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Abstract: Exogenously given reputational information is known to improve cooperation. This paper experimentally studies how people create such information through reporting of partner's action choices, and whether the endogenous monitoring helps sustain cooperation, in an indefinitely repeated prisoner's dilemma game. The experiment results show that most subjects report their opponents' action choices, thereby successfully cooperating with each other, when reporting does not involve a cost. However, subjects are strongly discouraged from reporting when doing so is costly. As a result, they fail to achieve strong cooperation norms when the reported information is privately conveyed only to their next-round interaction partner. Costly reporting occurs only occasionally, even when there is a public record whereby all future partners can check the reported information. However, groups can then foster cooperation norms aided by the public record, because reported information gets gradually accumulated and becomes more informative over time. These findings suggest that the efficacy of endogenous monitoring depends on the quality of platforms that store reported information.

Keywords: experiment, cooperation, prisoner's dilemma game, reputation, reporting, infinitely repeated game.

JEL classification codes: C92, C73, D70, H41

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1. Introduction

Situations in which cooperation is beneficial from long-term perspectives but individuals have strong short-term incentives to defect are ubiquitous in real life. Public monitoring plays a key role to facilitate cooperation in such situations, thereby enabling the members to operate effective punishment strategies (e.g., Mailath and Samuelson, 2006). Reputational information needs to be created gradually through motivated actors' gossiping of partners' behaviors for public monitoring, as many interactions are made privately.

The burgeoning experimental literature on cooperation in infinitely repeated dilemma games with random matching has largely confirmed the strong impact of exogenously given reputational information on sustaining cooperation (e.g., Camera and Casari, 2009; Kamei, 2017, Stahl, 2013; Schwartz *et al.*, 2000).[1] But where does the reputational information come from? There are recent successful attempts by scholars on people's possible *endogenous* formation of reputational information, suggesting that community members can share information effectively and achieve high cooperation norms through voluntarily disclosing own identifiable information (Kamei, 2017) or acquiring partners' history information at private costs (Duffy *et al.*, 2013). However, it also suggests that gossiping alone may not be enough to do so (Camera and Casari, 2018). In Camera and Casari (2018), allowing subjects in a laboratory to pay a cost to convey their partners' actions to the partners' next-round counterparts was not enough to improve cooperation, with which the authors conclude that "information about past conduct alone thus appears to be ineffective in overcoming coordination challenges." However, this leaves two important questions unanswered. First, how does the presence of a reporting cost influence the effectiveness of endogenous monitoring? It is possible that their result may have been driven by the positive reporting cost, considering that players' disclosure decisions have recently been shown to be sensitive to having a cost for the case of revealing own information (e.g., Kamei, 2017, 2020).[2] Second, what happens to people's reporting and cooperation behaviors if there is a publicly available platform that stores reported information? The availability of such a platform may be crucial in improving cooperation, considering that online markets, such as eBay, Uber and Airbnb, operate feedback mechanisms with information storing property (Dellarocas, 2003).

Gossiping has long been actively studied in the neighboring fields, such as anthropology,

[1] See Takahashi (2010) for theoretical work.

[2] There was no treatment in which subjects can transmit reputational information for free in Camera and Casari (2018), whose aspect makes answering this question impossible in their study.

biology, (evolutionary) psychology and sociology, and has been discussed to help create reputation, thereby promoting cooperation in human societies. For example, as summarized in Kamei and Putterman (2018), the literature suggests that gossiping can be initiated by pro-social individuals when observing others' norm violations or misdeeds, and that the gossiping activities are linked to emotional states of the reporters. Despite its obvious importance, however, surprisingly little attention has been paid to gossiping until recently in the experimental economics literature. In addition to Camera and Casari (2018), four more recent economic experiments explored the functioning of gossiping and provided useful evidence. However, these papers were all built on finitely repeated games unlike this paper and Camera and Casari (2018), and thus their focuses are different from the present paper, suggesting that most gossiping may take a form of cooperator-defector reporting due to other-regarding preferences in a one-shot prisoner's dilemma where material benefit to the reporter is absent (Kamei and Putterman, 2018), most reporting is truthful even when lying is possible in a trust game (Fonseca and Peters, 2018), having a third party who can gossip boosts trust and trustworthiness in a trust game, driven by the mere fact of being observed by others (Fehr and Sutter, 2019)[3], information transmission through subjective ratings may not raise transfer and return rates in a trust game (Abrahama *et al.*, 2016). This paper aims to contribute to not only the experiment literature in infinitely repeated dilemma games, but also the literature on reputation, by providing new experimental evidence that reporting behaviors may be severely deterred by the presence of a positive reporting cost even in long-term interactions with multiple equilibria and that the efficiency of monitoring may strongly depend on the availability of a platform that stores reported information.

In the experiment, recruited subjects play an indefinitely repeated prisoner's dilemma game under random matching. In each main treatment, subjects are given an opportunity to report their matched partners' action choices to the partners' future partners. Four main treatments are constructed by varying two factors (2×2 factorial design). The first factor is the size of the reporting cost: either reporting is free or costly. The second factor is the information structure: either reported action choice is informed to the partner's next interaction partner only or to all future partners.

The experimental results show that while cooperation is easily collapsed when endogenous monitoring is not possible, subjects can achieve strong cooperation norms if they

[3] See also Kamei (2018) for the impact of high visibility. This channel is absent in the present study since a third party is not introduced (see the experimental design).

can report another's action for free. Remarkably, the strong impact of endogenous monitoring does not depend on whether the community has a publicly available platform that stores reported information. By sharp contrast, the efficiency of monitoring does depend on the information structure under costly reporting. On the one hand, endogenous monitoring has almost no effect if subjects can convey with a cost their partners' action choices to the partners' next-round partners only, as is similar to the finding of Camera and Casari (2018). However, on the other hand, it has a strong positive effect if there is the publicly available platform of reputational information, because subjects can then gradually accumulate information and they can refer to all the previously reported behaviors of their matched partners when deciding on an action. This underscores the beneficial effect of storing reputational information when reporting is costly. Further, a structural estimation suggests that subjects' strategy choices were severely affected by the endogenous monitoring institutions. For example, a large fraction of subjects are estimated to have cooperated conditionally upon their matched partners' reputations in the experiment.

The rest of the paper proceeds as follows: Section 2 describes the experimental design. Section 3 discusses theoretical discussions and computer simulation exercises on possible evolutions of cooperation. Section 4 reports the experiment results. Section 5 concludes.

2. Experimental design

This study designs an infinitely repeated game based on a random termination rule. A multiple-supergame design is adopted to allow subjects to learn and update strategy choices (e.g., Dal Bó and Fréchette, 2018): subjects can play an indefinitely repeated prisoner's dilemma games with random matching up to six times.[4] An "indefinitely repeated prisoner's dilemma game" is also called a supergame in this paper (it was called a "phase" in the instructions distributed to subjects). Subjects are randomly assigned to a group of eight at the beginning of each supergame, and the group composition does not change within the supergame.[5]

Within a given supergame, each subject is randomly paired with another member in their group in every round. Since the group size is eight, the probability that a subject will interact

[4] An additional requirement is set so that the duration of interactions is up to 2 hours in total, to avoid having a too lengthy experiment session (which could contaminate data due to fatigue of subjects). Most sessions (11 out of the 16 sessions) went over all the six supergames, however.

[5] A larger group size was selected compared with Camera and Casari (2009) and Kamei (2017) where the group size was four, since this study considers large-scale economies (e.g., online platforms) where information does not automatically spread among community members without reporting. Responding to this design choice, a Markov transition matrix and equilibrium conditions were derived as summarized in Section 3 and online Appendix A.1.

with a specific group member in a round is one-seventh (they do not interact with those outside their groups within a supergame). Subjects' interactions are anonymous in the sense that they do not know their partners' IDs. However, they learn the partners' action choices in prior rounds in which they were reported. Neither their decisions nor their interaction outcomes in the past affect the matching process. The duration of each supergame is not pre-determined: subjects' interactions in a given supergame will end (continue) with a probability of 5% (95%).[6] The expected length of each supergame is therefore 20 (= 1/(1−.95)). The payoff matrix of the stage game is shown in Fig. 1.

Fig. 1: *Payoff Matrix of the Stage Game*

		Player 2	
		cooperate	defect
Player 1	cooperate	25, 25	5, 30
	defect	30, 5	10,10

Note: This matrix was used in Camera and Casari (2009) and Kamei (2017). Their studies used a group size of four.

