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Auteurs

**Benoît Chalvignac**

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**Faculté des sciences économiques et de gestion**
Pôle européen de gestion et d'économie (PEGE)
61 avenue de la Forêt Noire
F-67085 Strasbourg Cedex

Secrétariat du BETA
Géraldine Del Fabbro
Tél. : (33) 03 68 85 20 69
Fax : (33) 03 68 85 20 70
g.delfabbro @unistra.fr
www.beta-umr7522.fr

# Partnership and trust in gift-exchange games

Benoît Chalvignac[1]

*BETA*

*University of Strasbourg*

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**Abstract**

In this paper we extend the gift-exchange game setting to include a new experimental treatment where subjects are paired with the same partner for the whole game. We observe that the matching mode is more critical to cooperation levels than the contractual arrangement, and that trust-based contracts outperform incentive-based contracts when interaction is repeated within the same pair. In the partner setting, individual preferences seem only to be second-order determinants of cooperation levels and most subjects are highly responsive to others' cooperative choices. Our findings help explain the cooperation dynamics required for organizations to leverage their incentive structure and to endure.

*Keywords* : Gift-exchange game; Trust; Cooperation; Informal organization

*JEL classification* : D2; D7; M2

1 chalvignac@unistra.fr

## 1 . Introduction

Cooperation in organizations is alternatively conceived either as a choice to be elicited through the use of incentive-based mechanisms or as an emerging phenomenon stemming from the repetition of interactions between agents. Conversely, the debate over the relevant institutional arrangements is most often guided by the principles of contract theory, which support the exclusive use of binding mechanisms. The critical importance of the informal organization, as underscored in the seminal works of Barnard[2] and more generally in the behavioral theory of the firm, has questioned the relevance of this one-sided approach, while experimental results have documented the emergence of cooperation in non-binding settings. Most of these experimental investigations, however, have focused on rewards and sanctions mechanisms as an efficient way to achieve sustained, large-scale, cooperation in settings where free-riding behavior would otherwise undermine cooperative choices (see e.g. Masclet et al., 2003 and Bochet et al., 2006 on the public good game case, Fehr et al., 2007 on the gift-exchange game). Therefore, they have somehow fallen short of making a clear case for the emergence of cooperation in repeated settings beyond the level triggered by formal incentives.

In order to make a stronger case for the potential efficiency of non-binding mechanisms, which is needed to explain the sustained cooperation levels necessary for organizations to survive, we provide in this paper experimental evidence of the effect of repeted interaction within fixed pairs on cooperation levels in a principal-agent setting. In particular, we analyze a repeated gift-exchange game where at the beginning of each period the principal can choose between two types of contract. In both contracts, the principal must specify a wage and a minimum effort level. In non-binding contracts (NC) the minimum effort level is not binding for the agent who can then choose any actual level of effort without bearing any additional cost. In incentive contracts (IC) the principal can also choose a fine to be paid by the agent with a one-third probability if the minimum effort level is not reached. Establishing an incentive contract bears additional costs for the principal.

The gift-exchange game is repeated under two comparative settings. In the first setting, principals and agents are matched randomly at the beginning of each round (in the following 'stranger treatment', or 'ST'), while in the other setting the same principal-agent pairs play the game over all rounds (henceforth 'partner treatment', 'PT').

Our results show that the matching mode has a stronger effect on cooperation levels than contract types or individual preferences. We also observe that trust-based contracts outperform incentive-based contracts when principal-agent pairs are fixed throughout the repetitions of the

2 See e.g.Barnad (1948).

game, while the two contracts are chosen evenly if principal-agent pairs change after each round.

In order to identify the underlying individual behavioral patterns that could explain the observed distribution of contracts we investigated under each matching protocol how the principal's wage offer and proposed effort level affect the agent's realized effort and how past effort levels influence wages, depending on the arrangement chosen by the principal. The differences between the stranger and the partner treatments are especially stark. In the stranger treatment, in both contract types, there is no systematic effect of proposed effort and wage on reciprocated effort. In the partner treatment both proposed effort and wage have a positive impact on reciprocated effort under the non-binding contract. Under the incentive contract the wage offered remains influential but the proposed effort becomes irrelevant for the agent's effort choice. Thus, the principal's choices in the gift-exchange game have a stronger influence on the agent's effort in the partner treatment than in the stranger treatment, and their impact in the partner treatment further increases when a non-binding contract is chosen instead of an incentive contract.

These results on the individual level fit very well with the main patterns observed on the population level. In the stranger setting no arrangement is preferred because under neither arrangement the principal's choices effectively impact the agent's effort. This results in a low benefit for principals and agents. In the partner treatment the non-binding contract dominates over the incentive contract because under this arrangement agents respond to both offered wage and proposed effort, while the cost of the incentive contract is not compensated by additional benefits for the principal. Accordingly, gains are highest in the partner treatment under non-binding contracts.

## 2 . Related literature

A large body of experimental studies provides some evidence on the potential effectiveness of incentive-free mechanisms to achieve or approach the social optimum. The well-known voluntary contribution mechanism (VCM), introduced in Isaac et al. (1984) has yielded substantial levels of cooperation through its numerous implementations. Though free-riding causes the average contribution level to decline over time when the game is repeated, some groups display high and sustained contribution levels throughout the whole timespan (see e.g. Boun My and Chalvignac, 2010). This provides support to the experimental results on conditional cooperation presented in Fishbacher et al. (2001), and thus to the possibility of emerging cooperation when players hold the proper beliefs about the intended behavior of their peers.

The importance of beliefs about other players' willingness to contribute has been particularly highlighted by experimental studies focusing on pre-play communication and on group composition. Confirming the findings of Isaac and Walker (1988), Frohlich and Oppenheimer (1998) and Bochet et al. (2006) both found that face-to-face communication triggered 100% contribution rates in most rounds, including the last repetitions of the game. Refining the exogenous matching process of Burlando and Guala (2005), Ones and Putterman (2007) created groups according to the contribution choices observed in a preliminary round and to monetary punishment choices of the four following rounds. They observed that groups formed with players displaying both highest contribution levels and highest tendency to punish free-riders achieved the highest average contribution rates, with 94% of their total endowment against 58% for groups formed of the lowest ranked players. AMoreover, the former groups sustained these extremely high levels of cooperation over most rounds.

Since communication can be considered as cheap talk, and its effect might thus be limited to the relatively low stakes of experimental settings, and since player types can hardly be selected endogenously outside the lab, researchers have also focused on the use of different forms of reward and punishment as complementary mechanisms to raise contribution levels closer to the social optimum. Ostrom et al. (1992), Masclet et al. (2003), Ertan et al. (2005), Cinyabuguma et al. (2005), Bochet et el. (2006), Sefton et al. (2007), Güth at el. (2007) and Ones and Putterman (2007) have all found that endogenous punishment (either in the form of exclusion from the group or as a pay-off reduction device) as well as monetary and non-monetary rewards, have some effect on the overall contribution levels. As mentioned in Bochet et al. (2006), however, "punishment, as in earlier experiments, increased contributions but because of its cost had little net effect on efficiency" (p.11). More importantly, punishment and reward mechanisms amount to incentive devicesand thus cannot help explaining further the overall levels of cooperation necessary for organizations to survive.

Moreover, all these results have been generated in the public good game setting where players are in a symmetric, non-hierarchical relationship, contrasting with usual organizational features.

