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Incentive Compatible Contracts?

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Abstract

Property rights theory suggests that vertical integration is a sensible solution to hold-up problems and therefore improves social welfare. Theories of reciprocity, in contrast, suggest that vertical integration can reduce social welfare if it implies an unfair distribution. Translating the hold-up situation into a simple prisoners' dilemma game, we provide experimental evidence for social preferences at the individual level. Some individuals behave conditionally cooperative in the hold-up situation and some do not cooperate when they are offered an incentive compatible but unfair contract. Nevertheless, property rights theory correctly predicts that vertical integration increases aggregate welfare even in the case of unfair outcomes.

JEL classification: C72, D23, D63.
Keywords: Prisoners' Dilemma, Hold-up Problem, Experiment.

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1 Introduction

Property rights theory suggests that well-defined property rights ensure efficient allocations (Demsetz (1967)). The prisoners' dilemma game provides an example. Mutual cooperation would ensure the efficient outcome but poorly defined property rights induce non-cooperative behavior. Well-defined property rights would internalize the negative effects of non-cooperative behavior. In our experiment, we compare the behavior of two players in a prisoners' dilemma with the behavior of the same players in a context with well-defined property rights. In the latter situation, ownership is concentrated in one hand and the owner can adjust payments to the other player according to the behavior. Incentive compatible payments are therefore possible. Such concentration of ownership, however, can also lead to a more unfair distribution of welfare. This may deter people with reciprocal preferences from cooperation. Since people with reciprocal preferences often cooperate in a prisoners' dilemma, it can occur that well-defined property rights induce allocations which are pareto-inferior to allocations in the prisoners' dilemma. Our design allows to test if the reassignment of property rights in fact improves social welfare even if its distribution becomes unfair.

The reallocation of property rights is a crucial problem in situations like the hold-up problem. The hold-up problem is "of central concern to business people" (Holmström and Roberts (1998), p. 80). In its most simple representation, the problem can be expressed as a prisoners' dilemma (Milgrom and Roberts (1992)). Holmström and Roberts (1998) already point to situations with poorly defined property rights and nevertheless very cooperative behavior. There are various explanations for their observation, e.g. reputation mechanisms (Halonen (2002), Bar-Isaac (2007)) or relational contracts (Baker, Gibbons, and Murphy (2002)). Rajan and Zingales (1998) show that the regulation of access to critical resources can dominate this solution. Tirole (1986) and Gul (2001) argue that investment incentives increase with asymmetric information in hold-up problems if investment activities are unobservable. Experimental evidence (e.g. Hackett (1994), Sloof, Oosterbeek, and

Sonnemans (2007)) suggests that these explanations do not explain high ex-ante investments sufficiently. Instead, the results of these experimental studies show that social preferences play a major role in explaining relationship specific investments. Additionally, Ellingsen and Johannesson (2004) show experimentally that ex-ante investments in a hold-up problem lead to better ex-post bargaing outcomes. However, none of these studies suggests that feasible vertical integration would not lead to an efficient outcome, making all other mechanisms redundant. Only Von Siemens (2007) shows theoretically that incomplete contracts may be efficient in hold-up problem with renegotiation if some players have social preferences.

Additional to the above literature with a specific focus on relationship specific investments, there is overwhelming experimental evidence that people in the prisoners' dilemma in fact cooperate frequently (for a summary, see Gächter (2007)), although players' profit maximization goals are diametrically opposed. Further, monitoring may be counterproductive (e.g. Falk and Kosfeld (2006)), and incentive contracts may backfire (as summarized by Fehr and Falk (2002) or Bowles (2008)) because agents behave reciprocal. Reciprocity and conditional cooperation explain many deviations from conventional economic predictions in public good games and prisoners' dilemmas (Gächter (2007)). Some people are ready to cooperate if they expect others to do so as well but refuse to do so if they do not have this expectation. Groups of like-minded people achieve and maintain high levels of cooperation (Gächter and Thöni (2005)) while heterogeneity leads to lower cooperation over time (Fischbacher and Gächter (2009)).

Both conditional cooperation in the prisoners' dilemma and defection under an unfair incentive contract share characteristics that are key building blocks for theories of reciprocal behavior. The first behavior can be classified as positive and the second as negative reciprocity. Our experiment, thus, also tests whether there is a correlation between positive and negative reciprocity in general. Fehr and Schmidt (1999) assume for parts of their analysis also a positive correlation between positive and negative inequity aversion (Fehr and Schmidt (1999), p. 841 and the relevant appendix). Falk and Fischbacher (2006) use in their model just one parameter for both positive and negative reciprocity. So far, there are only few articles that examine the relationship between positive and negative reciprocity empirically. Dohmen, Falk, Huffman, and Sunde (2009) measure a correlation of only 0.021 in relevant survey questions in Germany. Herrmann and Orzen (2008) and Brosig, Riechmann, and Weimann (2007) find no systematic correlation for reciprocal behavior across different games.