Group assignment across the supergames follows the standard random matching protocol. Specifically, once a given supergame is over, all groups are dissolved in the session, and subjects are randomly assigned to a group of eight in the following supergame. Any information from a given supergame is not carried over to a future supergame.

This experiment consists of five treatments. The first treatment, denoted as the "No Reporting" treatment (dubbed "N"), serves as a control condition. Subjects play the aforementioned interactions without any information revelation, subject to the random termination rule. In each round, subjects just learn that they are randomly matched with one of the seven members in their groups. The other four treatments allow subjects to report (gossip) their own partner's action choice (cooperate or defect) to that person's future partner[s]. For the sake of simplicity, subjects' reporting is set to be always truthful.[7]

2.1. The Four Reporting Treatments

In every round, each subject can report their partner's action choice to that person's

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[6] An integer between 1 and 100 is randomly drawn at the end of each round. If it is less than (greater than or equal to) 96, subjects have (do not have) the next round.

[7] This design piece was used also in Camera and Casari (2018) and Kamei and Putterman (2018). Fonseca and Peters (2018) found that even without any material incentives, most trustors reported truthful information about their matched trustees as gossips in a trust game when their messages did not need to be objective.

future partner(s) in a given supergame. The treatment conditions are designed using a 2×2 factorial design by varying two dimensions (Table 1). The first dimension is the presence of a cost that a subject must pay to report; reporting is either cost-free or costly. Notice that reporting may not be considered free in reality since individuals need to incur the time (opportunity cost) or effort to warn others. In the costly reporting condition, if a subject reports her partner's action choice in a given round, one point will be deducted from her payoff at the end of that round. If the subject does not report it, no points will be deducted.

The second dimension is the consequence of reporting. In the "Minimum" condition, if a subject reports her partner's action choice in round *t*, only that partner's round $t + 1$ interaction counterpart will be informed of the choice before deciding how to act. This condition was used in Camera and Casari (2018) and Kamei and Putterman (2018). In the "Full" condition, by contrast, if a subject reports her partner's action choice in round *t*, all future counterparts of this partner will learn her choice in round *t*.

The four main treatments are called the "Free Reporting, Minimum" (F-Min), "Costly Reporting, Minimum" (C-Min), "Free Reporting, Full" (F-Full), and "Costly Reporting, Full" (C-Full) treatments.

2.2. Using a Block Design to Collect a Large Number of Observations

Considering that infinite repetition is designed using a random termination rule, a block design is employed in order to collect enough observations in each supergame (Fréchette and Yuksel, 2017).[8] In each supergame, subjects play blocks of ten rounds in sequence. That is, they will play ten rounds, assuming the random termination rule already described. In a given round, each subject will randomly be paired with a member in their group and will interact with each other. However, they will not be informed of an integer randomly drawn in each round until the end of the tenth round in a given block. After the tenth round, subjects will be informed of integers randomly drawn for all the 10 rounds. Subjects' payoffs are determined based on rounds before the round when an integer more than 95 is first realized.[9]

[8] Fréchette and Yuksel (2017) showed that subjects' behaviors under the block design do not differ from those under the standard random termination first used by Roth and Murnighan (1978).

[9] For example, suppose that the ten randomly drawn integers were: 4, 34, 98, 56, 32, 93, 2, 45, 14, and 32 in sequence. In this situation, subjects' total payoffs in the supergame will be calculated based on the interaction outcomes until the 3rd round in this block (the interaction outcomes from the fourth round will not be counted in calculating total payoff), and they will move on to the next supergame. By contrast, if the ten integers are all less than 96, then subjects will move on to the next block in the same supergame.

2.3. Experimental Procedure

16 sessions were conducted in the EXEC laboratory at the University of York in the United Kingdom from July through November in 2018 (Table 1). A total of 360 students participated in the experiment. All the subjects were recruited by solicitation messages sent through *hroot* (Bock *et al.*, 2014). No subjects participated in more than one session. No communication among the subjects was allowed after entering the laboratory and before the experiment ended. The experiment, except the instructions, was programmed using the zTree software (Fischbacher, 2007). Only neutrally-framed words were used in the instructions (any loaded words, such as cooperate and defect, were avoided) – see online Appendix C. The instructions were read aloud by the researcher. Subjects were also asked to answer a few control questions to check their understanding of the experiment at the start of each session. The conversion rate was 150 points in the experiment to one pound sterling.

Table 1: *Summary of Treatments*

<table>
<tr><th>Treatment</th><th>Available history information on round t partner before choosing an action in round t</th><th>Cost of reporting</th><th># of subjects (sessions)</th><th># of obs.</th><th>Avg. SG length [rounds]</th></tr>
<tr><td>N</td><td>n.a.</td><td>n.a.</td><td>72 (3)</td><td>9,120</td><td>21.11</td></tr>
<tr><td>F-Min</td><td rowspan="2">Round t partner’s action choices made in round t – 1 if he was reported in that round</td><td>0 points</td><td>88 (4)[#1]</td><td>7,336</td><td>23.33</td></tr>
<tr><td>C-Min</td><td>1 point</td><td>64 (3)</td><td>10,080</td><td>16.98</td></tr>
<tr><td>F-Full</td><td rowspan="2">Round t partner’s action choices made in all past rounds up to round t – 1 in a given supergame in which he was reported by his group members</td><td>0 points</td><td>72 (3)</td><td>10,320</td><td>23.89</td></tr>
<tr><td>C-Full</td><td>1 point</td><td>64 (3)</td><td>6,480</td><td>15.00</td></tr>
<tr><td>Total</td><td></td><td></td><td>360 (16)</td><td>43,336</td><td>20.06</td></tr>
</table>

Notes: [#1] Four sessions were conducted for the F-Min treatment because one session was not able to be completed (one subject withdrew the experiment in the middle of the session).

3. Theoretical Discussions on Subjects’ Behaviors

One instance of defection could quickly spread across a given group under random matching if the members act according to discriminating strategies (e.g., Kandori, 1992; Ellison, 1994). This contagious process makes cooperation difficult to evolve unless the continuation probability is large enough. Considering that the group composition is fixed in the experiment, such contagion and a possible evolution of cooperation can theoretically be studied using a Markov transition matrix, assuming that all the members act according to the grim trigger strategy (see Camera and Casari (2009) when the group size is four).[10] Appendix A.1.1 shows the transition matrix and the harmful contagious process identified when the group size is eight in the N treatment. As detailed in the Appendix, however, if the strategy set is restricted to only two: the grim trigger strategy and the always defect strategy, there are no material incentives for any member in the experiment to deviate from the grim trigger strategy, provided that all the other members follow the same trigger strategy. The threshold probability above which players have no profitable deviation from the grim trigger strategy, δ^*, is 0.574 (Appendix A.1.1), while the continuation probability used in the experiment is 0.95. This suggests that under this assumption, not only mutual defection but also mutual cooperation holds as an equilibrium outcome, even when no reputational information is available. Having this said, theoretical predictions under random matching are complex and not sharp. For example, a player who was betrayed in a given round would, if allowed, refrain from engaging in punishment unlike described by the grim trigger strategy (i.e., would deviate to choosing cooperation in the next round under certain conditions) because such a deviation helps delay the propagation of defection to other group members. δ must be less than 0.84 to avoid such deviation in the off-equilibrium path (see Appendix A.1.2 for the detail). Hence, following the grim trigger strategy is not an equilibrium in the experiment once players are allowed to select any strategy. It is also worth noting that the number of possible strategies in the infinitely repeated environment is not finite.

The complexity of the standard theory to predict behavior also holds for the four reporting treatments. However, while the reporting treatments are identical to the N treatment if no one engages in reporting, reputational information could encourage more cooperative choices if reporting does occur. Notice that uncooperative actions are more contagious in the reporting treatments than in the N treatment if it is assumed that (a) some members engage in reporting and (b) group members act according to a strict grim trigger strategy (e.g., members start to defect unconditionally in all future rounds, as soon as they learn from reported information that their matched partners defected in the past, or the partners defect towards them now) – see Camera and Casari (2009) and Kamei (2017). This means that δ^* (the threshold value for the continuation probabilities that encourage players to select the strict trigger strategy in the

[10] Also see Duffy and Ochs (2009).

equilibrium path) is not greater in the reporting treatments than in the N treatment. The lower threshold value may mean that players have more incentives to refrain from behaving uncooperatively with than without reporting.