The gift-exchange game setting, which has been introduced in Fehr et al. (1993) has been implemented as a test bench for theories based on equity, fairness or reciprocity concerns in principal-agent settings. It has already been evidenced in many experimental investigations based on TCs that the agent's dominant strategy of choosing the lowest possible effort is by far not the most favored choice in the lab, and that a strong positive correlation between offered wage and

chosen effort level can be observed[3]. This contrasts with the IC case, where agents in experiments typically follow the dominant strategy of choosing the lowest possible effort[4]. These observations underline the complex interaction pattern between institutional designs and players' preferences, which appear to be distributed along a multi-dimensional continuum between selfish, myopic, and purely monetary-driven utility functions at one end and altruistic, long-sighted, non-monetary driven utility functions at the other end.

To our knowledge, most experiments on gift-exchange games investigated a single interaction mechanism. This keeps the game relatively straightforward and thus allows to focus on the behavioral drivers at stake within a specific institutional arrangement. However, this prevents performance comparisons between alternative institutional arrangements in situations where mechanisms are endogenously chosen by the players themselves and not exogenously set by the experimenter. Furthermore, even a comparison across experimental sessions with exogenously given institutional mechanisms is hardly feasible, because of the diversity of experimental outcomes involving the same mechanism and given the effects of the game structure on players perceptions and choices. Thus, how trust-based contracts compare to incentive based contracts when chosen endogenously is still an open question. Current evidence suggests that trust-based contracting is less beneficial for principals than incentive-based contracts although higher wages are reciprocated with higher effort. It has also been observed that agents tend to react negatively to an increasing use of incentives above some threshold when paired with the same principal throughout the repetitions of the game, while they positively react to most incentive levels when a stranger matching protocol is applied (Dickinson and Villeval, 2008).

A few recent studies depart from this 'single interaction mechanism' design and implement alternative mechanism choices. Keser and Montmarquette (2004) introduced an experimental setting where players can choose between a private (incentive-based) and a team (VCM-based) remuneration in an effort game. Though choosing private remuneration is a subgame perfect equilibrium strategy, team remuneration is chosen by both players in 45% of cases. Moreover, 85% of the players who were in the team remuneration mode in one round chose that mode again in the next round and 52% of those who were in the private remuneration mode opted for the team remuneration mode subsequently. However, the hierarchical relationship between the players was also missing in this setting and the production functions were different from one option to the other. Fehr et al. (2007) investigated the gift-exchange game in a a two-step setting. In the first step of

3 See the experimental results presented in Fehr and Tougareva (1996), Fehr et al. (1997), Fehr and Gächter (1998), Falk et al. (1999) and Fehr and Gächter (2002).

4 By "lowest possible effort" we mean here either the effort level specified in incentive-compatible contracts or the null effort level when the contract is not incentive compatible.

their Trust-Incentive treatment, principals choose the institutional arrangement, that is either NC or IC. Then, in the second step, the 'traditional' gift exchange game takes place. In their experiments, the game is repeated for several rounds but in each round agents and principals are matched randomly. They observed that IC tends to become the preferred arrangement over NC and show that their results fit predictions based on the distribution of player types regarding inequity aversion. They also ran a Bonus-Incentive treatment, featuring a bonus contract (BC) where the principal could specify an additional amount, the bonus, to be discretionary transferred to the agent at the end of the round. In this treatment, BC was most often preferred over IC, being chosen by 80% to 96% of the principals, depending on the round and increasing in the last rounds. However, the bonus can still be considered as a reward device, i.e. a form of positive incentive, so that the Bonus-Incentive treatment nearly amounts to testing for framing effects in incentive contracts.

Our experiment follows the approach of Fehr et al. (2007) in that we use the same two-step procedure as in their Trust-Incentive treatment. We extend their design to investigate the effect of the matching mode through the comparison of the stranger and the partner treatments, and focus on a simple behavioral model which does not involve the definition of player types according to other-regarding preferences.

## 3 . The experiment

### *3.1. The principal-agent games*

In all treatments, subjects played the same two-step principal-agent game. In the first step, the principal has to choose between the Incentive Contract (IC) and the Non-binding Contract (NC). In the second step, a gift-exchange game is played which differs by contract choice.

If NC is chosen the principal must specify a wage $w$ and a desired effort level $e^*$. The agent then decides whether to accept or not the proposed contract. In the latter case the round is over and both agent's and principal's payoffs are null. In the former case the agent chooses an effort level $e$. The agent bares a non linear effort cost $c(e)$, increasing in $e$ and with an increasing derivative in $e$ (see Table 1). The cost and payoff functions are common knowledge.

The principal's expected payoff $\Pi_P$ is given by:

$$\Pi_p = 10 \, . \, e - w$$

The agent's expected payoff $\Pi_A$ is given by:

$$\Pi_a = w - c(e)$$

If IC is chosen the principal must specify a wage $w$, a desired effort level $e^*$ and a fine $f$ to be paid by the agent with a probability $p = \frac{1}{3}$ if the desired effort level is not reached. The maximim value for $f$ is 13. The agent then decides whether or not to accept the proposed contract. If the agent does not accept the contract the round is over and both agent's and principal's payoffs are null. Otherwise the agent chooses an effort level $e$. The p rincipal bares an additional, fixed cost $k$ = 10 to finance the control mechanism. The agent's effort cost function is the same as in the NC. Again, the cost and payoff functions are common knowledge.

The principal's expected payoff $\Pi_P$ is given by:

$$\Pi_p = 10.\mathrm{e} - w - k \quad if \quad e \geq e^*$$

$$\Pi_p = 10.\mathrm{e} - w - k - pf \quad if \quad e < e^*$$

The agent's expected payoff $\Pi_A$ is given by:

$$\Pi_a = w - c(e) \quad if \quad e \geq e^*$$

$$\Pi_a = w - c(e) - pf \quad if \quad e \geq e^*$$

Table 1: *Effort cost function for the agents.*

| ***e*** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| ***c(e)*** | 0 | 1 | 2 | 4 | 6 | 8 | 10 | 13 | 16 | 20 |

### *3.2. Game-theoretical solution*

If both players are assumed to maximize their monetary payoffs in each round and to believe that

the other player do so, the outcome of the stage game is straightforward. In the NC subgame the agent has a dominant strategy in choosing the minimum effort level ($e = 1$) for any positive wage ($w > 0$) and otherwise either choose $e = 1$ or refuse the contract, each with a probability of 0.5, so that the principal is left with the only option of choosing the null wage to secure the maximum possible payoff of 10. In the IC subgame the selfish agent will refuse the contract if $w < c(e^*)$ and $w < pf$. The agent accepts the contract and chooses the minimum effort required $e^*$ if $c(e^*) < pf$ holds, else the agent chooses the minimum effort level $e = 1$. Since the highest available value for $f$ is 13, the highest effort level that an incentive compatible contract can elicit is thus $e^* = 4$. It is then a strictly dominant strategy for the principal to choose a wage $w^* = 5$, a required effort level $e^* = 4$ and the maximum fine $f = 13$, a contract to which the agent will reply by choosing the required effort level $e^* = 4$. The latter yielding a payoff of 25 to the principal, the IT will be the only contract chosen and will yield payoffs of (25,1) to the principal and the agent respectively.

The social optimum, which requires that the principal chooses the NC and the agent accepts and chooses the maximum effort level of 10 is thus precluded, as well as any intermediate outcome where the agent would choose an effort level higher than 1 in a NC or an effort level higher than the required one in IC.