Our experiment is designed to test the predictions of property rights theory with subjects who may have social preferences. In the first game of our experiment, subjects play a prisoners' dilemma. This reflects the non-integrated situation. In the second game, the aggregate payoffs remain the same than in the prisoners' dilemma, but the relationship of the two players is now transferred into an integrated situation with players being the "employer" and "employee", respectively, of each other. The owner can choose between two contracts for the employee. Both contracts are incentive compatible for selfish employees but one of the two possible contracts leads to unequal payoffs in the case of mutual cooperation. Property rights theory and the social preferences literature make very different predictions for this. Property rights theory expects social welfare being maximized in the second game due to the internalization of external effects. In the prisoners' dilemma this theory does not predict any cooperation. Theories of reciprocity predict some cooperation in the first game. The second game only implies a certain welfare improvement if employers choose the fair contract.

As we use a within-subject design, our approach differs from papers which compare explicit and implicit incentive contracts. Fehr, Klein, and Schmidt (2007) show that incentive contracts outperform trust contracts with ex-ante wage payments, but not bonus contracts with ex-post wage payments. Fehr, Kremhelmer, and Schmidt (2008) look at the endogenous development of property rights among subjects with heterogenous social preferences. They find that joint ownership provides the efficient solution relative to single ownership. In their experiment ownership does not allow for incentive compatible contracts or no ownership at all.

Our results show that overall welfare increases with vertical integration, even if the offered incentive contracts are not fair. Thus, the results suggest that vertical integration is a sensible policy in hold-up problems. At the individual level, we also find behavior that contradicts conventional economic theory, in particular a high share of (conditional) cooperators in the hold-up problem and defections in the case of unfair incentive contracts. However, behavior in the hold-up problem does not predict behavior in vertically integrated units.

Our paper is structured as follows. We introduce the design and procedures of the experiment in section 2 and present some behavioral predictions of both property rights and social preferences theory in section 3. In section 4 we discuss the experimental results. Section 5 concludes.

2 Experiment

2.1 Design

The subjects in our experiment play two games, where the second game is an integrated version of the first. In the following, we will first introduce the common features of the two games and then explain in detail their differences. In both games each participant has a binary choice between cooperation and defection. Given the set of choices the total revenue of both participants is identical in both games but distributions differ. If both participants cooperate the overall output is 10 points. If just one participant cooperates and the other defects the output is 6, and mutual defection yields a total of 2. The marginal revenue of cooperation is therefore 4. Each game is a sequential game. Player 1 decides first and player 2 decides afterwards. The assignment of participants to the roles of player 1 and 2 is random in both games. All information about behavior and revenues in both games is revealed at the end of the experiment. Each player has a different "partner" in each game.

In the first game (our base game NonInt) the distribution of revenue resembles a standard prisoners' dilemma. If both players cooperate, each party earns 5 points. If both defect the per capita reward is 1. If just one player cooperates, the defecting player gets all 6 points. In our experiment, we use a sequential order of decisions. Thus, player 1 decides first between cooperation and defection. Next, player 2 decides, knowing already the decision of player 1 (see Figure 1). We use the strategy method to elicit responses for both possible assignments of the roles of player 1 and player 2: both participants enter their decisions for the two roles of player 1 and player 2, where they enter one decision for the role of being player 1 and two decisions for the role of player 2, conditioning on both possible choices of player 1. To avoid a predetermination of choices in the second game, we informed players about their actual role in the first game only after they played the second game.

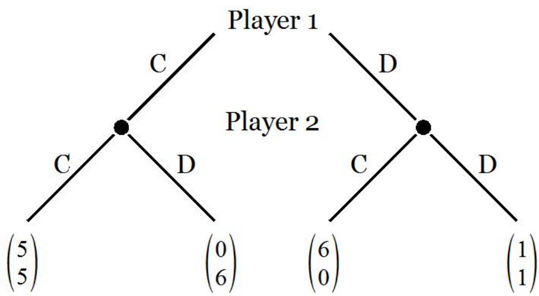

Figure 1: Decision Structure in NonInt

The second game transfers the prisoners' dilemma into a vertically integrated situation. We name this game Int. Figure 2 depicts the structure of this game. Player 1 can choose between two take-it-or-leave-it contracts which determine the distribution of payoffs between the two players. The fair contract provides equal rewards for both players for cooperative behavior. Player 2 receives 5 points in case of cooperation and 2 points in case of defection. All remaining points remain with player 1. In the unfair contract, player 2 gets a lower, but nevertheless incentive compatible reward. Player 2 gets 3 points for cooperation and 2 points for defection. Referring to our research question about the conflict between property rights theory and theories of reciprocity, we are mostly interested in the reactions of players 2 to the unfair offer in this integrated situation compared to their decision as player 2 in the non-integrated situation above.

