorable to the firm, which is the essential of the temptation hypothesis. The significantly

[18] It is unlikely that subjects thought they had to choose the same action in both stage games, as the examples in the instructions and the questionnaire dealt mostly with two different choices.

negative coefficient of $\pi(A)_{t-1}$ supports this interpretation. Apparently, the consumers are aware of the earnings of player A and react to it with lowering their effort in Game 0. Both of these findings are in line with the temptation hypothesis.

The coefficient of *group* in the regression for Game 1 is significantly positive. Hence, in matching groups where the consumers have almost solely experienced Game 1-choices of the firm, the probability of choosing "2" in Game 1 increases. The reciprocity hypothesis would have suggested otherwise. Hence, there is no indication of the reciprocity hypothesis. Either the players do not judge the choice of Game 1 by the firm as unfavorable, or the punishment strategy implying a play of action 2 is too expensive, in particular as equilibrium play is increasing over time. In a post-experimental questionnaire, the majority of the subjects in the role of the consumers declared that they prefer Game 0 to be chosen by the firm.[19] But none of them blamed the firm for its frequent choices of Game 1. They rather complained about the egoistic play of their counterpart in Game 1 and not about the firm having them put into this strategically unfavorable situation. About a quarter of the subjects indicated that they themselves were willing to cooperate in Game 1 but that they made bad experiences with the cooperative action. Hence, in this setting negative reciprocity is not a driving force as the firm's behavior seems not to be judged as unkind. A possible explanation is that the subjects are better able to put themselves into the position of a player who is in the same strategic situation as themselves, as the respective other consumers, and thus feel capable of evaluating the other consumer's action. Thinking about the strategy and the corresponding motives of a player whose incentives are different from their own, as the ones of the firm, is more demanding and might thus not be accomplished by the consumers.

Just like the firms, the consumers choose the equilibrium actions more often, as these become more profitable compared to the non-equilibrium actions, as $\Delta\pi$ is significantly positive in both regressions. The coefficients of *period* go in the direction suggested by figure 2. There seems to be some trend over the course of the game not captured by the learning variables. However, the influence of *period* is quantitatively small. Treatment differences are not found, as the coefficient of *treat* is insignificant.

[19] The questions we asked the consumers were "Did you prefer player A to choose input 0 or input 1?", "According to which criteria did you choose your input?", and "Did your input choice differ depending on the action of player A?".

3 Discussion and Conclusions

In this paper we experimentally investigate the behavior in a strategic situation underlying for example the implementation of voluntary agreements by firms in order to preempt consumer lobbying groups from political intervention. The voluntary increase of the environmental standard by a firm is costly but changes the strategic incentives of the consumers such that the firm is (in equilibrium) better off in the end. We use a neutral setting in our experiment in order to focus on pure strategic considerations and not to push subjects into a direction by using value-laden terms. We find that all subjects in the role of the firm learn to increase the standard voluntarily in the full information treatment. Under restricted information conditions a substantial fraction of subjects do not incur the costs in order to increase the standard, implying that the reasoning about other players' incentives is limited. In deciding about their strategy the players in the role of the firm compare the effects of their actions, if possible, and learn from their past payoffs.

On the side of the consumers we investigate whether they perceive a deterioration of their strategic situation a unkind, and thus possibly reciprocate in a negative way. The results indicate that the former is not true, though the majority of the subjects prefer the stage game chosen only rarely by the firms. Hence negative reciprocal behavior is not observed. Several reasons might apply for why consumers did not perceive the firm's behavior to be based on bad intentions. As there are two consumers, they have to think about the action of the respective other consumer. This might have been in the focus of the consumers instead of thinking about the motives of the firm. Beyond that, the advantage the firm gained by increasing the voluntary standard might not have been large enough in order to make the selfish behavior of the firm sufficiently apparent. Also, the use of the strategy method for the consumers might have weakened the perception of having been treated unfavorably.[20]

Though there is no direct punishment of the firm, the results indicate that the consumers try to influence the choice of the firm by deviating from the equilibrium in the stage game rarely chosen by the firm. Instead of harming the firm, they attempt to alter the firm's incentives.