Furthermore, with the above assumption on selfish and myopic players theoretical predictions are the same for the two treatments, since in both cases the time horizon is bounded. However, repeated transractions between the same players have been experimentally related to some positive level of voluntary cooperation, either triggered by reciprocity on observed behavior ("reaction-function" reciprocity) or by beliefs on others' reciprocal motives. For instance, results from the bonus-incentive treatment in Fehr et al. (2007) clearly indicate that adding one step in the decision process could trigger higher effort levels. Accordingly, the Partner treatment should offer more opportunities to both principals and agents to signal their willingness to cooperate and thus favor the NC.

### *3.3. Experimental settings*

The experiment was carried out at the Laboratoire d'Economie Exprimentale de Strasbourg (LEES). A total of 80 voluntary subjects took part in the experiment after being randomly selected through ORSEE among 1200 students from various programs.

None of them had previously confronted gift-exchange game experiments (inexperienced subjects). Written instructions were handed out and read aloud to the subjects before they performed a

questionnaire test to check proper understanding. The session began as soon as they all had correctly answered every question. No communication was allowed between subjects throughout the experimental sessions.

We implemented two treatments, namely a Stranger (S) treatment and Partner (P) treatment. In both treatments we formed randomly two groups of ten subjects who played as principals and agents respectively for the whole experiment. In both treatments subjects played for ten rounds. In the Stranger treatment we formed new principal-agent pairs each round, each player being paired once with each of the ten players of the other group. In the Partner treatment we formed ten principal-agent pairs, each player being paired with the same partner all ten rounds. Each subject played the same role (principal or agent) all along the game and participated in only one session and thus in only one of the two treatments, so that data are independent from one treatment to the other and pair data in the Partner treatment are independent from one pair to any other. Table 2 summarizes the experimental treatments.

Table 2: *Experimental settings.*

| Treatment | Sessions | Number of subjects | Number of pairs | Rounds | Choices |
|---|---|---|---|---|---|
| Stranger | 2 | 40 | 200 | 10 | 400 |
| Partner | 2 | 40 | 20 | 10 | 400 |
| Total | 4 | 80 | - | - | 800 |

At the end of each round both players would be displayed a result screen with all the choices made during the round and their own payoff for the round. At any moment during the experiment players could access their own history table with the above mentioned information for each previous round and their own cumulated payoff.

## 4 . Results

Results are organized in four subsections. The first subsection compares the overall contract choices in the Partner and the Stranger Treatments. Sections 4.2 and 4.3 focus on the aggregate level. Section 4.2 compares the outcomes, or contract efficiency, by contract, and Section 4.3 compares the outcomes by treatment. In Section 4.4 we investigate a two-step behavioral pattern which helps explaining the aggregate results on the individual level without resorting to heterogeneous individual preferences or to contract efficiency. We estimate the agents' response to the principals'

offers and the principals' response to the agents' effort levels.

### *4.1. Contract choices : Partner Treatment (PT) vs Stranger Treatment (ST)*

We start by comparing the relative use of NC and IC in each setting, overall as well as over rounds. Furthermore, we investigate how principals contract choices switched over rounds, which is a clear indicator of relative performance and learning. Table 3 displays the share of contract types by treatment jointly with the average decisions and outcomes by treatment and contract type.

Table 3: *Contract shares by treatment and average outcomes by treatment and by contract.*

| Treatment | Contract | Share | Wage | Effort | principal payoff | agent payoff |
|---|---|---|---|---|---|---|
| Stranger | NC | 52% | 15.2 | 1.9 | 3.2 | 13 |
| | IC | 48% | 16.4 | 2.3 | -1.3 | 11 |
| Partner | NC | 72% | 31.2 | 5.3 | 12.7 | 22 |
| | IC | 28% | 26.4 | 3.7 | 0.5 | 17.9 |

#### *4.1.1 Shares of IC vs NC*

Result 1. *In the Stranger treatment, the two contract types were chosen evenly.*

Contrasting with the results of Fehr et al. (2007) we do not find that IC dominates NC in the Stranger treatment. Instead, both contract types are used at about the same frequency. Out of 200 offered contracts, 103 (52%) were NC, and 83 out of 164 accepted contracts were NC (51%).

We observed that NC was preferred to IC in the first round (70%), and that both contracts held a closely even share of principals' choices in the following rounds (see Figure 1). In rounds 2 and 3 as well as in the two final rounds the principals' choices led to a 50% divide between the two contracts. In relative terms, NC have been slightly more refused by agents than IC: 83 NC (81% of the proposed NC) and 81 IC (84% of the proposed IC) have been accepted. Two third of contract rejections have occurred in the last five rounds.

Result 2. *In the Partner treatment, NC was the most chosen contract in all rounds.*

In the Partner treatment NC markedly dominated IC. NC was chosen in 143 cases (72% of all 200 cases) and 112 accepted contracts were NC (70% of the 159 accepted contracts). Figure 2 shows that NC was chosen in 90% of cases in round one, that more principals chose NC in all rounds, and that NC was chosen in at least 70% of cases from round 5 on. The lowest share of NC was 56% of

accepted contracts in round 2 and 55% of proposed contracts in round 4.

Here again the percentage of accepted to proposed IC is slightly higher, with 78% of NC accepted by the agents against 84% for IC. From round 7 on though, the percentage of accepted NC is equal to or higher than the percentage of accepted IC.

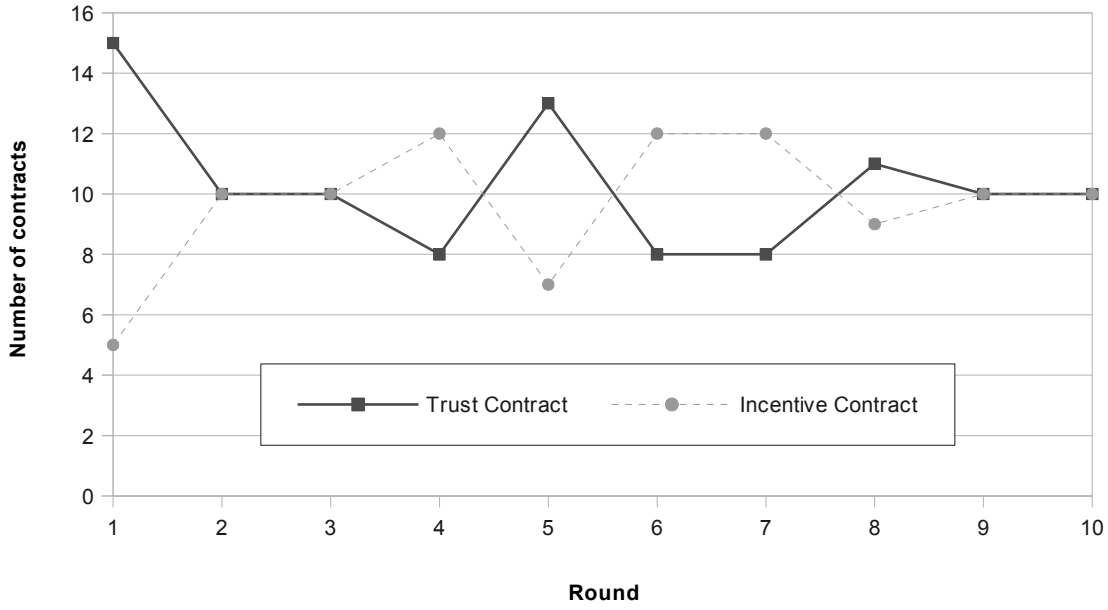


Figure 1: *Stranger Treatment - TC and IC contracts chosen by the principals, by round.*