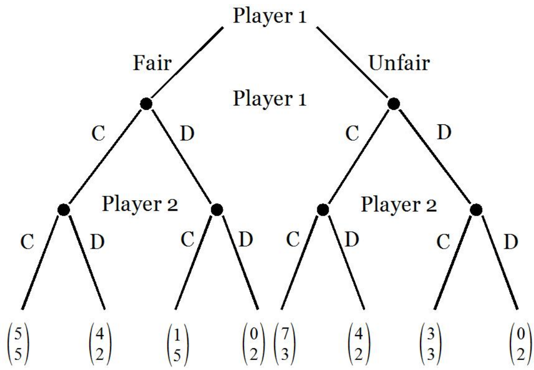

Figure 2: Decision Structure in Int 32

In two sessions we reduced the payoffs for player 2's cooperation (defection) in the contractual setting to 2 (1) (see Figure 3). We use these additional observations as a robustness check to see whether the rejection of unfair offers is sensitive to a modification of its relative cost. We name the two variants of this game according to the payoffs under the unfair contract Int 32 and Int 21.

In Int, each participant plays only one role either of player 1 or player 2. Player 1 only makes the actual decision between the two options "cooperate" and "defect" and, of course, between the two contracts. For player 2 we again use the strategy method such that player 2 decides between the two options cooperate and defect in each contract, knowing whether player 1 cooperates or defects, but not the contract offered.

In our experiment we use a within-subject design. That is, all players participated first in the NonInt and next in the Int. To avoid an updating of beliefs about others' cooperation, we inform them neither about the behavior of their opponent

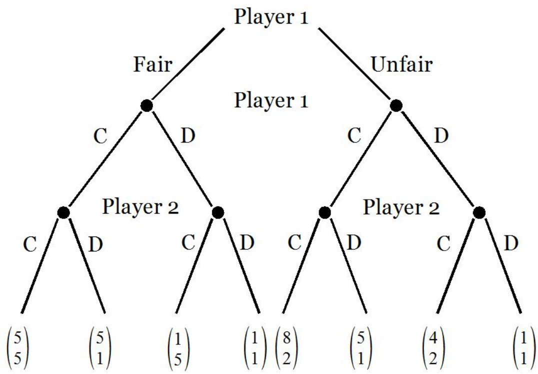

Figure 3: Decision Structure in INT 21

nor about the result of the random draw in the first game before they make their decisions in the second. Matching is organized in matching groups of each four participants where we no participant meets the same opponent in both games.

2.2 Procedures

The experiment was computerized using z-tree (Fischbacher (2007)). Overall, 132 subjects participated in the experiment, 92 in INT 32 and 40 in INT 21. Thus, we receive a total of 66 independent observations. 65 of the players 1 in INT chose to cooperate but could not reveal their contract choice. Hence we have 65 observations for player 2 which we can compare statistically.

Subjects were students of the University of Konstanz, recruited via ORSEE (Greiner (2004)). The experiment took place in *lakelab*, the laboratory for experimental economics at the University of Konstanz. All sessions lasted less than one hour. The experimental currency are points, with each point being converted into 1 Euro after the experiment. On average, participants earned 12.33 Euros in the experiment with a standard deviation of 3.05. Before the experiment, subjects received instructions about the experiment. Before the experiment started each subject had to answer control questions about the experiments. The experiment started when all subjects had answered all question correctly. The Appendix contains the instructions and questions, translated from German.

3 Behavioral Predictions

In this section we develop hypotheses about the behavior of subjects in our experiment. These hypotheses derive from conventional economic theory and theories of reciprocity. The experiment contains two games, the nonintegrated prisoners' dilemma game and the integrated version of this game with incentive wage setting. Interaction is anonymous, no results are revealed during the experiment and subjects are matched with different other players in the two different games. Hence, we can treat both games as independent games. We ignore risk aversion.

We are particularly interested in the behavior of second movers in both games. In detail, we consider whether there is a relationship between conditional cooperation of second movers in the nonintegrated game and the rejection of unfair offers in the integrated game. Both these decisions have in common that they reduce, in absolute terms, the inequality in outcomes (as in Fehr and Schmidt (1999) or Bolton and Ockenfels (2000)). Futhermore, both decisions respond to behavior which can be seen as a statement of intentions (as in Falk and Fischbacher (2006), Rabin (1993) or Dufwenberg and Kirchsteiger (2004)): a first mover who cooperates in sequential prisoners' dilemma makes a kind decision, while the choice of the unfair incentive scheme is an unkind decision.