Summary 1: *Cooperation can be sustained at a higher level with than without reporting.*

Recent experiments, however, suggest that theoretical analyses based on such grim trigger strategies may not be accurate. For example, Dal Bó and Frechétte (2011) estimated the distribution of subjects' strategy choices under partner matching, showing that the tit for tat strategy is the most frequently adopted cooperative strategy while the grim trigger strategy is not common.[11] Kamei (2017) studied subjects' behaviors when they had an option to hide IDs in an indefinitely repeated prisoner's dilemma game with random matching. His experiment revealed that the subjects' average behaviors are characterized by conditional cooperative strategies. For example, he showed that the higher fraction of cooperation her partner had in his reputational information, the more likely a subject was to choose cooperation.[12]

In order to accommodate the findings of these related studies and also to discuss possible treatment differences in great depth, a large simulation analysis was additionally performed by assuming that some group members engage in reporting and act according to a conditional cooperative strategy – CC players hereafter (while the rest follow the "always defect" strategy – AD players hereafter).[13] In the simulation, for simplicity, the strategy space is restricted only to the conditional cooperative strategy and AD strategy. While the simulation shows the presence of the symmetric cooperation situation where every group member selects cooperation in the equilibrium path under all five treatment conditions, clear treatment differences emerged (Appendix A.2). First, mutual cooperation is difficult to sustain in the N treatment.[14] As shown in Appendix A.2.1,

[11] The distribution of subjects' strategy choices were estimated in our paper, using the approach taken by Dal Bó and Frechétte (2011). As discussed in Section 4, the grim trigger strategy was also infrequently adopted by our subjects.

[12] People's use of such discriminatory strategies is an established phenomenon also in finitely repeated dilemma games such as public goods games (e.g., Fischbacher and Gächter, 2010; Kamei, 2020).

[13] The always defect strategy – the strategy where the subject selects defection unconditionally – is commonly observed even under partner matching. For example, Dal Bó and Frechétte (2011) estimated that the tit for tat and AD strategies together can account for 80 percent of all the data. In our simulation, for simplicity, the AD players are assumed to always report when doing so is free, considering the high efficiency of reputational information seen in the prior studies (e.g., Camera and Casari, 2009; Stahl, 2013; Kamei, 2017). However, it is assumed that the AD players do not engage in reporting when it is costly since they can free ride on others' reporting. Kamei and Putterman (2018), in a two-period prisoner's dilemma game environment, found that defectors are more selfish than cooperators in deciding whether to report: the former almost never engaged in reporting when reporting was costly.

[14] The simulation assumes that CC players stochastically select cooperation based on their own experiences in the N treatment (i.e., with a probability that their partners selected cooperation so far) – see Appendix A.2.1.

the cooperative equilibrium is volatile because defection spreads quickly to all members as soon as more than one player deviates from the cooperative strategy. Recall that as discussed in footnote 13, a non-negligible fraction of players are known to behave according to the AD strategy, either due to their tastes or errors, in this kind of indefinitely repeated dilemma interaction. The simulated pattern in the N treatment is consistent with the prior finding that cooperation tends to stay at low levels without reputational information.[15] Second, however, reputational information does help prevent such a breakdown of cooperation (Appendices A.2.2 and A.2.3).[16] This is consistent with Summary 1 discussed based on the standard theory. Having this said, the effectiveness of endogenous monitoring does depend on the reporting cost and the information structure. On the one hand, the symmetric cooperation situation is very stable when reporting does not involve a cost. This holds both for the F-Min and F-Full treatments, regardless of what conditional cooperative strategy is considered. For example, a simulation result indicates that a player in the F-Min treatment has material incentives to follow a conditional cooperative strategy (rather than the AD strategy) under reasonable assumptions, unless more than the majority of her group members act according to the AD strategy (Appendix A.2.2). Having a public platform that stores previously reported information in the F-Full treatment strengthens the stability of the cooperative equilibrium further (Appendix A.2.3). These positive effects are driven by the large quantity of reported information, thereby enabling CC players to accurately discriminate members based on observable peers' cooperation history. Hence, a player is deterred from behaving uncooperatively for future material concerns.

On the other hand, the impact of endogenous monitoring may be weak under costly reporting due to the smaller size of reported information. As detailed in Appendices A.2.2 and A.2.3, the simulation suggests that cooperation can be sustained at a high level in the C-Min treatment if players select actions as their partners' reputational information indicates, like a parrot (e.g., a player selects cooperation if her partner selected cooperation in the last round and it is

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[15] The average cooperation rate when the group size was four was 59.5% in Camera and Casari (2009) and 33.4% in Kamei (2017), when no reputational information was available. It is worth noting that sustaining cooperation is theoretically more difficult when the group size is eight than four.

[16] Simulations were performed based on two simplest assumptions for CC players. The first one is to assume that CC players select cooperation (defection) in round t if their current-round partners selected cooperation (defection) in round $t-1$ and the action was observable. This assumes that they use the history information as a coordination device but they do not consider their interaction experiences in the past. The second one is to assume that CC players adjust action choices over time such that they select cooperation in round t stochastically based on all their relevant prior interaction experiences. Specifically, they mimic how previous unmasked partners selected cooperation towards themselves up to round $t-1$ (see the Appendix in the detail). CC players' behaviors in a laboratory can be considered somewhere in the middle between the two extreme assumptions.

observable). Such information effects as a coordination device are stronger in the C-Full than in the C-Min treatments.[17] However, the positive effects diminish if players take own prior interaction experiences into account and then adjust their cooperation decisions, instead of simply relying on the tit-for-tat-like strategy. This is because such adjustments create mis-coordination among CC-players, meaning that the impact of reported information becomes weaker compared with the parrot-like approach.[18]

Summary 2: *(a) Cooperation can be sustained at a higher level when subjects can report for free, compared with the N treatment. (b) The impact of costly reporting is weaker compared to free reporting. (c) The level of cooperation is higher in the C-Full (F-Full) treatment, aided by the public record of accumulated reported information, than in the C-Min (F-Min) treatment.*

These simulations assume that CC players engage in reporting irrespective of the reporting cost, since the reporting cost is just one point. It is worth noting that they may be reluctant to report partners' actions in the costly reporting treatments, even though the reporting cost is the lowest positive amount and interactions are infinitely repeated. Kamei (2017), in the context of voluntary disclosure of own information, demonstrated that people may have a discontinuity in disclosure behaviors between zero and positive costs (also see Abraham *et al.* [2016], Kamei [2020], Kamei and Putterman [2018], and Shampanier *et al.* [2007] for evidence under finite repetition). In order to explore possible heterogeneity in subjects' reporting, a structural estimation of reporting strategy choices will be performed using the experiment data in Section 4.4.

4. Experiment Results

An overview of subjects' cooperation rates and the effects of the endogenous monitoring institutions is given in Section 4.1. Subjects' reporting behaviors are carefully examined in Section 4.2. Lastly, as driving forces behind the observed treatment differences, a relationship between reputational information and subjects' cooperation decisions and a structural estimation result of subjects' strategy choices are discussed in Sections 4.3 and 4.4, respectively.

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[17] The positive effects of costly reporting are nevertheless smaller compared with free reporting, since players' ability to discriminate peers are lower under costly than free reporting due to the smaller size of the reported information in the Min condition (Appendix Figs. A.2, A.3, A.6 and A.7).

[18] In the context of an infinitely repeated prisoner's dilemma game with partner matching, Axelrod and Hamilton (1981) demonstrated that a simple tit for tat strategy works better than any strategy (e.g., sophisticated strategies based on the Markov process and Bayesian inference) in sustaining cooperation in computer simulations.

4.1. Treatment Differences

A first view of the effects of endogenous monitoring is given by Fig. 2. The average cooperation rates were calculated based on data from round 1 in supergames, the first block in supergames, and all supergames, respectively, as the random termination rule was adopted in this study (e.g. Dal Bó and Fréchette, 2018).[19] Three clear patterns were found. First, subjects' cooperation rates were modest when reporting was not possible (panel *i*). For example, the average cooperation rate in the N treatment was 46.5% in round 1 and 35.2% when data from all rounds are used. A higher cooperation rate in round 1 than in later rounds suggests that some subjects turned to punishment mode for some duration after negative experiences. Having said this, the average cooperation rate in the first block was 33.9%, whose level was similar to that when all data are used. This implies that communities' cooperation dynamics became settled quickly to some stable patterns within a supergame.