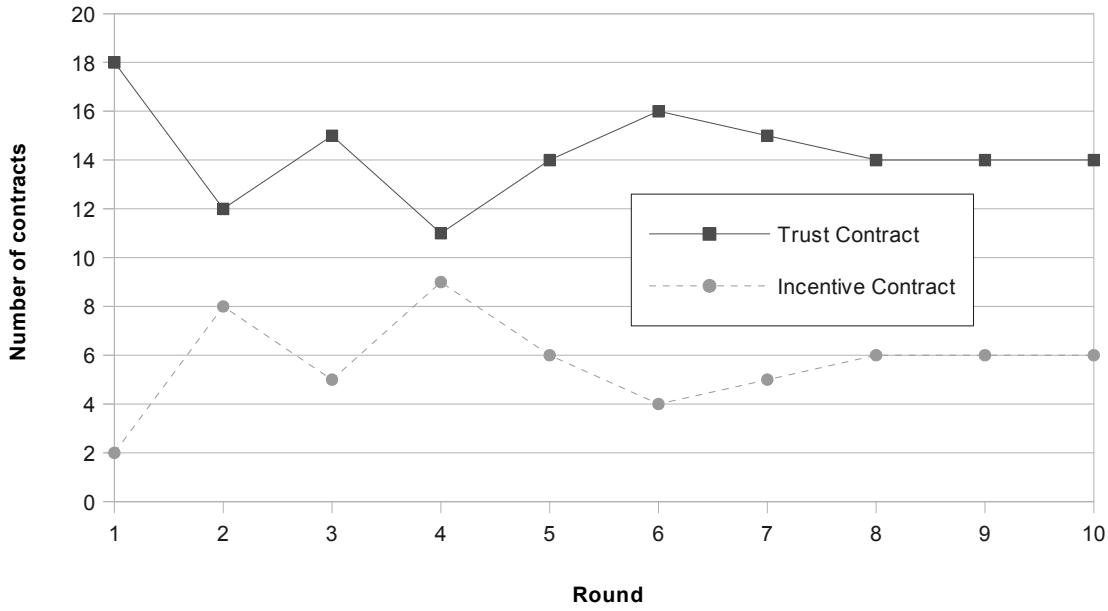


Figure 2: *Partner Treatment - TC and IC contracts chosen by the principals, by round.*

### 4.1.2 *Contract switches: the relative stability of contract choices*

Since the repeated game setting provides the players with an opportunity to learn in both treatments as well as a signaling tool in the Partner setting, it is worth examining the pattern of contract switches to investigate whether principals did stick to their first round choices or did experiment with the other contract.

RESULT 3. *In both treatments, most principals switched contracts in the early rounds, and further on in the Stranger treatment.*

In each treatment a total of 180 choices were made where the principal could choose between keeping the same contract and switching to the alternative contract. In the ST 67 switching choices were observed, as compared to 54 in the PT. The evolution of the number of switching choices (see Figure 3) shows a similar pattern in both treatments for the four first and four last rounds, with a higher proportion of switches in the first rounds and a clear decrease in the last rounds. In the ST however, we observed a strong increase in the number of switches in rounds 5 and 6, amounting to 11 out of 20 choices for each of these two rounds : twice as much as in the PT. In the 5th round, 8 of the 11 switches were from IC to NC, 6 of which were reversed in the next round where a total of 8 switches were from NC to IC. Principals in the Stranger treatment have kept switching contracts and exploring long after the first rounds, and have reversed their choices in a larger extent than principals in the Partner treatment later on in the game. The observed indecisiveness in ST is also confirmed by the share of the least chosen contract for each principal, which is 40% or 50% in 6

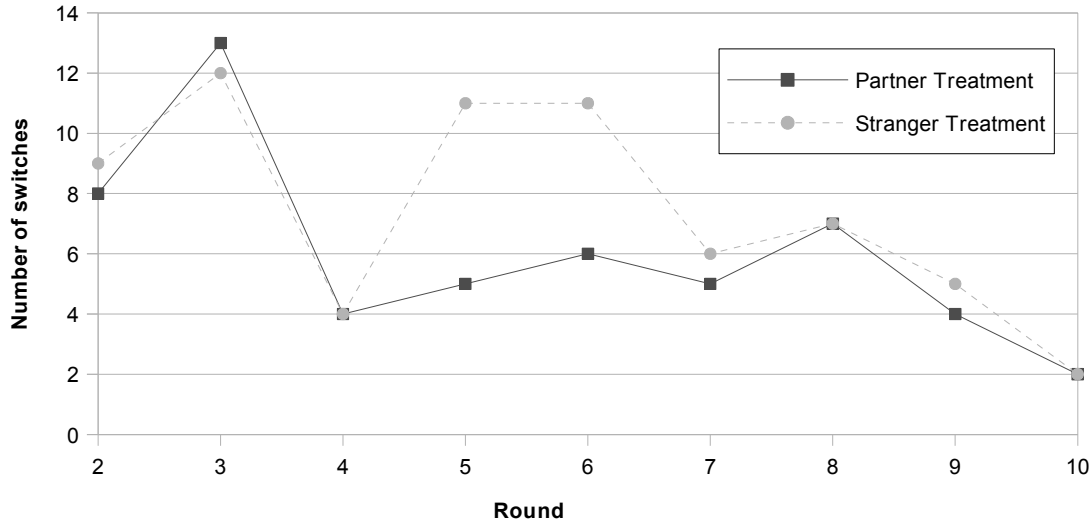


Figure 3: *Number of round-to-round contract switches*

cases in ST as compared to 3 cases in PT. Similarly, only one principal did stick to his first round choice (NC) in all rounds in ST as compared to 5 in PT. The higher instability of contract choices in the Stranger treatment, combined with the equal share of contract types, provides strong evidence that *none of the two contract types holds an absolute competitive advantage on the other* whatever the individual rationale for choosing one rather than the other.

Over the two treatments, 6 principals thus chose the same contract, NC, in all rounds (1 in ST and 5 in PT). Among the 7 principals who chose a different contract only once, 5 chose NC (2 out of 4 in ST and 3 in PT), which was also chosen by 6 principals among the 9 ones who chose a different contract twice (3 out of 5 in ST and 3 out of 4 in PT). Furthermore, 72% (13 out of 18) principals who chose NC in the first round in PT did mostly stick to their first-round choice, choosing NC in 7 or more rounds throughout the whole game. These observations further underline the relative advantage of NC over IC, particularly sharp in a partner setting, since most principals who exhibited a sustained preference for one of the contract chose NC. By contrast, no principal chose IC in all rounds in any of the treatments.

### *4.2. Contract efficiency: Incentive vs Trust*

We now turn to a closer examination of the relative performance of the two types of contracts with whether IC and NC were differently accepted or not, and whether averages and tendencies of offered wages, effort levels, principals pay-offs, agents pay-offs, and social output were similar or not.

We noted that IC were slightly more accepted than NC in both treatments. 84% of the proposed IC were accepted in each treatment against 81% and 78% of the proposed NC, in the ST and in the PT respectively.

Result 4. *On average, NC performed generally better than IC and provided higher payoffs*.

Table 4 displays the comparative values of offered wages, chosen effort level, and principals' and agents' payoffs, averaged over all rounds and all concerned players[5] for the two treatments. Average offered wages in IC and NC were about the same level within each treatment. It can still be noted that the highest wages were not associated with the same contract from one treatment to the other : in ST wages proposed with IC were around 7% higher on average than proposed wages in NC[6]

5 The analysis of the average effort does not include the incomplete cases where the proposed contract was refused by the agent. Unless otherwise specified, all the differences in average values presented below are significant at the 0.05 confidence interval (Mann-Whitney rank-sum test).