In both of our games, there are 2 players, indexed by $i \in [1, 2]$. Let $x = x_i$ denote the monetary payoff of player i. The utility function of a selfish player $i \in [1, 2]$ is given by

$$U_i(x) = x$$

We expect that some people will act selfish but by no means all of them. Selfishness is one assumption underlying property rights theory and therefore one benchmark. The following results are one yardstick in the development of our hypothesis.

1. With 2 selfish players participating in the game, each player will
   (a) never cooperate in the nonintegrated prisoners' dilemma.
   (b) always cooperate under incentive contracts, irrespective of its fairness.
   (c) choose the unfair contract as principal.

These results derive directly from Figures 1 to 3. Selfishness is one benchmark for our analysis but most experimental studies show that some subjects have a preference for reciprocity. For simplicity, we model reciprocity as inequity aversion, using the model setup from Fehr and Schmidt (1999).

In Fehr and Schmidt (1999), players with inequity aversion have the following utility function.

$$U_i(x) = x - \alpha_i \max(x_j - x_i, 0) - \beta_i \max(x_i - x_j, 0), i \neq j, \alpha_i \geq \beta_i, 0 \leq \beta_i < 1$$

The second term in this equation measures the utility loss from disadvantageous inequality, while the third term measures the loss from advantageous inequality. Our results hold for any distributions of α and β in the population, as long as $\alpha_i \geq \beta_i, 0 \leq \beta_i < 1$ holds. The distributions are common knowledge but individual preferences are unobservable.

The size of our subject pool and the experimental design ensure homogeneous beliefs about the preferences of the other players throughout the entire experiment. Then the following predictions can be derived for the behavior of an player i who faces another player j with unknown characteristics:

2. In the nonintegrated sequential prisoner's dilemma (NonInt)

(a) any player i with $\beta_i > \frac{1}{6}$ will cooperate as second mover, if the first mover has chosen to cooperate.

(b) a sufficiently large share of players with $\beta > \frac{1}{6}$ ensures that first movers choose to cooperate.

(c) first movers with a low α are more likely to cooperate than those with a high α.

(d) players 1 with a low β are less likely to cooperate than those with a high β.

3. In the integrated game with complete ownership and incentive contract (Int)

   (a) all players cooperate as player 1.

   (b) all players cooperate as player 2 if they receive a fair contract.

   (c) any player i with $\alpha_i > \frac{1}{2}$ will not cooperate as player 2 if she receives an unfair contract.

   (d) a sufficiently large share of players with $\alpha > \frac{1}{2}$ ensures that the fair contract will be offered.

   (e) players with a low β are less likely to offer the fair contract than those with a high β.

All quantitative expressions are derived from treatment Int 32. Qualitatively, the results do not differ from treatment Int 21. A more detailed derivation of these predictions is provided in the appendix. We use these predictions to derive testable hypotheses to contrast the predictions of property rights theory and theories of social preferences with respect to vertical integration and incentive contracts.

Property rights theory suggests that predictions 1a to 1c about the behavior of players are correct. Hence, we can derive the following hypothesis.

Hypothesis 1 *The joint payoff of player 1 and player 2 will be higher in* Int *than in* NonInt*, even if the unfair contract is chosen.*

Fehr and Schmidt (1999) suggest that some of the players exhibit social preferences. Therefore, we base our following hypotheses on predictions 2a to 2d as well as 3a to 3e. Note that these predictions include predictions for a *homo oeconomicus* in the case of $\alpha = \beta = 0$. In some situations the predictions of theories of social preferences and property rights theory are identical, e.g. for predictions 3a and 3b. This allows for the following hypothesis

Hypothesis 2 *All players cooperate in* INT *as player 1. All players 2 cooperate if they receive a fair contract.*

As we have just seen that the contract choice can be relevant for the cooperation of second movers in INT, we also have to look at the contract choices of players 1 in this game. Remember prediction 1c that according to property rights theory the contract offer will always be unfair in an interaction of two selfish players. From predictions 2d and 3e, in contrast, we derive the following hypothesis regarding the contract choice of players with social preferences.

Hypothesis 3 *Subjects that are cooperative as first movers in* NONINT *are more likely to offer the fair contract in* INT*.*

Prediction 3c implies that negative reciprocators ($\alpha > 0$) defect under unfair incentive contracts. According to prediction 2c, the same subjects are less likely to cooperate as *first* movers in NONINT because their loss in utility is rather high if the second mover defects. Property rights theory does not predict any cooperation among the first movers in NONINT and no defection in INT.