Second, endogenous monitoring had a strong effect on improving cooperation if reporting did not involve a cost, regardless of whether reported action choices were observed by the next partner only (F-Min) or by all future partners (F-Full). A comparison between the two free reporting treatments shows a positive effect of having larger history information – however, the effect is small. The average cooperation rates in round 1 (over all rounds) were 67.7% (49.7%) in the F-Min versus 71.8% (58.2%) in the F-Full treatment. This suggests that subjects chose actions in round t mainly based on the information from the immediate previous round, i.e., round $t - 1$.

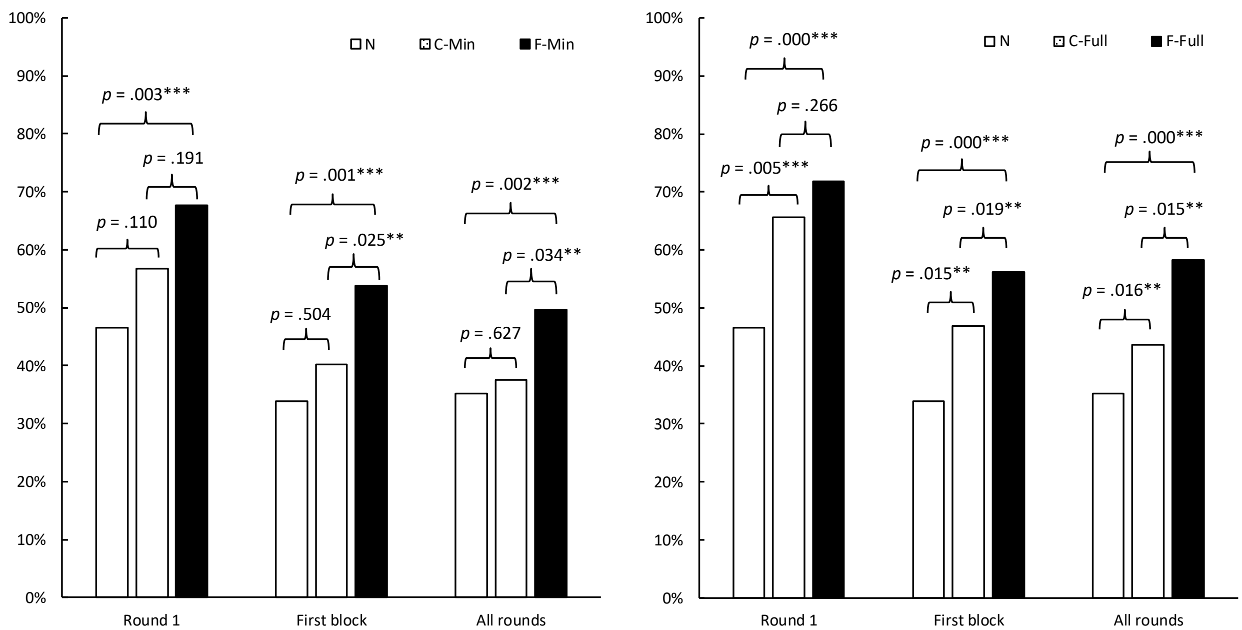
Third, however, the effects of costly reporting clearly depend on the information structure. Costly reporting has only mild effects in the C-Min treatment: while the average cooperation rate was higher in the C-Min than in the N treatment, the difference was not significant (panel *i*). This result is similar to Camera and Casari (2018) in the context of an indefinitely repeated helping game. By sharp contrast, costly reporting significantly improved cooperation in the C-Full treatment, relative to the N treatment (panel *ii*). Especially, the round 1 cooperation rate in the C-Full treatment was 65.6%, only somewhat lower than the rate in the F-Full treatment. Having this said, cooperation was sustained better in the F-Full than in the C-Full treatment, as seen in the average cooperation rates in the first block and from all rounds. These findings seem to suggest that on average, the larger quantity of information created through

[19] Data are balanced across the treatments if observations in the first round or from the first block are used since subjects in all the treatments went through the first ten rounds of each supergame thanks to the block design.

endogenous monitoring, the more persistently cooperation is sustained at high levels, if it is assumed that the quantity of reported information would be larger in the F-Full, followed by C-Full and then C-Min (whose assumption turns out to be correct as studied in Section 4.2).

Result 1: *(a) Endogenous monitoring improved cooperation when reporting did not involve a cost, irrespective of whether reported action choices were conveyed to any future partners. However, (b) costly reporting did not significantly improve cooperation in the C-Min treatment. By contrast, (c) costly reporting did improve cooperation in the C-Full treatment, aided by the public platform whereby all future partners can check reported information.*

Fig. 2: *Average Cooperation Rate by Treatment*



(*i*) C-Min and F-Min treatments

(*ii*) C-Full and F-Full treatments

Notes: p-values (two-sided) were calculated based on subject random effects probit regressions with robust bootstrapped standard errors (300 replications). In the regressions, the length of previous supergame was controlled as an independent variable for observations after the first supergame while having a dummy which equals 1 for the first supergame (which makes it possible to control for cooperation behaviors without prior experiences). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

The impact of endogenous monitoring is also evident for subjects' across-supergame cooperation dynamics. However, the trends reveal new insights (Fig. 3). First, the supergame-average cooperation rate decreased from supergame to supergame in the N treatment. The decrease rate was on average significant (see columns (2) and (3) of Appendix Table B.1). This suggests that in the absence of reputational information, subjects learned to behave uncooperatively when they gained experience. Second, however, free reporting has a strong effect on improving cooperation uniformly across the six supergames. The round 1 average cooperation rates were around 70% consistently across the experiment, whether in the F-Min or F-Full treatment, meaning that subjects' high willingness to cooperate persisted over time (panels I.*i* and II.*i*). While there are no clear trends if the data after round 1 are incorporated (panels *ii* and *iii*), groups achieved significantly stronger cooperation norms with the endogenous monitoring compared with the N treatment, whether the data only from earlier supergames (supergames 1 to 3) or from later supergames (supergames 4 to 6) are used.[20]

Third, Fig. 3 reveals different dynamics between the information structures under costly reporting. On the one hand, panel I of the figure suggests that costly reporting has only mild effects similarly across the six supergames in the C-Min treatment, strengthening Result 1(b). As shown in Appendix Fig. B.1, the effect was not significant, regardless of which data are considered: the first or second half of the experiment. However, on the other hand, subjects on average improved cooperation from supergame to supergame in the C-Full treatment. The increase rate was significant (see the coefficient estimates for the supergame number variable in Appendix Table B.1). In addition, groups in the C-Full treatment achieved significantly higher cooperation rates, compared with the N treatment, in the second three supergames, although not in the first three supergames (Appendix Fig. B.1). This suggests that in the C-Full treatment, subjects gradually learned how to utilize a public record that stores reported information. It is reasonable that such learning took time considering that only a subset of actions were reported and the distribution of information may be biased. As will be discussed in Section 4.2, subjects' reporting rates were far less than 50% in the C-Full treatment, which is only somewhat higher than in the C-Min treatment.

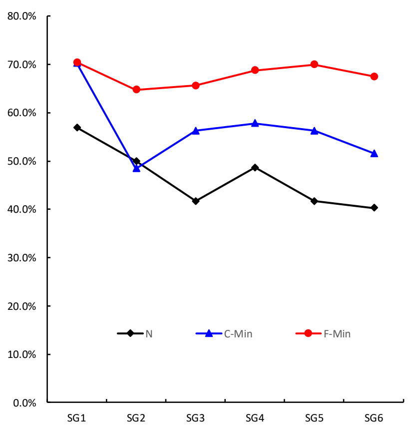
Result 2: *(a) Average cooperation rates decreased from supergame to supergame in the N treatment. (b) Endogenous monitoring significantly improved cooperation across the six supergames in the F-Min and F-Full treatments. (c) Costly reporting did not improve cooperation regardless of which supergames to be considered in the C-Min treatment. However, (d) in the C-Full treatment, costly reporting gradually improved cooperation from supergame*

[20] Treatment differences were calculated as identified in Fig. 2, when using the data only from supergames 1 to 3, and also when using the data only from supergames 4 to 6. As shown in Appendix Fig. B.1, in each subset of the data the difference in the average cooperation rate is significant between the N and F-Min treatments, regardless of which rounds of plays are used (round 1 only, the first block only, or all rounds). The same also holds for a comparison between the N and F-Full treatments.