Further research on how unkind behavior is perceived if it is directed at a deterioration of strategic incentives and not directly at payoffs is needed.

[20] Casari and Cason (2009) show that trustworthiness in a trust game is lower when elicited by the "cold" strategy method compared to the "hot" game method.

4 Appendix

4.1 Instructions for the INF treatment

The experiment you are taking part in is part of a project funded by the German Science Foundation. It is about analyzing economic decision behavior. Your income earned in this experiment depends on your decisions and the decisions taken by the other participants. Please read these instructions thoroughly. They are the same for all participants.

Please note that during the experiment it is not allowed to communicate with the other participants. If you have any questions, please raise your hand. One of the experimenters will come to your and answer your question personally. Please do not ask your question publicly. Should there be any infringement of these rules, we will immediately end the experiment.

General

The experiment consists of 40 rounds in each of which you have to take decisions. The course of actions and the decision situations are the same in all rounds. At the beginning of the experiment you are randomly assigned a role A, B, or C. You stick to this role during the whole experiment. In each of the rounds you interact with two randomly chosen participants who are in the respective other roles. This means each round you form with two potentially different participants one group. Your identity and those of the other participants will not be revealed in the experiment.

In each round you have to take one or two decisions, independent of the other participants. After all participants have made their decision, the next round starts. After each round the number of points you and your group members have earned will be displayed to you. Those points determine your income in the following way: after the 40 rounds are finished, seven rounds will be picked randomly. The points you have earned in these seven rounds will be summed up and converted into Euros at the exchange rate 1 point=0.10 Euro, and paid in cash to you.

Decision situation in one round

Each round all members of a group have to make a decision about their "input". The sum of all inputs determines the points each player earns. In addition, for the players in role B or C it is relevant whether they themselves or the respective other group members have contributed their inputs. You can infer the exact allocation of points from the tables blow.

Course of decisions in one round

At the beginning of each round the player with role A decides whether he/she chooses an input of 0 or 1. This decision is initially not revealed to the players B and C. The group members B and C simultaneously choose their input of 0, 1, or 2. They make their decision dependent of whether player A has chosen an input of 0 or 1. Player B (C) make those two decisions without knowing the input of player C (B). After all players made their decisions the round is over and the decisions are revealed. The points are allocated accordingly. The number of points you have earned in this round are displayed to you at the end of the round.

Hence, player A only makes one decision, namely whether she/he chooses input 0 or 1. Players B and C make two decisions. One is their input choice should player A chose "0". The other is their input choice if player A has chosen "1". The input of the player B and C is 0, 1, or 2, respectively.

Point allocation of one round

The sum of inputs determines the point allocation for player A as follows:

Sum of inputs	0	1	2	3	4	5
points for player A	36	31	26	21	16	11

The points for the players B and C can be inferred from the tables below. The point allocations depend both on the sum of inputs and the own input in relation to the input of the respective other players. Depending on whether player A has chosen an input of 0 or 1, the point allocations are thus different.

Points of players B and C if **A has chosen an input of 0:**

		player C (B)		
	inputs	**0**	**1**	**2**
	0	$0, 0$	$23, -5$	$34, 2$
player B (C)	**1**	$-5, 23$	$20, 20$	$31, 27$
	2	$2, 34$	$27, 31$	$34, 34$

Points of players B and C if **A has chosen an input of 1**:

		player C (B)		
	inputs	**0**	**1**	**2**
	0	23, 23	34, 6	45, 13
player B (C)	**1**	6, 34	31, 31	38, 34
	2	13, 45	34, 38	36, 36

The tables read as follows:

The bold numbers $\{0, 1, 2\}$ are the feasible inputs of B and C. If you are in the role of player B or C, the tables will always be presented to you in such a way that you can determine the row of the table by choosing your input and the respective other player determines the column by his/her input. This happens to facilitate reading the tables and does not influence the outcome. The numbers in the cells are the points for B and C. Thereby the left number represents in the cell the points for the player choosing the rows. The right number represents the points earned by the player who chooses the columns.

For example, if player A chooses an input of 1, player B chooses "1" and player C chooses "0", player B earns 6 points and player C 34 points. Note that this allocation is independent of who chooses row or column. The sum of points is 2. According to the table above, player A earns 26 points.