Hypothesis 4 *Subjects that are cooperative as first movers in* NONINT *are less likely to defect when they face unfair incentive contracts in* INT*.*

We use predictions 2a and 3c to identify positive and negative reciprocity. A conditionally cooperative second mover in NONINT is characterized as a player exhibiting positive reciprocity, while a player 2 rejecting unfair offers in Int exhibits negative reciprocity. For the above analysis, we had to set the correlation between positive and negative reciprocity to zero. Let now r denote the relevant correlation coefficient between the two. A positive correlation between the two characteristics would confirm the following core hypothesis:

Hypothesis 5 *Subjects that are conditionally cooperative as second movers in the nonintegrated prisoners' dilemma game are more likely to defect in the integrated game when they face unfair incentive contracts, if* $r > 0$.

In our experiment we can only observe r. If we find $r > 0$ it is obvious that subjects with specific preferences are more likely to prefer the ambiguous dilemma to an seemingly unambiguous, but unfair incentive contract.

4 Results

In the prisoners' dilemma we find that 40 percent of the participants are egoists. They defect as second movers no matter what the other player decided. About 46 percent are conditional cooperators reciprocating the first mover's choice, and 11 percent of the participants are always cooperative. The remaining 3 percent of the subjects cannot be classified into one of the above categories. The distribution of types in our population is therefore similar to the distributions in synonym experiments in the literature. Gächter, Nosenzo, Renner, and Sefton (2008), for instance, using a similar design to NonInt but with more variations in subjects' choices, find 46 percent egoists, 48 percent reciprocators, and 3 percent unconditional cooperators. Figure 4 presents the distribution of the different types in our NonInt game.

58% of all egoists decided to cooperate as first movers. Among the conditional cooperators 85% did. These decisions as first movers reflect the expectation that the

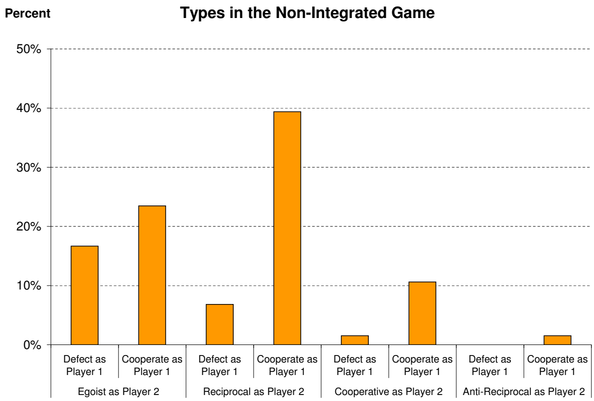

Figure 4: Distribution of types in NonInt

second mover is a conditional cooperator. This difference may reflect a false consensus effect, whereby selfish subjects believe others are selfish and reciprocal subjects believe others are reciprocal (Altmann, Dohmen, and Wibral (2008), Gächter, Nosenzo, Renner, and Sefton (2008)).

The behavior of participants in the two conditions Int 32 and Int 21 does not differ. 67 percent of the players 1 in Int 32 offer the unfair contract and 70 percent of the players 1 in Int 21. Of the players 2, 22 percent reject the unfair offer in Int 32 and 15 percent do so in Int 21. Neither of the two differences is significant (two-sided Fisher Exact Test). Thus, in the following we jointly evaluate the data of the two conditions.

4.1 Welfare

We measure welfare by the joint profit of both players. Thus, welfare is 10 if both players cooperate, 2 if both defect, and 6 if one player cooperate and the other defects. To calculate welfare, we determine the expected frequency of the three different outcomes (cooperate, cooperate), (cooperate, defect), and (defect, defect) within our population of subjects. Next, we multiply the expected frequency of (cooperate, cooperate) by 10, the expected freqency of (cooperate, defect) by 6, and the expected frequency of (defect, defect) by 2, and sum up these values. The result is 6.89 points in NonInt and 9.40 points in Int.

For the statistical tests, we average expected welfare in NonInt over the outcomes of the game for both possible role assignments of player 1 and player 2 within one pair. In Int, we can calculate welfare within each pair directly, because players 1 enter only their actual decisions. The difference of welfare between the two games is statistically significant in a Wilcoxon rank sum test (one-sided) at the 1 percent level. Even the most beneficial assignment of partners in the SPD would not yield welfare levels close to the results derived from the unfair incentive contracts. Thus, we conclude that vertical integration in fact improves welfare, confirming hypothesis 1.

Most welfare gains derive from two simple observations, confirming hypothesis 2. First, all (except one) principals choose the cooperative option.[1] Second, the incentive compatible payment scheme makes most agents cooperate - naturally under the fair, but to a great share also under the unfair contract.

[1] We excluded the decision of the respective agent whose principal did not cooperate from the statistical test above.