6 The difference is not significant here.

whereas in PT wages proposed with NC were around 18% higher than in IC. The average wage offered with NC over both treatments was 24.5 against 19.5 for IC. Wages offered with both contracts decreased over time in ST, from an average wage of 32.9 for NC in the first round down to 5.6 in the last round and from 28 down to 13 for IC. An even steeper decrease was observed in PT for the IC, from an average first round wage of 48 down to 17.7 in the last round, however the NC average wage in PT exhibit a rather moderate decrease, from 35.4 to 29.4.

Effort levels followed the same pattern as wages, the average chosen effort level being higher for IC than for NC in the ST and vice versa in the PT (see Table 4). Over the two treatments however, the average observed effort level was 3.9 in NC against 2.8 in IC. The higher offered wages in NC seem thus to have successfully triggered higher effort levels, and quite effectively so since the observed increase of 26% of the average wage was associated with an increase of 38% of the average effort level. The correlation coefficient between wages and effort level is indeed 0.72 for the NC over the two treatments, against 0.54 for the IC. The difference between the two contracts in terms of effort levels is quite stable over time, the average effort level being higher in NC than in IC in all rounds excepted round 6 were the average effort level is the same for the two contracts.

The effort levels were rather stable over time, the only noticeable decreasing trend ($R^2 = 0.43$) being observed for the average effort levels chosen in IC in the ST.

In both treatments, the average payoff was thus higher in NC for both types of players. The average payoff for principals in NC was 8.6 against -0.6 in IC, agents obtain an average of 18 in NC and 13.6 in IC. As already mentioned, the PT was relatively more favorable to NC. However, the collective cost of IC, where principals had to pay $k = 10$ for the control device and agents had to pay on average one third of the fine in case they chose an effort level lower than the requested one, made the NC more efficient than the IC in both treatments in terms of payoffs: in the ST the average payoff for principals was 3.2 in NC against -1.3 in IC, when the average agent's payoff was 12.9 against 11. The *social outcome* was thus higher on average in NC than in IC, in each treatment.

Finally, principals were better off on average under NC in the ST than they were under IC in the PT. This provides some additional evidence that the mechanisms supporting the emergence of cooperation through repetition may not necessarily add up with the effects of incentives, since the latter even seem to be counteracting the benefits of repetition between the same pairs. Here, control costs have totally offset the effects of incentives.

Table 4: *Average wages, effort levels and payoffs by treatment and by contract.*

| | Wage | | | Effort | | | Principal payoff | | | Agent payoff | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contract | *ST* | *PT* | All | *ST* | *PT* | All | *ST* | *PT* | All | *ST* | *PT* | All |
| NC | *15.2* | *31.2* | 24.5 | *1.9* | *5.3* | 3.8 | *3.2* | *12.7* | 8.6 | *13* | *22* | 18 |
| IC | *16.4* | *26.4* | 20.1 | *2.3* | *3.7* | 2.8 | *-1.3* | *0.5* | -0.64 | *11* | *17.9* | 13.6 |
| Together | 15.7 | 29.8 | 22.75 | 2.1 | 4.8 | 3.4 | 0.94 | 9.2 | 5.07 | 12 | 20.9 | 16.45 |

### *4.3. Matching mode efficiency: Partner vs Stranger*

As shown in Table 4, average offered wage was much higher in the PT (29.8) than in the ST (15.7). At first look, agents seem to have responded to the higher wages in PT with an average effort level of 4.6 against 2.1 in ST. The minimum possible effort level being 1, the difference between the two treatments in terms of effort level is even stronger than the difference in terms of average offered wages. We indeed observed a correlation coefficient of 0.73 between wages and chosen effort level in PT, as compared to 0.21 in ST. The outcome was a strong difference between the two treatments both in terms of principals' average payoff, which was 0.9 in the ST against 9.2 in the PT and of agents' average payoff, which was 12 in the ST and 20.9 in the PT.

RESULT 5. *Wages, effort levels and payoffs were higher in the Partner treatment than in the Stranger treatment. On average their value is doubled for the NC.*

The PT had a positive effect on payoffs values for both players and for both contracts, the average payoff being significantly higher in PT than in ST (the difference varies between 1.8 and 9.5 points, depending on player type and chosen contract).

As expected in the light of the previous observations on contract shares, the PT was more favorable to the NC also in terms of its relative efficiency in comparison to the IC. The difference between PT and ST in terms of average wages and effort level is greater for the NC than for the IC, in such a way that the ranking of the two contracts in these terms is reversed from ST to PT.

### *4.4. Trust and forward-looking reciprocity: the dynamics of cooperation*

We will now try to get a finer picture of the interaction dynamics at stake by estimating (i) the possible determinants of effort levels (wage, required effort level, treatment and contract) and in turn (ii) the effect of effort levels on the wages chosen by the principals.

### *4.4.1 The agents' side*

The analysis of the comparative responsiveness of agents to offered wages and required effort levels by treatment and by contract should indeed provide the first leg of the explanation to the contract shares observed at the aggregate level.

Given that the agents have accepted the contracts offered by the principals, they may choose an effort level between one and ten. Many observations lie at the boundaries: in the Stranger treatment (Partner treatment) an effort of one was chosen in 114 (61) and ten was chosen in 1 (35) of 163 (159) cases. Thus, effort is a doubly censored outcome which we estimate in a censored regression approach.[7]

Two models are estimated. In both models, effort (e) of an agent in a given round is regressed on the characteristics of the contract offered by the principal, namely the wage *w*, required effort level *e** and contract mechanism (where the dummy *IC* (*NC*) assumes one if incentive (non-binding) contract is chosen and zero otherwise). The first model introduces the contract mechanism in the form of an additional regressor, next to wage and required effort, that may shift the level of effort. A second model considers the interaction between contract mechanism and the other contract characteristics. This way the effect of wage and required effort level on the agent's effort is allowed to vary from NC to IC.

Estimation results are given in Table 5. We will first consider effects within the Partner treatment on the left-hand side of the table. The two models without and with interaction effects, columns 1, 2 and columns 3, 4 respectively, are estimated with a pooled and fixed effects approach. The fixed effects estimation is based on considerably fewer observations than the pooled estimation due to differencing and symmetrizing (68/69 observations versus 159 observations). The Hausman test suggests that interpretation of results should be based rather on the more efficient pooled estimation approach, since neither for Model 1 nor for Model 2 the test is able to reject the null hypothesis that coefficients of wages, efforts and contract mechanism are the same in both pooled and fixed effects approach. Comparing the model fit of Model 1 and Model 2 furthermore suggests that Model 2 with

7 Since we are in a panel data setting, we estimate coefficients following two approaches. A pooled censored regression with a common intercept for all individuals is estimated first. This estimation is then complemented by a fixed effects approach in which individual specific fixed effects are swept out by first differencing. Here, consistency is established by symmetrizing observations along the work of Honoré (1992) as discussed in Hsiao (2007, p. 243). The second approach is less efficient because observations violating symmetry need to be discarded. Therefore, we compare the estimates of the pooled and fixed effects approach with a panel robust version of the bootstrapped Hausman test (see e.g. Cameron and Trivedi, 2005, p. 378). All regressions include dummies for each round of the game. P-values of coefficients, i.e. the significance level of rejecting the null hypothesis that the true value of an estimated coefficient is zero, are derived in a block-bootstrap which samples over individuals (not individual-period observations). Resulting p-values are thus robust to clustering of errors within individuals (see e.g. Cameron and Trivedi, 2005, pp. 377). All bootstrap tests provided henceforth use ten thousand bootstrap samples.

interaction effects improves over Model 1. In particular, a likelihood ratio test on the pooled models yields a significance level below 10%.