The following point allocations are feasible:

In case player A chooses an input of 0 and

- player B chooses 0 and player C chooses 0
  - player B earns 0 points,
  - player C earns 0 points, and
  - player A earns 36 points,
- player B chooses 1 and player C chooses 0
  - player B earns -5 points,
  - player C earns 23 points, and

– player A earns 31 points

[All possible combinations and resulting point allocations are listed in the original instructions as the six combinations above.]

Example for one round

Player A chooses an input of 0. This decision remains secret at first. Player B chooses an input of 2, for the case that player A chose an input of 0 (and thus the upper table becomes payoff relevant), and an input of 2, for the case that player A chose an input of 1 (and thus the lower table becomes payoff relevant). Player C chooses an input of 0, for the case that player A chose an input of 0, and an input of 2, for the case that player A chose an input of 1. The points are allocated according to the decisions made. The sum of inputs in this example is 2 ("0" from player A, "2" from player B, and "0" from player C). Player A thus earns 26 points. Players B and C earn 2 points and 34 points, respectively. The decisions the players B and C made should player A choose an input of 1 are in this example irrelevant for the allocation of points. However, they are made common knowledge.

It is very important for you to understand how the decisions translate into the allocation of points. If you have any questions, please raise your hand.

After you learned of all decisions and your earnings in one round, the next round starts. Remember that out of the 40 rounds played in total 7 will be randomly selected and will determine your earnings. The sum of the points reached in these 7 rounds is converted into Euros according to the exchange rate above.

Please note that all examples given in the instructions were chosen arbitrarily. They should not serve as hints on how to behave.

4.2 Control Questions

Please answer the following questions and raise your hand once you have completed the quiz.

1. Suppose you are player A. How many decisions do you have to take in one round?

   (a) One decision.

   (b) No decision.

   (c) Two decisions.

2. Suppose you are player C. How many decisions do you have to take in one round?

   (a) One decision.

   (b) No decision.

   (c) Two decisions.

3. How many decisions will become common knowledge at the end of one round?

   (a) One decision.

   (b) Three decisions.

   (c) Five decisions.

   (d) Six decisions.

4. Suppose you are player B. What do you know at the time you have to make your decisions?

   (a) You know the decision of player A.

   (b) You know the decision of player C.

   (c) You do not know any of the decisions of your group members.

5. Suppose, you learn that in one round player A has chosen "1", player B has chosen "1", and player C has chosen "2". What will the point allocation be for

   (a) player A ? ________________

   (b) player B ? ________________

   (c) player C ? ________________

6. Suppose, you learn that in one round player A has chosen "0", player B has chosen "1", and player C has chosen "0". What will the point allocation be for

   (a) player A ? ________________

   (b) player B ? ________________

   (c) player C ? ________________

7. You play in each round with two randomly determined participants in one group.

(a) True.

(b) False.

8. Your overall income is the converted sum of the point allocations of all rounds.

   (a) True.

   (b) False.

References

Arora, S. and T. N. Cason (1995). An experiment in voluntary environmental regulation: Participation in epa's 33/50 program. *Journal of Environmental Economics and Management 28*(3), 271–286.

Arora, S. and S. Gangopadhyay (1995). Toward a theoretical model of voluntary overcompliance. *Journal of Economic Behavior & Organization 28*, 289–309.

Berg, J., J. Dickhaut, and K. McCabe (1995). Trust, reciprocity, and social history. *Games and Economic Behavior 10*(1), 122–142.

BLL (2010, April). Press release. http://www.bll.de/presse/pressemitteilungen/pm-20100422-gfk/.

Casari, M. and T. N. Cason (2009, June). The strategy method lowers measured trustworthy behavior. *Economics Letters 103*(3), 157–159.

Clark, K. and M. Sefton (2001, January). The sequential prisoner's dilemma: Evidence on reciprocation. *Economic Journal 111*(468), 51–68.

Cooper, R. (1996). Cooperation without reputation: Experimental evidence from prisoner's dilemma games. *Games and Economic Behavior 12*, 187–218.

Costa-Gomes, M. A. and G. Weizsäcker (2008). Stated beliefs and play in normal-form games. *The Review of Economic Studies 75*, 729–769.