4.2 Contract Choices

Figure 5 summarizes the choices which contract players 1 offered to players 2 in the Int game. On average, players having a positive expectation of others' conditional cooperation offer the fair contract more often (38 percent) than those with a negative expectation (14 percent). This difference is statistically significant at the 5 percent level (Fisher Exact Test, two-sided). Thus, we confirm hypothesis 3. Egoists offer the fair contract less often (26 percent) than (conditional) cooperators (37 percent). This second difference, however, is statistically not significant.

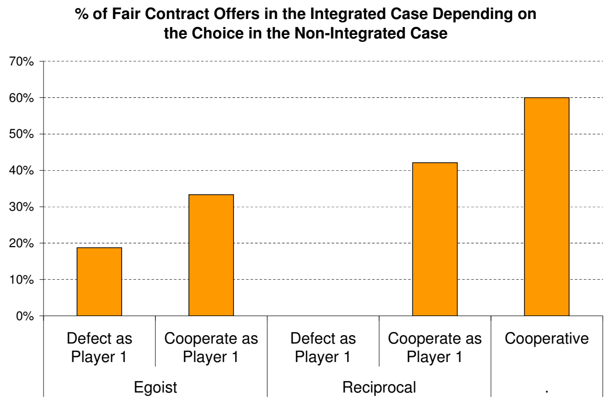

Figure 5: Contract Choices

4.3 Reactions of the different types in NonInt to unfair offers in Int

There is no difference between the cooperative and noncooperative first movers in NonInt with respect to their reaction to unfair contracts in Int. Out of the

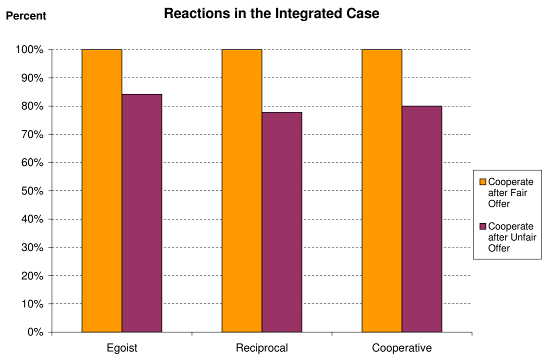

Figure 6: Reactions of the Egoists and Cooperators from NonInt in Int

cooperative first movers, 80 percent later accept the unfair contract, compared 78 percent of uncooperative first movers. Thus, we have to reject hypothesis 4.

Although we found at an aggregate level that vertical integration increases welfare, 20 percent of all agents do not cooperate in Int if they are offered an incentive compatible but unfair payment scheme. Assuming a correlation between positive and negative reciprocity, we might expect that positive reciprocity in NonInt (identified as conditional cooperation of the second movers) correlates with negative reciprocity (rejection of an unfair offer) in Int. Thus, we predict that conditional cooperators in the first game are more likely to defect in the second game if they are offered the unfair contract (hypothesis 5). Egoists and strict cooperators in NonInt, in contrast, should cooperate independently of the contract offered. Figure 6 shows the reactions of egoists and (conditional) cooperators in the second game.

Agents who stricly or conditionally cooperate in NonInt both have a cooperation rate of just 78 percent as agents in the unfair incentive relationship, compared to 84 percent in the case of egoists according to the SPD. The differences are statistically insignificant which implies a zero correlation between negative and positive reciprocity. The correlation coefficient between the two is $r = 0.0696$. We therefore reject hypothesis 5.

5 Conclusion

This paper investigated the impact of concentrated ownership on behavior. We motivated our research program because of experimental evidence which contradicts crucial assumptions of property rights theory. We can confirm the experimental evidence, in particular a high share of (conditional) cooperators in the hold-up problem and defection in the case of unfair incentive contracts. Yet, the evidence has no crucial implications for welfare and strategic considerations. We find that vertical integration increases welfare relative to a prisoner's dilemma even if very unfair incentive contracts are implemented. This result holds for egoists and conditional cooperators alike. Yet, we find no correlation between positive and negative reciprocity. Behavior in the hold-up problem does not predict behavior in vertically integrated units.

In the context of our simple experiment, vertical integration is a sensible solution for hold-up problems even if the underlying economic theory is not accurate. There are several reasons for it: first, vertical integration induces at least one player to behave cooperatively, the prospective owner of the firm. Only his employee may consider defection. Second, vertical integration is strictly welfare maximizing if it is combined with a fair incentive contract. This finding is in line with the observation in Fehr, Kremhelmer, and Schmidt (2008), that joint ownership dominates single ownership. Finally, even with an unfair incentive contract, agents on average receive higher benefits than in the ambiguous situation of the prisoners dilemma.