RESULT 6.1. *In the Partner treatment, wages (w) have a significant positive effect on agents' effort levels for both types of contracts and required effort levels ($e^*$) have a significant positive effect on agents' effort levels in the NC.*

Turning to the coefficient estimates for the Partner treatment, we find that agents positively respond to wages offered by the principal and that this response is rather independent of the contract mechanism governing the relationship. In both, pooled and fixed regression of Model 1, the estimated coefficient of wage is positive and significant (see coefficient w in first two columns of Table 5). Model 2 allows for separate wage effects arising from incentive and trust contracts (see Table 5, columns 3 and 4, rows $w_{IC}$ and $w_{NC}$ for wage in IC and NC respectively). Results from pooled and fixed effects regressions show that the effect of wage on effort is the same for both types of contracts.

Moreover, required effort has some effect on effort provided by the agent. Pooled estimates provide some support for the idea that required effort is positively related to exerted effort (see row $e^*$, first column in Table 5), and, that this effect is particular to the non-binding contract regime (since $e^*_{IC}$ is insignificant and $e^*_{NC}$ is significant in column 3 of Table 5). However, this result is less robust as estimated coefficients of required effort are insignificant in all (less efficient) fixed effects models.

We also observe that the chosen contract *per se* did not significantly affect the effort level, as shown by the insignificant contract dummy *IC* in Model 1. Thus it appears that intentionality models of reciprocity (see e.g. Rabin, 1993, or Falk and Fischbacher, 2006), which would have attributed an effect to the choice of the non-binding contract devoid of any punishment device, may not add much in the explanation of agents' choices in our case.

Results on the Partner treatment are in stark contrast with the estimation results on the Stranger treatment (presented on the right-hand side of Table 5). Also for interpretation of the Stranger treatment results, focus should be on the pooled regression estimates because the Hausman test does not suggest that coefficient estimates differ from pooled to fixed effects regression (rejection levels of about 10 percent and 20 percent for Model 1 and Model 2 respectively). Moreover, a likelihood ratio test shows that the interaction model, Model 2, does not fit the data significantly better than Model 1 where the contract mechanism affects only levels.

Table 5: *Censored regression of agent's effort, p-values in parenthesis*.

| | Partner treatment | | | | Stranger treatment | | | |
|---|---|---|---|---|---|---|---|---|
| | Model 1 | | Model 2 | | Model 1 | | Model 2 | |
| | Pooled | Fixed | Pooled | Fixed | Pooled | Fixed | Pooled | Fixed |
| Intercept | -6.56 | | -7.097 | | -0.162 | | 0.412 | |
| | (0.000) | | (0.000) | | (0.4842) | | (0.3353) | |
| *w* | 0.227 | 0.188 | | | -0.002 | 0.086 | | |
| | (0.000) | (0.000) | | | (0.486) | (0.091) | | |
| *e** | 0.407 | 0.342 | | | 0.157 | 0.349 | | |
| | (0.036) | (0.2471) | | | (0.1967) | (0.1308) | | |
| *IC* | -1.897 | -0.578 | | | 1.899 | 1 | | |
| | (0.0819) | (0.4067) | | | (0.0352) | (0.1258) | | |
| $w_{IC}$ | | | 0.249 | 0.188 | | | 0.04 | 0.046 |
| | | | (0.0041) | (0.0061) | | | (0.336) | (0.2303) |
| $w_{NC}$ | | | 0.214 | 0.186 | | | -0.018 | 0.115 |
| | | | (0.000) | (0.0038) | | | (0.2848) | (0.1139) |
| $e^*_{IC}$ | | | 0.08 | 0.291 | | | 0.175 | 0.429 |
| | | | (0.4477) | (0.3703) | | | (0.2778) | (0.1386) |
| $e^*_{NC}$ | | | 0.529 | 0.374 | | | 0.152 | 0.123 |
| | | | (0.0187) | (0.2467) | | | (0.2394) | (0.3671) |
| $Log(\sigma)^1$ | 1.567 | | 1.554 | | 1.508 | | 1.511 | |
| | (0) | | (0.000) | | (0) | | (0) | |
| Period dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| No. ind. | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 |
| No. obs. | 159 | 68 | 159 | 69 | 163 | 56 | 163 | 58 |
| Gof[2] | -243.91 | 209.37 | -242.56 | 209.67 | -196.74 | 132.10 | -197.48 | 136.54 |

Notes: [1]Estimated standard deviation of the residuals in logarithms. [2] Goodness of fit is log likelihood for pooled regression and least absolute deviance for fixed effects regressions.

RESULT 6.2. *In the Stranger treatment, no significant effect of wage (w) or required effort level ($e^*$) is observed.*

In the Stranger setting, according to estimation of Model 1 with the pooled approach, agents' efforts are not affected systematically by offered wage or required effort level. In the fixed effects estimation of Model 1, wage is estimated to be somewhat positive and significant. The associated significance level however is close to 10% and the effect is small compared to the effect in the Partner treatment. Also, the wage effect disappears when we detail by contract mechanism in the interaction model (Model 2).

This result can be partly explained by the large number of agents who chose the minimum effort level in this treatment and by the rather low number of incentive-compatible contracts among the chosen IC. As in Fehr et al. (2007) we observed a larger share of these in the last round (four of eight chosen IC) than in the first round (one of five chosen IC). Overall only one fourth of the

accepted IC used such values of $w$, $e^*$ and $f$ that the best response for the agent in terms of monetary payoffs was to choose the required effort level. This could also explain why we did not find a systematic effect of wages and required effort on chosen effort in the Stranger treatment, where IC was chosen more often than in the Partner treatment.

Preference of IC over NC may be explained by the fact that we find some support for higher effort under IC in Model 1 in the pooled estimation. However, the corresponding fixed effect estimate is lower and becomes insignificant. Nevertheless, we can not neglect the possibility that incentive contracts help to enforce higher efforts of agents in the Stranger setting.

Roughly speaking, in total our estimations strongly suggest that in the Partner treatment offered wage affects the agent's effort independently from the contract mechanism, and perhaps that required effort levels play a role above that of wages in non-binding contract settings. In the Stranger treatment however, agents do not respond positively to either higher wages or higher required effort, under incentive as well as under non-binding contracts. A positive effect of incentive contracts on agents' efforts finds some weak support.

### *4.4.2 The principals' side*

The second leg of the cooperation dynamics is provided by the analysis of the correlation between the effort level chosen by agents and the wage offered by principals in the following round.

Each round the agent makes the first step in offering a contract that consists of a contract mechanism, an offered wage, a required effort level, and potentially a fine. This section shows that the principal's offer is influenced by the past effort of the agent. In particular, we find that influence of past effort on contract offer is higher in the Partner than in the Stranger treatment.

Our econometric analysis focuses on the wage offered by the principal. The principal may offer any integer value between 1 and 99. However, only in two cases a wage of one or 99 has been chosen and half of the observations are between 25 and 50. Hence boundaries are not a practical issue and we may estimate an ordinary linear regression model.