Dawson, N. L. and K. Segerson (2003, November). Voluntary agreements with industries: Participation incentives with industry-wide targets. Working papers 2004-06, University of Connecticut, Department of Economics.

Dufwenberg, M. and G. Kirchsteiger (2004). A theory of sequential reciprocity. *Games and Economic Behavior 47*, 268–298.

Falk, A., S. Gächter, and J. Kovacs (1999). Intrinsic motivation and extrinsic incentives in a repeated game with incomplete contracts. *Journal of Economic Psychology 20*, 251–284.

Fehr, E., S. Gächter, and G. Kirchsteiger (1997). Reciprocity as a contract enforcement device: Experimental evidence. *Econometrica 65*, 833–860.

Fischbacher, U. (2007, June). z-tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics 10*(2), 171–178.

Greiner, B. (2004). An online recruitment system for economic experiments. In K. Kremer and V. Macho (Eds.), *Forschung und wissenschaftliches Rechnen 2003*, Volume 63 of *GWDG Bericht*, pp. 79–93. Göttingen, Germany: Ges. für Wiss. Datenverarbeitung.

Güth, W., R. Schmittberger, and B. Schwarze (1982, December). An experimental analysis of ultimatum bargaining. *Journal of Economic Behavior & Organization 3*(4), 367–388.

Innes, R. (2006). A theory of consumer boycotts under symmetric information and imperfect competition. *The Economic Journal 116*, 355–381.

Jones, G. (2008). Are smarter groups more cooperative? evidence from prisoner's dilemma experiments, 1959-2003. *Journal of Economic Behavior & Organization 68*, 489–497.

Kirchhoff, S. (2000). Green business and blue angels: A model of voluntary overcompliance with asymmetric information. *Environmental and Resource Economics 15*, 403–420.

Mason, C. F. and C. Nowell (1998). An experimental analysis of subgame perfect play: the entry deterrence game. *Journal of Economic Behavior & Organization 37*, 443–462.

Maxwell, J. W., T. P. Lyon, and S. C. Hackett (2000). Self-regulation and social welfare: The political economy of corporate environmentalism. *Journal of Law and Economics 43*, 583–617.

Roth, A. E. and I. Erev (1995). Learning in extensive-form games: Experimental data and simple dynamic models in the intermediate term. *Games and Economic Behavior 8*(1), 164 – 212.

Discussion Papers of the Research Area Markets and Choice 2015

Research Unit: **Market Behavior**

Sebastian Kodritsch A note on the welfare of a sophisticated time-inconsistent decision-maker	SP II 2015-201
John Duffy, Dietmar Fehr Equilibrium selection in similar repeated games: Experimental evidence on the role of precedents	SP II 2015-202
Onur Kesten, Morimitsu Kurino, Alexander Nesterov Efficient lottery design	SP II 2015-203
Dietmar Fehr, Rustamdjan Hakimov, Dorothea Kübler The willingness to pay-willingness to accept gap: A failed replication of Plott and Zeiler	SP II 2015-204
Dorothea Kübler, Julia Schmid Take your time to grow: A field experiment on the hiring of youths in Germany	SP II 2015-205
Julia Schmid Voluntary industry standards: An experimental investigation of a Greek gift	SPII 2015-206

Research Unit: **Economics of Change**

Nikolaus Schweizer, Nora Szech Revenues and welfare in auctions with information release	SP II 2015-301
Maja Adena, Steffen Huck Matching donations without crowding out? Some theoretical considerations and a field experiment	SP II 2015-302
Justin Valasek Reforming an institutional culture of corruption: A model of motivated agents and collective reputation	SP II 2015-303
Steffen Huck, Nora Szech, Lukas M. Wenner More effort with less pay: On information avoidance, belief design and performance	SP II 2015-304

All discussion papers are downloadable:
http://www.wzb.eu/en/publications/discussion-papers/markets-and-choice

WZB Junior Research Group: **Risk and Development**

Ferdinand M. Vieider, Clara Villegas-Palacio, Peter Martinsson, Milagros Mejía

SP II 2015-401

Risk taking for oneself and others: A structural model approach