Summing up, the unfair contract implies some risk of defection but the behavior in the prisoners dilemma does not predict defection. Hence, we find no strategic reason for avoiding the unfair contract. The choice between the fair and the unfair contract rather depends on the risk aversion and the social preferences of the *principal* than the agent.

6 Appendix A: Results of the Behavioral Predictions

In the following we derive the results in section 3. We first consider the choices of both players in NonInt and then in Int.

6.1 Behavioral Predictions in NonInt

Let us first consider the reasoning of a second mover (player 2) in game NonInt (see Table 1). Cooperation in this game is reasonable for player 2 if player 1 cooperates and if $\beta_2 > \frac{1}{6}$.

		Player 2	
		Cooperate	**Defect**
Player 1	**Cooperate**	5, 5	-6α, $6-6\beta$
	Defect	$6-6\beta$, -6α	1, 1

Table 1: NonInt, second mover (player 2 is relevant)

Anticipating the behavior of different types of second movers and their distribution in the population, the first mover (player 1) in NonInt applies the following reasoning (see Table 2): The sure payoff from defection for player 1 is 1. Thus, any type of player 1 will only cooperate if the expected profit from cooperation is at least 1. Further, player 1 knows that a second mover only cooperates if $\beta_2 > \frac{1}{6}$. Let δ denote the share of subjects with $\beta_2 > \frac{1}{6}$. Thus, a player 1 cooperates only if $\delta > \frac{1+6\alpha_1}{5+6\alpha_1}$. Hence, cooperation decreases in the α of the first mover.

6.2 Behavioral Predictions in Int 32

Let us for Int 32 again start with the behavior of the second mover (player 2). All players 1 will always choose the cooperative option themselves since $\beta < 1$, but they

		Player 2	
		Cooperate	**Defect**
Player 1	**Cooperate**	5, 5	-6α, $6(1-\delta)+(6-6\beta)\delta$
	Defect	$(6-6\beta)$, $-6\alpha\gamma$	1, 1

Table 2: NonInt, first mover (player 1 is relevant)

will not all offer the fair contract to player 2. For players 2, we therefore have to distinguish the reactions to a fair and to an unfair contract offer. Confronted with a fair contract offer, all second movers will cooperate (see Table 3).

		Player 2	
		Cooperate	**Defect**
Player 1	**Cooperate**	5, 5	$1-4\alpha$, $5-4\beta$
	Defect	$5-4\beta$, $1-4\alpha$	1, 1

Table 3: Int 32, fair contract offer, second mover (player 2 is relevant)

Given an unfair offer, a player 2 cooperates only if $3-4\alpha_2 > 2-2\alpha_2$, i.e. if $\alpha_2 < \frac{1}{2}$ (see Table 4).

		Player 2	
		Cooperate	**Defect**
Player 1	**Cooperate**	$7-4\beta$, $3-4\alpha$	$4-2\beta$, $2-2\alpha$
	Defect	3, 3	-2α, $2-2\beta$

Table 4: Int 32, unfair contract offer, second mover (player 2 is relevant)

Finally, we have to consider the contract choice of player 1 in Int 32. The payoff from choosing the fair contract is always 5. The payoff from choosing the unfair contract is $7(1-\gamma)+4\gamma$, with γ denoting the share of players 2 with $\alpha_2 > \frac{1}{2}$. Players 1 therefore choose the unfair contract if $(7-4\beta_1)(1-\gamma)+(4-2\beta_1)\gamma > 5 \rightarrow \gamma > \frac{4\beta_1-2}{2\beta_1-3} < \frac{2}{3}$.

7 Appendix B: Instructions

Welcome and thank you for participating in this experiment. Please read the instructions carefully. From now on we ask you to remain seated and to stop communicating with other participants. If you have any questions, please raise your hand. We will come to your place and answer your questions in private. It is very important that you follow these rules.

The instructions are identical for all participants. Please take your time to read and understand them. Should any questions or unclearnesses about something occur please do not hesitate to ask us, we will come to you.

Your payoff in this experiment depends on your decisions as well as those of other. You will not be told which participants these are as will nobody be informed about your identity.

The experiment consists out of two parts in each of which you will be interacting with another participant. You will be interacting with a different other participant in part two than in part one. Your payoffs will be added up after you finished both parts. During the experiment your payoffs will be counted in points. Each point you gain is worth 1 Euro cash after the experiment. You will get another 4 Euro for participating.

You and the other participant will be asked to decide between to possible choices (A and B) in both parts of the experiment.

In the first part of the experiment your payoff will depend on the decisions of both you and the other participant.

- If you both choose A each of you gets 5 points
- If you both choose B each of you gets 1 point.