Several independent variables are included. Firstly, the wage offered by the principal in the preceding round, i.e. the lagged dependent variable, is entered to capture that principals may adapt their wage offer from round to round. Squared lagged wage is introduced to allow for non-linear effects. Then, the effort exerted by the agent in the last round, or 'lagged effort', is entered as our key independent variable. Finally we also take into account whether the agent rejected the offer in the prior round (if so the dummy `Lag(reject)' assumes one, else zero), and a dummy variable

indicating whether the current offer is within a non-binding contract (dummy NC).[8] Model 1 considers all these factors but ignores under which contract mechanism past choices emerged. Model 2 takes this into account by letting the lagged contract mechanism choice interact with the independent variables of Model 1.

The estimation strategy is similar as for the estimation of agents' effort. For each treatment both models, Model 1 and Model 2, are estimated first by pooling all observations and then by taking into account individual specific fixed effects through a within-estimation approach (only taking into account variation within individuals for estimation). Estimation approaches are compared with a Hausman test. As above, Hausman tests and p-values of coefficients are all derived within a panel-cluster-robust block-bootstrap approach based on ten thousand resamples.

We turn now to the results in Table 6. Results for the Partner treatment are found at the left-hand side and for the Stranger treatment at the right-hand side of Table 6. In both treatments and all models, Hausman tests clearly reject the null hypothesis that pooled and fixed (within) regression estimates are both consistent for all models and treatments.[9] Furthermore, for both treatments an F-test comparing the two models obtained from fixed effects estimation is not able to reject the hypothesis that both models fit the data equally well, taking into account increasing complexity from Model 1 to Model 2. Therefore, we focus now on the results of Model 1 obtained within the fixed effects approach.

> Result 7.1. *In the Partner treatment, wages (w) offered by principals are significantly positively correlated to previous effort levels chosen by the agents (Lag(e)) and to previous contract refusal.*

In Model 1 (see second column, Table 6), wage offered in the current round correlates with wage offered in the prior round and its square term. Most importantly we estimate a significant positive effect of past effort on subsequent wage. Also rejecting an offer is found to have a positive effect on subsequent wages. Finally, current wages within NC are not significantly different from those in Incentive contracts.

These estimates seem reasonable: the average estimated fixed effects over principal-agent pairs is

8 Although the contract is a bundle on which the agent simultaneously decides, we do not model the contract mechanism choice explicitly as an endogenous variable. The reason is that contract mechanism choice and offered wage are little correlated controlling for other factors in the regressions. Setting up a two-equations model is therefore not reasonable as this would necessitate either more assumptions than we would like to make (Maximum Likelihood) or more data than we have (Generalized Method of Moments). For the same reasons the initial observation problem has not been treated explicitly in the regression results. This might underestimate the effect of the lagged dependent variable (see Hsiao, 2003, pp. 69).

9 One exception is lagged effort in both models estimated for the Stranger setting where the Hausman test is not able to reject that pooled and fixed regression are the same given their variation in resampling.

11 (not displayed in the table). Combining the average fixed effect and the estimated inverse-U-shaped effect of past effort, we obtain a wage of about 26 as a stable equilibrium (which is close to the average observed wage of 30). Wages set above 26 tend to decline again in case the agent does not sufficiently contribute. For instance, in order to sustain a wage of 40, the agent needs to contribute an effort of 7 with an associated cost of 10. Gains for both principal and agent amount then to 30 each under trust contracts.

Table 6: *Linear model regression of wage offered by the principal, p-values in parenthesis*.

| | Partner treatment | | | | Stranger treatment | | | |
|---|---|---|---|---|---|---|---|---|
| | Model 1 | | Model 2 | | Model 1 | | Model 2 | |
| | Pooled | Fixed | Pooled | Fixed | Pooled | Fixed | Pooled | Fixed |
| Intercept | -6.257 | | -5.966 | | 4.54 | | 2.748 | |
| | (0.034) | | (0.044) | | (0.214) | | (0.257) | |
| *Lag(w)* | 1.233 | 0.888 | | | 0.375 | -0.051 | | |
| | (0) | (0) | | | (0.006) | (0.452) | | |
| *Lag($w^2$)* | -0.011 | -0.011 | | | 0.003 | 0.005 | | |
| | (0.019) | (0.026) | | | (0.342) | (0.046) | | |
| *Lag(e)* | 2.484 | 1.297 | | | 0.906 | 0.638 | | |
| | (0) | (0.004) | | | (0.01) | (0.069) | | |
| *Lag(reject)* | 10.566 | 8.173 | | | 6.116 | 0.249 | | |
| | (0) | (0.001) | | | (0.004) | (0.454) | | |
| *NC* | -0.923 | 0.538 | | | 0.205 | -0.531 | | |
| | (0.356) | (0.39) | | | (0.369) | (0.53) | | |
| *Lag($w_{NC}$)* | | | 1.119 | 0.838 | | | 0.458 | -0.073 |
| | | | (0) | (0.011) | | | (0.004) | (0.382) |
| *Lag($w_{IC}$)* | | | 1.612 | 1.209 | | | 0.578 | 0.093 |
| | | | (0) | (0) | | | (0.005) | (0.307) |
| *Lag($w^2_{NC}$)* | | | -0.009 | -0.009 | | | 0.002 | 0.005 |
| | | | (0.158) | (0.104) | | | (0.41) | (0.072) |
| *Lag($w^2_{IC}$)* | | | -0.018 | -0.015 | | | -0.003 | 0.003 |
| | | | (0) | (0.003) | | | (0.143) | (0.267) |
| *Lag($e_{NC}$)* | | | 2.712 | 1.537 | | | 0.783 | 0.341 |
| | | | (0) | (0.018) | | | (0.131) | (0.252) |
| *Lag($e_{IC}$)* | | | 1.742 | 1.004 | | | 0.887 | 0.595 |
| | | | (0.016) | (0.048) | | | (0.014) | (0.141) |
| *Lag($reject_{NC}$)* | | | 12.786 | 13.553 | | | 8.989 | 1.014 |
| | | | (0) | (0.001) | | | (0.023) | (0.448) |
| *Lag($reject_{IC}$)* | | | 7.755 | 0.079 | | | 3.058 | -1.722 |
| | | | (0.015) | (0.4) | | | (0.062) | (0.307) |
| *IC_Lag(NC)* | | | -1.649 | 0.115 | | | 1.724 | 3.263 |
| | | | (0.261) | (0.488) | | | (0.361) | (0.341) |
| *NC_Lag(IC)* | | | 0.905 | 0.072 | | | -2.913 | -4.88 |
| | | | (0.441) | (0.452) | | | (0.077) | (0.019) |
| Period dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| No. ind. | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| No. obs. | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 |
| $R^2$ | 0.666 | 0.175 | 0.685 | 0.211 | 0.345 | 0.159 | 0.361 | 0.181 |

Notes: $R^2$ is the explained variance over total variance in the pooled regression and over within individual variance in

the fixed effects regression.

Model 2 has not been found to fit the data significantly better as Model 1 but gives nevertheless some intuition in how past contract mechanism choice actually tends to alter the effect of past outcomes on future choices. We first note that the inverse-U-shaped effect of past wages is more accentuated for IC than for NC, and that past effort is more influential within NC than in IC. Furthermore, only within NC rejecting an offered contract has a positive effect on the subsequent principal's wage offer.

Summarizing the findings on the Partner treatment, results support the idea that *there is a strong influence of past actions on future decisions*. Notably, the agent's effort in the preceding round is going to positively affect the principal's wage offered in the subsequent round.