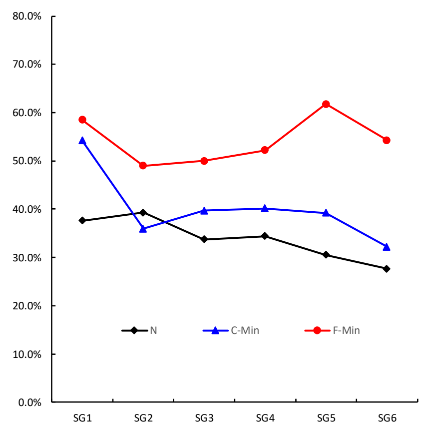
and supergame, and the subjects achieved a significantly higher cooperation rate in the second half of the experiment relative to the N treatment.

As touched upon earlier, the average cooperation rate was higher in round 1 than in later rounds in all the treatments (Fig. 2). A regression confirms that subjects' average cooperation rates gradually declined over time within supergames in all five treatments (Appendix Table B.1). This suggests that subjects on average behaved conditionally cooperatively or being in punishment mode for some duration after having some negative experiences, thereby gradually weakening cooperation. Sections 4.3 and 4.4 will be devoted to analyzing what strategies subjects took in the experiment.

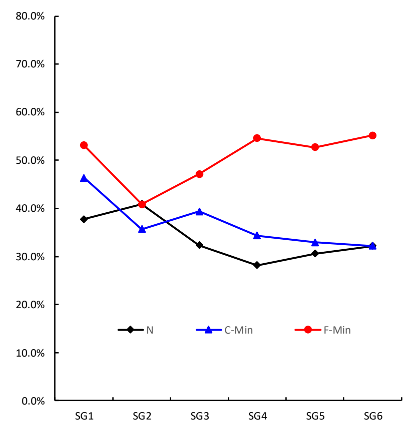
Fig. 3: *Average Cooperation Rate, Supergame by Supergame*



(*i*) Round 1

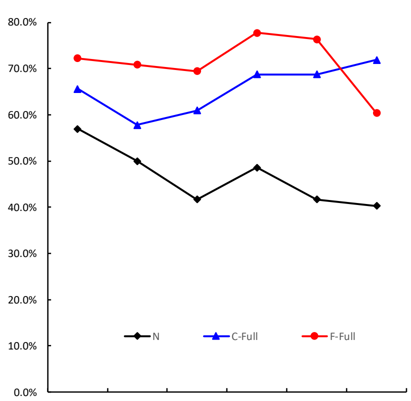


(*ii*) First block

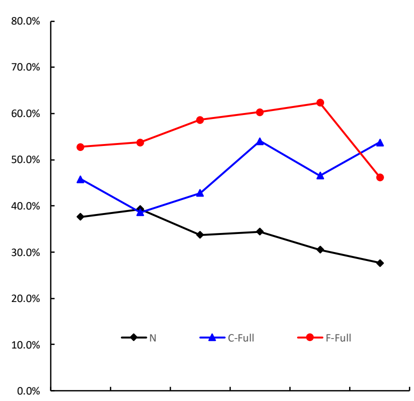


(*iii*) All rounds

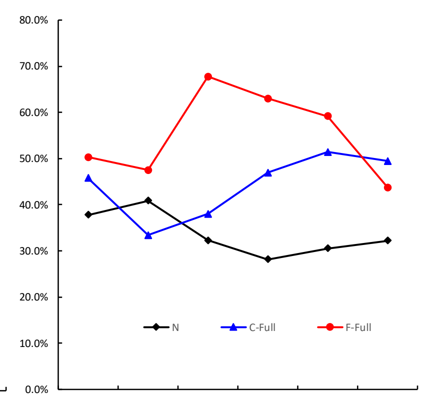
I. C-Min and F-Min treatments



(*i*) Round 1



(*ii*) First block



(*iii*) All rounds

II. C-Full and F-Full treatments

4.2. Reporting

It was discussed that costly reporting did not improve cooperation in the C-Min treatment (Result 1.b). This result can be explained by the small size of reputational information. Table 2 reports subjects' reporting rate by treatment. It shows that subjects were less likely to engage in reporting in the C-Min than in the F-Min treatment. The difference in the reporting rate is huge, around 50%. The strong negative impact of a positive reporting cost is remarkable, considering that the cost is only one point (= 0.67 pence). This is, however, consistent with the results of recent research that showed players' sensitivity to having a cost in the context of voluntary disclosure of own information (e.g., Kamei, 2017, 2020). Table 2 also indicates that the presence of reporting costs significantly undermined reporting also in the Full condition, suggesting that the strong negative impact of having a cost is a robust finding.

The subjects' reporting behavior on average did not differ by the information condition when reporting did not involve a cost (see again Table 2). This implies that perhaps, having a publicly available platform as in the Full condition did not improve material incentives to report provided that reporting is cost-free since already more than 70% of subjects chose to report even in the Min condition. This also implies that subjects might have weighed the latest-round experiences (available already in the Min condition) far more than earlier ones in deciding which action to take.

However, subjects were significantly more likely to engage in reporting in the C-Full than in the C-Min treatment, while their reporting behaviors in the former were still much weaker compared with the F-Full treatment. In the C-Full treatment, as already discussed, communities were able to gradually accumulate information on members' reported action choices unlike in the C-Min treatment. Recall that subjects in the C-Full treatment achieved quite strong cooperation norms (Section 4.1). It seems that the presence of a public record accessible to group members raised material benefits of reporting acts and thus helped deter uncooperative behaviors in the group despite the modest reporting rates in the C-Full treatment, well explaining the difference between Results 1(b) and (c).

Result 3: *(a) Subjects were significantly more likely to engage in reporting in the F-Min (F-Full) than in the C-Min (C-Full) treatment. (b) Subjects' reporting rates were at high levels similarly for the F-Min and F-Full treatments. (c) Subjects' reporting rates were significantly higher in the C-Full than in the C-Min treatment.*

Table 2: *Average Reporting Rates by Treatment*

	Data used for calculations								
	Round 1			First block			All rounds		
reporting:	costly		free	costly		free	costly		free
information:									
Min	28.1%	<***	76.0%	23.5%	<***	72.6%	20.7%	<***	71.7%
	∧**		=	∧*		=	∧**		=
Full	41.9%	<***	74.0%	30.8%	<***	74.2%	28.4%	<***	77.5%

Notes: Each treatment comparison was made based on a subject random effects probit regression with robust bootstrapped standard errors (300 replications), while having a treatment dummy as an independent variable. In the regressions, the length of previous supergame was controlled as an independent variable for observations after the first supergame while having a dummy which equals 1 for the first supergame. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Online Appendix Fig. B.2 reports the average reporting rates, supergame by supergame. It reveals that subjects' strong reporting behaviors in the F-Min and F-Full treatments were seen in the very first supergame and then persisted throughout the six supergames. This implies that perhaps, there were material benefits of endogenous monitoring to the reporters if reporting did not involve a cost. This trend is parallel to Result 2(b).

Fig. B.2 also interestingly reveals that while the supergame-average reporting rate increased only to a small degree across the six supergames, the round 1 reporting rate increased significantly from supergame to supergame, in the C-Full treatment (panel *i*). This supports the idea that subjects gradually learn the benefit of having a platform that stores reported information. Recall that in the C-Full treatment, in the earlier rounds a subject invests in reporting, the higher benefit she will receive from the reputational information since the community members including her can refer to the information in any future rounds after reporting is made. It is also worth noting that the increasing trend of subjects' round 1 reporting rates in the C-Full treatment is parallel to Result 2(d) and Fig. 3.II. This implies that subjects' reporting behaviors were closely linked to the level of cooperation norms fostered in their community.

A detailed look at subjects' reporting by stage game outcome reveals three future interesting patterns. First, cooperators were more likely than defectors to engage in reporting under each treatment condition, whether they were matched with cooperators or defectors. The differences in the reporting rate between the cooperators and defectors are statistically significant for almost all comparisons (Table 3). This implies that some defectors might not have appreciated the benefits of creating reputational information and/or might have free ridden on cooperators' reporting behaviors.