- If one of you chooses A and one chooses B the person choosing A gets 0 points and the person choosing B gets 6 points

The following table is a summary of the payoffs:

Decision of the other	**My Decision**	**My Payoff**	**Payoff of the other**
A	A	5	5
A	B	6	0
B	A	0	6
B	B	1	1

In the first part of the experiment you and the other participant will make your decisions in a sequential order. However, initially you will not know which of you actually has to decide first. Thus, you will be asked to make decisions for both possible orders. If you decide first, you simply state you will choose either A or B. In case you have to decide second you have to choose between A and B twice, once for both possible preceeding decisions of the other participant.

The actual order will be randomly choosen by the computer only after you and the other participant have made your decisions for both possible orders. The probabilites are equally distributed.

- If chance puts you first only your first decision counts. The reaction decisions you made will not count for you payoff. Your payoff will be calculated with the help of the figure shown above and depending on the reaction decision of the other participant.
- If chance puts you second only the first decision of the other participant counts. Only your reaction decision to the decision of the first player counts for you.

You will not receive any information concering the outcome of the experiment at this stage. The second part will start immediately instead.

In the second part of the experiment you and the other participant will play two different roles (roles 1 and 2). Your role will be determined randomly at the beginning of the second part and be told to you. You will then only make decisions for your role.

Like in part 1 you and the other participant will make a decision between A and B. However, the payoffs will be different. The participant who plays role 1 will get the sum of the payoffs of both the participants as in part one. Hence, if you are playing role 1 you will get the sum of the columns "my payoff" and "payoff of the other participant" out of the figure shown in part 1.

Decision Player 1	**Decision Player 2**	**Sum of Payoffs**
A	A	10
A	B	6
B	A	6
B	B	2

If you are playing role 1 you have to give the other participant a part of your payoff. You have to give him at least 2 points but may choose to give him more as a bonus if he chooses A. You have to choose between two different payoff structures:

1. Participant 2 gets a total of 5 points if he chooses A. Therefore, you give him 3 points in addition to the 2 points you have to give him.
2. Participant 2 gets a total of 3 points. Therefore, you give him only 1 point in addition to the 2 points you have to give him.

If you are playing role 1 you will decide for one of the two variants first. Then you will choose between A and B like in part 1. Depending on which variant you decided for and how the other participant decides the following payoffs are possible:

1st Variant:

Decision Player 1	Decision Player 2	Combined Payoffs	Payoff Player 1	Payoff Player 2
A	A	10	5	5
B	A	6	1	5
A	B	6	4	2
B	B	2	0	2

2nd Variant:

Decision Player 1	Decision Player 2	Combined Payoffs	Payoff Player 1	Payoff Player 2
A	A	10	7	3
B	A	6	3	3
A	B	6	4	2
B	B	2	0	2

If you are playing role 2 you will be informed about player 1's decision between A and B before you have to decide yourself. You will be asked to make a decision for both possible variants. However, you will only be told how many points player 1 offers you as a reward for choosing A (1 or 3 points) after you have made your decision. Depending on the variant player 1 chose you will get either 5 or 3 points for choosing A and always 2 points for choosing B.

In the end of the experiment you will be informed about:

- the order of decisions in the first part of the experiment
- your own decisions in both parts of the experiment
- the decisions of the other players in both parts and,

- your payoffs of each part and the whole experiment

In the end your payoffs from both parts will be added up and paid to you. The exchange rate is 1 Euro per point. You will get another 4 Euros for participating. After having read these instructions please answer the following test questions. The experiment will begin after everybody has anwered the questions correctly. You will be asked to answer another questionnaire after the experiment.

Before starting please answer the following questions first to check if you understand everything you need to:

1. Presume you and the other participant make the following decisions in the first part of the experiment:

   - If you have to decide first you choose A.
   - If you have to decide second you choose
     - B, if the other participant chose A.
     - A, if the other participant chose B.
   - If the other participant decides first he chooses B.
   - If the other participant decides second he chooses:
     - A, if you chose A.
     - B, if you chose B.

   Afterwards the computer decides you have to decide first and the other participant second. What are the payoffs in the first part of the experiment?

   You: ☐ The other participant: ☐

2. Presume you have been assigned role 2 in the second part of the experiment.

   - The other participant decides to choose A and offer you variant 2.
   - You want to decide like the following:

- If you are offered variant 1 you play A.
- If you are offered variant 2 you play B.

What are the payoffs in the second part of the experiment?

You: ☐ The other participant: ☐

3. Presume you have been assigned role 2 in the second part of the experiment.

   - The other participant decides to choose A and offer you variant 2.
   - You want to decide like the following:
     - If you are offered variant 1 you play B.
     - If you are offered variant 2 you play A.

   What are the payoffs in the second part of the experiment?

   You: ☐ The other participant: ☐

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