> RESULT 7.2. *In the Stranger treatment, wages (w) are positively correlated to previous effort levels chosen by the agents (Lag(e)), though notably less than in the PT and less significantly so.*

This contrasts with the estimation results on the Stranger treatment where we find prior effort to be less influential and less systematic (see right-hand side of Table 6, Model 1, fixed effects, *Lag(e)* estimate). In detail, the effect of lagged effort is about half the magnitude as found in the Partner treatment, with a higher significance level of about 7%.

Finally, distinguishing influence from the prior round by contract mechanism in Model 2 fixed approach does not add much insight. There is some weak support that wages offered in prior non-binding contracts might be somewhat positively correlated with current wages (as $lag(w^2_{NC})$ is significant and positive), and that switching from IC to NC is accompanied by a reduction in wage (see *NC_lag(IC)*).

As mentioned before, interpretation should be based rather on the fixed effects version of Model 1. In order to gain some intuition, we ask the same question as for the Partner treatment : when would a wage of, say, 40 be sustained over several rounds? In the Stranger treatment, Model 1, fixed effects are in average 16 (this is higher than in the Partner treatment and with lower variance across principals). Now, given further coefficient estimates, agents would actually need to exert an impossible effort of 28 in order to sustain a wage of 40. However, sustained wages at around 20 seem to be in reach when the agent contributes an effort of 5. This effort results in much lower gains than in the Partner treatment. More importantly, such a strategy would probably not be sustainable because it gives rise to very unequal gains in favor of the principal and, hence, motivates the agent to reap all the wage without any effort.

Taken together all estimation results insights are clear. In the Stranger treatment, past decisions of agents and principals do not effect considerably subsequent wages. One noticeable limitation is weak support for an effect of past agent's effort on subsequent wage. This effect however is small, about half of that found in the Partner treatment, and less systematic. More importantly the effect is unlikely to sustain higher levels of wages over rounds.

### *4.4.3 The dynamics*

In the larger picture, these results support a strong effect of the repetition of interactions between the same pair of subjects, through a sustained responsiveness of agents to the offered wage in both contract types and to the required effort level in the non-binding contract, tightly reciprocated by principals in the following round. Since the incentive contract furthermore bears a fixed cost for principals it should clearly be dominated by the non-binding contract in the Partner treatment while principals should find it more difficult to select a contract type in the Stranger treatment. This is indeed what is observed at the aggregate level, as shown by the contract shares.

## 5 . Discussion

From the above results, the NC appears as generally more favorable to cooperative outcomes than the IC. It is indeed associated with higher wages and higher effort levels in the PT while performing equally in the ST. However, in our experimental setting the IC contract is cognitively more complex than the NC, since it requires principals to set correctly the required effort level, the fine and the wage parameters in order to achieve incentive compatibility. The large number of non incentive-compatible IC and the increasing share of incentive compatible ones shows that these choices have not been straightforward for our subjects though some learning happened[10]. One could also point that by design the IC could not elicit higher effort than $e = 4$ and that it was associated with a fixed cost. We also observed that most of the incentive-compatible IC were successful in determining the agent to choose the specified effort level, but that in only one case a higher effort was provided.

In Fehr et al. (2007) the authors claim that "the principals converge toward the most efficient contract in the set of available contracts" (p.151), a claim at least partly backed by their data but contradicted by the results of our Stranger treatment, in which we reproduced their trust-incentive

10 Fehr et al. (2007) also note that "over time, most principals learned to make the contract incentive compatible, but this was not a trivial task. After all, no principal observed what the other principals did, so everybody had to figure it out on their own. Not all principals managed to do so within the ten rounds of the experiment" (p.133).

treatment as a benchmark for the Partner treatment. We observed that NC and IC hold an equal share of principals' choices until and including the last round of the experiment. We agree with them that "this observation is important because the 'efficiency principle' provides the basis for much of modern contract theory" but in both treatments the NC happened to be on average more efficient than the IC. Though it is outside of the scope of this paper, it could be interesting to investigate how the inequity aversion model they used would help explain and interpret these differences, since they actually found a very close match between their experimental results and predictions based on a fixed set of parameter values applied to their model. They also found that "on average the payoff differences [between the two contracts for the principals] are, however, not statistically significant ($p > 0$ 59, Mann–Whitney test) " (p. 131). It seems thus that principals did not extract any absolute payoff advantage from choosing the incentive contract in their experiment either, so that their results could also stem from the principals' indifference to the two contracts in a stranger setting (i.e. be in the confidence interval of the null hypothesis of indifferent principals)[11].

Finally, the bonus-incentive treatment in Fehr et al. (2007) yields very similar results to our Partner treatment. In both settings the principals have the opportunity to respond to agents' choice – by paying a bonus in one case and by adjusting the offered wage in the following round in the other. It is thus obviously more straightforward for principals in both cases to trust that the agent's choice will be favorable than it is in the (trust-incentive) Stranger treatment. However, again, the bonus-incentive treatment amounts to comparing two forms of incentive contracts and can thus not make a case for the form of cooperation that sustains the informal organization.

## 6 . Conclusion

We have let two alternative mechanisms, differentiated along the lines of the two conceptions of cooperation, compete in a small population of principals and agents. When the interactions were not repeated between the same pairs of subjects, the incentive contract and the trust contract shared equally the principals' choices from the second round on. When the same players were matched for all rounds, the non-binding contract was chosen by a majority of principals and in more than 70% of cases in the last iterations of the game.

11 The only noticeable differences between their settings and ours were that (i) they used the connoted terms "employer" and "employee" in the instructions where we used the neutral expressions "player A" and "player B", (ii) they relied on a manual procedure with paper and pen without isolating players while we used computer terminals and blinders, (iii) their subjects were students of "the natural sciences, engineering, law, political science and mathematics from the University of Munich and the Technical University of Munich" while ours came from more diverse fields of the University of Strasbourg and (iv) they explicitly required that the offered wage cover the effort cost, which we did not. Since the incentive compatibility of the chosen IC is crucial to their performance, any procedural factor that may favor the correct calculation could partly explain the difference between our results in the Stranger treatment and theirs.

These results support the conception of cooperation as possibly emerging from non-binding settings where agents must rely on reciprocal trust to produce collective outcomes. Importantly, this form of cooperation is enhanced by the repetition of interactions between the same agents, which is usually the case in organizational processes. It does not preclude that incentives can indeed trigger cooperation efforts but these should not be expected to go beyond incentive compatibility. Real-life incentives cannot always be set in such a way as to extract the maximum contribution level from the members of the organization. This is particularly the case concerning that crucial part of the overall contribution needed to sustain the informal organization stressed by Barnard (1948), and in turn to support the very survival of the organization. In Barnard's own words, "it would be better if economic motives did operate more effectively, but the point is that it is impossible to get to the root of personnel relations or understand labor troubles or successes on the unrealistic assumption that economic motives exclusively govern. They *merely limit and guide*. They control more in some cases or some businesses than others"[12]. Our results provide experimental support to this view.

In a broader context, two complementary conclusions can also be drawn from these results. First, the efficiency of contract design is not clear cut *ex ante* and is mainly determined by context-specific behavioral frames. It has not been observed here that the non-binding contract was outperformed by the incentive contract, nor that one contract was eventually swept away in any of the two treatments. Second, repeated interactions are not necessarily a source of learning towards some predefined equilibrium and can effectively support the emergence of contract designs that economize on coercive mechanisms. This raises the related issue of the availability of alternative designs. If cooperation is influenced by existing contract designs, then the dominant form of contractual arrangement would likely influence the extent to which emerging or elicited cooperation is perceived as the normal context of interaction, and in turn be strengthened as the preferred contractual form.

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12 Barnard (1948), p.15 (emphasis added).

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