Second, cooperators were more likely to choose to report when matched with defectors, rather than cooperators, when reporting was costly (panels *i* and *iii*). The differences were significant in the C-Full treatment. This result may mean that cooperators' reporting was partly driven by other-regarding motives or emotional responses. This pattern is consistent with Kamei and Putterman (2018) who studied costly reporting in a one-shot two-period model. However, unlike Kamei and Putterman (2018), cooperators in the present study did engage in reporting also when interacted with cooperators. In Kamei and Putterman (2018), cooperator-cooperator reporting was less than 10%. By contrast, it on average occurred more than 30% of the time in the C-Min treatment, and around 40% of the time in the C-Full treatment. The difference in the result can be attributed to the difference in the design: subjects in the present study repeated interactions indefinitely with a very high probability, 95%, thereby making reporting of cooperators potentially helpful for communities' maintenance of cooperation norms.

Third, both cooperators and defectors frequently engaged in reporting when reporting did not involve a cost. However, not everyone did so in the F-Min and F-Full treatments. This result is not surprising considering that some people are known to behave uncooperatively even though a Pareto-dominant cooperative equilibrium exists in an infinitely repeated dilemma game.[21]

Table 3: *Average Reporting Rates by Stage Game Outcome*

(*i*) C-Min treatment

	Data used for calculations								
	Round 1			First block			All rounds		
decision-maker: partner:	cooperator		defector	cooperator		defector	cooperator		defector
cooperator	31.5%	=	19.1%	36.6%	>***	19.1%	35.5%	>***	17.7%
	=		=	=		∨***	=		∨***
defector	47.9%	>**	8.3%	42.4%	>***	9.4%	38.6%	>***	7.6%

(*ii*) F-Min treatment

	Data used for calculations								
	Round 1			First block			All rounds		
decision-maker: partner:	cooperator		defector	cooperator		defector	cooperator		defector
cooperator	86.3%	>**	59.0%	86.5%	>***	67.3%	87.2%	>***	66.0%
	=		=	∨**		∨*	∨***		=
defector	82.1%	=	54.3%	77.6%	>***	55.3%	75.6%	>***	57.5%

[21] Some subjects' decision not to report their partners' actions in the F-Min and F-Full treatments may have been caused by their limited cognitive ability as discussed in Arruñada and Casari (2016) and Kamei (2020).

(*iii*) C-Full treatment

	Data used for calculations								
	Round 1			First block			All rounds		
decision-maker:	cooperator		defector	cooperator		defector	cooperator		defector
partner:									
cooperator	48.9%	>***	13.9%	38.6%	>***	17.8%	39.2%	>**	18.0%
	∧***		=	∧***		=	∧***		∨*
defector	77.8%	>*	11.7%	59.8%	>***	17.0%	56.2%	>***	14.4%

(*iv*) F-Full treatment

	Data used for calculations								
	Round 1			First block			All rounds		
decision-maker:	cooperator		defector	cooperator		defector	cooperator		defector
partner:									
cooperator	82.0%	>***	44.8%	84.8%	>***	52.9%	86.3%	>***	57.9%
	=		=	=		∧***	=		∧***
defector	85.1%	=	9.7%[#1]	79.7%	>**	69.2%	79.3%	=	73.6%

Notes: Each treatment comparison was made based on a subject random effects probit regression with robust bootstrapped standard errors (300 replications), while having a treatment dummy as the independent variable. In the regressions, the length of previous supergame was controlled as an independent variable for observations after the first supergame while having a dummy which equals 1 for the first supergame.
*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Appendix Table B.2 supplements Table 3 by calculating the average reporting rates by supergame. One aspect of the C-Full treatment is worthwhile remarking. It was discussed earlier that subjects' round 1 reporting rate increased significantly from supergame to supergame in the C-Full treatment. The appendix table reveals that this increase was driven by an increase in cooperator-cooperator reporting. In this treatment, cooperator-cooperator reporting was at low levels in the first two supergames (18.8% and 26.9% in the first and second supergames, respectively). However, it occurred 56% to 68% of the time for the third to sixth supergames. This implies that cooperators learned the benefits of reporting cooperators for future mutual cooperation purpose gradually over time.[22]

One may wonder how subjects' reporting was affected by others' previous reporting. It is possible that their reporting activities may partly be characterized by conditional behaviors. For example, a reciprocal subject may be more likely to engage in reporting to help community members, if she receives larger information for the current-round partner than otherwise.[23] In

[22] Cooperator-defector reporting was very frequent from the very first supergame in the C-Full treatment (Table B.2).
[23] People's conditional behaviors were widely documented in the experimental literature, for example in decisions to cooperate (Fischbacher, Gächter and Fehr, 2010), direct punishment (Kamei, 2014) and third party punishment (Kamei, 2018).

order to explore possible conditional reporting, partial correlations between subjects' reporting decisions and the quantity of their received information were calculated, confirming significantly positive relationships (Table 4). Subjects in the C-Min and F-Min treatments were on average more likely to report by around 17.4 and 10.7 percentage points, respectively, when they received a report than otherwise. In the C-Full and F-Full treatments, a 10% increase in a subject *i*'s quantity of reported information raises the likelihood that her current-round partner reports *i* by around 1.3 and 1.4 percentage points, respectively.

Result 4: *(a) Cooperators were more likely than defectors to engage in reporting under each treatment condition. (b) Cooperator-defector reporting was more common than in any other case when reporting is costly. (c) Cooperator-cooperator reporting was more frequently observed compared with Kamei and Putterman (2018). (d) Both cooperators and defectors frequently engaged in reporting when reporting did not involve a cost. (e) Subjects' reporting activities were positively correlated with their matched partners' frequencies of being reported in the past.*

Table 4: *Partial Correlations between Received Information and Reporting*

(A) C-Min and F-Min treatments

	C-Min		F-Min	
	First block (1)	All rounds (2)	First block (3)	All rounds (4)
Pairwise correlation between *i*'s decision to report in round *t* {=1(0) if s/he reported (did not report)} and a dummy that indicates whether *i*'s round *t* partner was reported in round *t* – 1 {=1(0) if the partner was (was not) reported}	.1285	.1740	.0968	.1068
Two-sided *p*-value[#1]	< .001***	< .001***	.007***	< .001***

(B) C-Full and F-Full treatments

	C-Full		F-Full	
	First block (5)	All rounds (6)	First block (7)	All rounds (8)
Pairwise correlation between *i*'s decision to report in round *t* {=1(0) if s/he reported (did not report)} and the quantity of *i*'s round *t* partner *j*'s reputation {the % of rounds in a given supergame where *j* was reported so far}	.1206	.1259	.0857	.1357
Two-sided *p*-value [#1]	.003***	< .001***	.012**	< .001***

Notes: All observations (except the ones in the first round of supergames) were used. [#1] The two-sided *p*-value in each column was calculated based on a subject random effects probit regression with robust bootstrapped standard errors (300 replications) in which the dependent variable is *i*'s decision to report in round *t*. A dummy that indicates whether *i* received a report for her round t partner's last-round action was included as an independent variable in columns (1) to (4). The quantity of i's round t partner j's reputation was included as an independent variable in columns (5) to (8). Considering that reporting decisions were found to be affected by stage game outcome (see Results 4(a) and (b)), the cooperator-cooperator reporting dummy, the cooperator-defector reporting dummy and the defector-cooperator reporting dummy (the reference group was the defector-defector outcome) were included as controls. These three dummies indicate subjects' stage game outcomes in the current round. Further, the previous supergame length was also controlled in the regression. It is worth noting that the correlations are significant at $p < .001$ for all columns if p-values are calculated based on the formula of the pairwise Pearson's correlation coefficients instead of using regressions. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

4.3. Reputational Information and Behaviors

On what mechanism did endogenous monitoring help sustain cooperation in communities? Studying this question is meaningful as a driving force behind Results 1 and 2. The availability of reputational information may serve as a coordination device, thereby enabling subjects to achieve mutual cooperation easily (Section 3). The method to explore the role of the reputational information is to perform a regression analysis in which the dependent variable is subjects' decisions to cooperate. The estimation result reveals that irrespective of the treatment condition, subjects on average cooperated conditional upon the *quality* of their partners' reputational information (Table 5). First, as shown in columns (1) to (4), subjects were significantly more (less) likely to select cooperation when matched with an unmasked cooperator (defector), compared with when matched with a masked individual, in the two Min treatments – see the coefficient estimates for variables (c) and (d). These columns also indicate that a cooperator in round $t - 1$ was significantly more likely than a defector to select cooperation again in round t, suggesting some consistency of their cooperation decisions across the rounds. A comparison between columns (1) and (3) (columns (2) and (4)) interestingly suggests that subjects responded to reputational information more strongly when reporting was costly rather than cost-free. This seems to contrast with Result 1. However, this discrepancy can be explained by the less frequent reporting in the C-Min than in the F-Min treatment.

Second, columns (5) to (8), likewise show that the larger fraction of cooperation her current-round partner had in his observable reputational record, the more likely a subject was to select cooperation in the C-Full and F-Full treatments (see variable (g)). This tendency is especially strong in the F-Full treatment: subjects in the F-Full treatment decided action choices mainly based on the quality of the partners' reputation. By contrast, subjects in the C-Full treatment weighed their own reputation quality similarly to their partners', seeming to suggest that, with less accurate reputational information, subjects carefully contemplated how their partners would react to own reputation scores (see variable (e)).

In the Full treatments, the 'quantity' measure had only minor roles in the subjects' decisions to cooperate. While subjects in these treatments were aware of how frequently their current-round partners were reported so far, they weighed the quantity information much less than the quality information in deciding on an action (see variable (h)).

In sum, these analyses suggest that subjects on average used the reported information as a device to coordinate with peers by conditionally selecting cooperation based on its quality.

Result 5: *(a) Subjects were significantly more (less) likely to select cooperation when matched with an unmasked cooperator (defector), compared with when matched with a masked individual, in the C-Min and F-Min treatments. (b) The larger fraction of cooperation her current-round partner had in his observable reputational record, the more likely a subject was to select cooperation in the C-Full and F-Full treatments.*

Table 5: *Reputational Information and Action Choices*

Dependent variable: a dummy that equals 1 (0) if subject *i* chose to cooperate (defect) in round *t*.

	C-Min		F-Min		C-Full		F-Full	
	1st block (1)	All rounds (2)	1st block (3)	All rounds (4)	1st block (5)	All rounds (6)	1st block (7)	All rounds (8)
(a) Own choice in round $t-1$ {=1(0) when subject *i* cooperated (defected)}	1.077*** (.130)	1.161*** (.103)	.696*** (.123)	.762*** (.118)	---	---	---	---
(b) Variable (a) × reported dummy {= 1(0) if subject *i*'s round $t-1$ action was reported}	.182 (.121)	.156* (.91)	.186** (.093)	.188*** (.073)	---	---	---	---
(c) Cooperated partner dummy {=1 when subject *i*'s round *t* partner cooperated in round $t-1$ and it was reported; 0 otherwise}[#1]	.623*** (.162)	.654*** (.130)	.536*** (.083)	.529*** (.071)	---	---	---	---
(d) Defected partner dummy {=1 when subject *i*'s round *t* partner defected in round $t-1$ and it was reported; 0 otherwise}[#1]	-.950*** (.185)	-.902*** (.163)	-.389*** (.089)	-.447*** (.090)	---	---	---	---
(e) Own reputation quality in round *t* {= the % of cases in a given supergame where subject *i* cooperated in prior rounds when s/he was reported}	---	---	---	---	1.168*** (.213)	1.331*** (.217)	.365 (.233)	.343 (.293)
(f) Variable (e) × Size of own reputation in round *t* {= the % of prior rounds in a given supergame where subject *i* was reported so far}	---	---	---	---	.381 (.295)	.018 (.259)	.336* (.180)	.168 (.205)
(g) Round *t* partner *j*'s reputation quality {= the % of cases in a given supergame where *j* cooperate in prior rounds when s/he was reported}	---	---	---	---	1.048*** (.174)	1.343*** (.181)	1.410*** (.200)	1.664*** (.221)
(h) Variable (g) × Size of round *t* partner *j*'s reputation {= the % of prior rounds in a given supergame where *j* was reported so far}	---	---	---	---	.342 (.244)	.332 (.225)	.146 (.166)	.424** (.193)
(i) First supergame dummy {= 1 for the first supergame; 0 otherwise}	.562*** (.098)	.401*** (.086)	.226 (.183)	.145 (.150)	-.005 (.158)	.145 (.185)	.140 (.089)	.069 (.079)

(j) Previous supergame length[#2]	.001	.001	.002	-.000	-.009	-.006	.005**	.000
	(.002)	(.002)	(.007)	(.006)	(.005)	(.004)	(.002)	(.001)
Constant	-1.086***	-1.160***	-.624***	-.679***	1.410***	-1.700***	-1.290***	-1.305***
	(.150)	(.161)	(.200)	(.172)	(.184)	(.180)	(.165)	(.164)
# of Observations	3,456	9,696	3,456	6,952	2,206	4,738	3,382	9,574
Wald chi-squared	135.73	187.63	93.64	125.22	115.15	138.05	103.16	145.99
Prob > Wald chi-squared	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

Notes: Subject random effects probit regressions with robust bootstrapped standard errors (300 replications). All observations except the ones in round 1 [i.e., variables (a) to (d) can be defined] were used in columns (1) to (4). Only observations where both *i* and *j* were reported at least once [i.e., variables (e) and (g) can be defined] were used in columns (5) to (8). [#1] The reference group in columns (1) to (4) is the case in which *i* was matched with a masked partner in round *t*. [#2] Variable (j) is zero in the first supergame, while the first supergame dummy – variable (i) – was included to control for cooperation behaviors without any experience.

*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

4.4. Structural Estimation of Subjects' Strategy Choices

It was found in Section 4.1 that subjects' decisions to cooperate were severely affected by endogenous monitoring. But in more detail, how did subjects' strategy choices change by the endogenous monitoring institutions? While subjects' average cooperation behaviors were found to be characterized by conditional cooperative strategies (Result 5), one may wonder exactly what fraction of subjects acted according to such conditional cooperative strategies responding to their matched partners' reputations.

In order to answer these questions, subjects' strategy choices regarding cooperation were estimated, supergame by supergame, by applying the maximum likelihood method developed by Dal Bó and Frechétte (2011) to this study.[24] This method assumes a fixed number of strategies subjects can take and then assigns one strategy to each subject. The set of strategies assumed in Dal Bó and Frechétte (2011) are: AD ("Always Defect"), AC ("Always Cooperate"), GT ("Grim Trigger"), TFT ("Tit For Tat"), WSLS ("Win Stay Loose Shift"), and T2 ("Trigger Strategy with 2 Periods of Punishment").[25,26] Each subject's strategy choice was identified in the N treatment using the same set of strategies, considering that their interactions were anonymously made in this control setup (panel *i* of Fig. 4). The estimation result indicates that 72.6% of the subjects' strategy choices were explained by only the two strategies – the AD and TFT strategies.[27] Among the two,

[24] The estimation assigned pure strategies to most subjects in the present study. For simplicity, a subject was assigned a pure strategy with the highest probability in case that she was assigned a mixed strategy.
[25] A GT subject selects defection in all future rounds as soon as she experiences defection.
[26] The GT, TFT, WSLS, and T2 subjects are assumed to select cooperation in the first round of a given supergame.
[27] As discussed in footnote 13, this estimation result is similar to the one under partner matching in Dal Bó and Frechétte (2011). They found that the AD and TFT strategies together account for 80% of their subjects' behaviors. This implies that in the absence of reputational information, subjects' behavioral patterns may be similar between partner versus random matching.

a much larger fraction of subjects, somewhat below the majority of the population, acted according to the AD strategy, which reasonably explains why cooperation stayed low in the N treatment (Figs. 2 and 3).

Subjects have reputational information in the four main treatments. As such, subjects' strategy choices were estimated by including a new strategy where a subject acts according to her partner's reputational information while removing the T2 strategy.[28] The newly added strategy is called the Rep ("Reputation") strategy, and can be defined differently by the information structure as follows: first, in the C-Min and F-Min treatments, a Rep subject is assumed to select cooperation in round t if her matched partner selected cooperation in round t–1 and it is observable; and to select defection otherwise. Second, in the C-Full and F-Full treatments, a Rep subject is assumed to select cooperation (defection) in round t if her matched partner j selected cooperation at least 50% (less than 50%) of the time in his observable reputational record.[29]

The AD, AC and TFT strategies can be defined the same as in the N treatment. However, the GT strategy can be re-defined for the four main treatments since subjects can learn some other pairs' interaction outcomes (e.g., Camera and Casari, 2009; Kamei, 2017). The revised strategy is called the SGT ("Strong GT") strategy in the paper to distinguish it from the GT strategy of the N treatment. A SGT subject i is assumed to select cooperation if i did not experience defection in her stage game interactions so far or i did not see any instance of defection in her partners' observable reputational records (i is assumed to select defection otherwise). As touched upon in Section 3, defection therefore spreads more quickly across the community under endogenous monitoring than in the N treatment if some people act according to the SGT strategy.

Panels *ii* to *v* of Fig. 4 show the estimation result, revealing three interesting patterns. First, the percentages of subjects who acted according to the AD strategy are substantially smaller under endogenous monitoring than in the N treatment. The percentages are especially smaller when reporting does not involve a cost: they are 36.7% and 51.0% smaller in the F-Min and F-Full treatments, respectively, than in the N treatment (the difference is each significant – see Appendix Table B.4). The corresponding percentages under costly reporting are somewhere in the

[28] Subjects' strategy choices were estimating assuming the same set of strategies used in the Dal Bó and Frechétte (2011) for the four main treatments as a preliminary analysis. As summarized in panels *ii* to *v* of Appendix Fig. B.3, and in Appendix Table B.3, the T2 strategy was almost never selected by subjects in each main treatment.

[29] This definition is set for the sake of simplicity. The Rep strategy could alternatively be defined, for example, using a stochastic action choice, as a subject can observe her partner's cooperation rate and the quantity of reported information so far from his reputation record. Using such a strategy makes the estimation complicated, however.

middle between the N and free-reporting setups, which again resonates with the idea that subjects' decisions may be discontinuous between zero and positive costs (e.g., Kamei, 2017, 2020).

Second, endogenous monitoring encouraged subjects to act according to the most generous strategy – the AC strategy – in the Min condition. Subjects' likelihoods to act according to this strategy in C-Min and F-Min treatments are significantly higher at the 10% and 1% levels, respectively, compared with the N treatment (Table B.4). Especially, the AC strategy is the more prevalent strategy than any other strategy in the F-Min treatment (Fig. 4).

Third, by contrast, the percentages of the AC subjects in the Full condition are not significantly different from that in the N treatment (Table B.4). However, the percentages of the TFT subjects are significantly smaller in the C-Full and F-Full treatments than in the N treatment at the 1% level (Fig. 4, Appendix Table B.4). Instead, remarkably, 31.3% and 47.3% of subjects were estimated to have acted based on the Rep strategy in the C-Full and F-Full treatments, respectively. It should be noted that subjects in the Min condition could have also decided on an action based on their partners' reputations (last-round action choices). However, only 10.9% and 14.7% of subjects in the C-Min and F-Min treatments, respectively, acted according to the Rep strategy (Fig. 4).[30] So, why did subjects' strategy choices drastically differ between the Min and Full conditions? It may be due to the availability of a reputational platform: since all reported action choices get stored in the platform in the C-Full and F-Full treatments (Result 3), subjects in the Full condition may have tended to rely on the reputational information in choosing an action, instead of, say, relying on their own experiences and using the tit for tat.

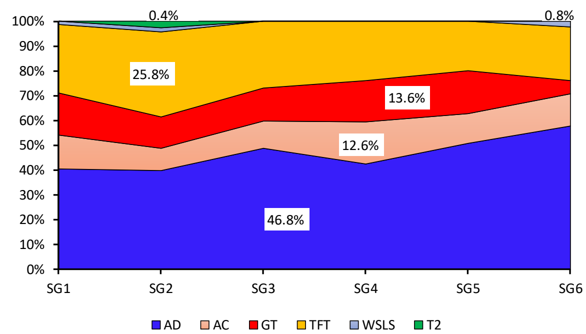
Subjects' decisions to report may differ according to their strategy choices just discussed. In order to study this possibility, subjects' average reporting rates were calculated by the estimated strategy choice, supergame by supergame (Appendix Table B.5). The results are messy due to the large volatility of reporting behaviors stemming from the small sample size. These calculations, however, indicate that reporting rates are much higher for the AC, Rep and TFT subjects than for the AD subjects. This pattern reinforces Result 4(a).

Result 6: *(a) 72.6% of subjects' strategy choices were explained by the AD and TFT strategies in the N treatment. (b) The percentages of the AD subjects were much lower with endogenous monitoring, especially in the F-Min and F-Full treatments, that in the N treatment. (c) Subjects*

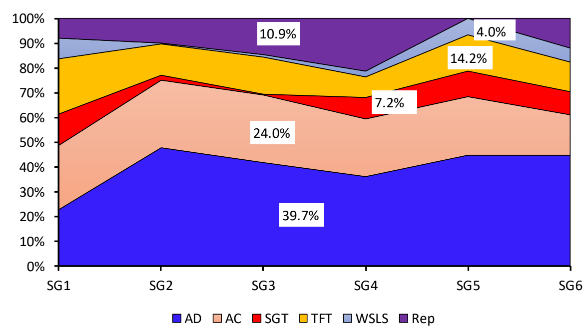
[30] The percentages of the Rep subjects are significantly different between the C-Min (F-Min) and C-Full (F-Full) treatments at two-sided $p < .001$ (Table B.4).

were significantly more likely to act according to the AC strategy in the C-Min and F-Min treatments than in the N treatment. By contrast, (d) in the C-Full and F-Full treatments, a large percentage of subjects acted according to the Rep strategy. The percentages of the Rep subjects are significantly larger compared with the corresponding Min treatments.

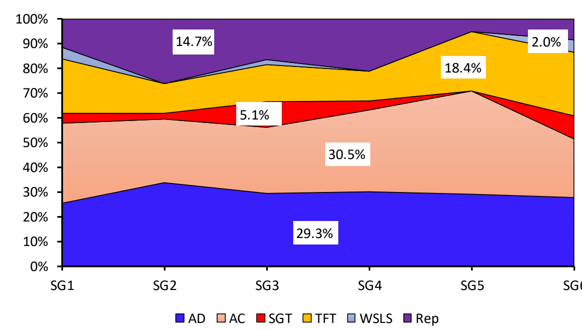
Fig. 4: *Strategy Choices Regarding Cooperation, Supergame by Supergame*



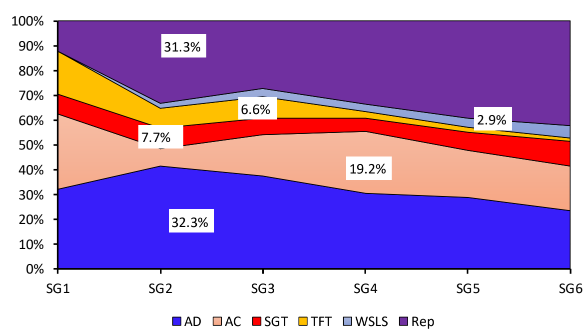
(*i*) N treatment



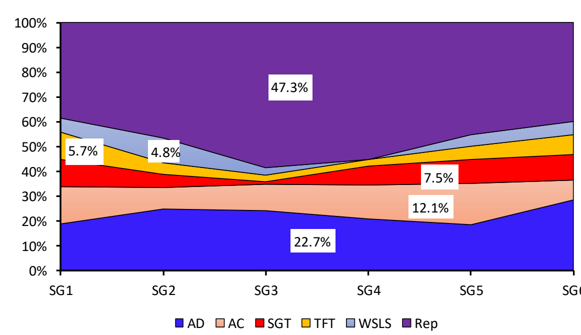
(*ii*) C-Min treatment



(*iii*) F-Min treatment



(*iv*) C-Full treatment



(*v*) F-Full treatment

Note: The percentage written in each region indicates the average percentage in which a given strategy was used by subjects across the six supergames. The detail of the estimation result can be found in Appendix Table B.4.

The last question that remains unanswered is exactly what motivated subjects to engage in reporting. While we uncovered differences in reporting by stage game outcome and also the evidence of conditional reporting (Results 3 and 4), subjects' reporting may be motivated by heterogeneous reasons. As a final analysis, a structural estimation of subjects' reporting strategy choices was performed again utilizing the maximum likelihood method.

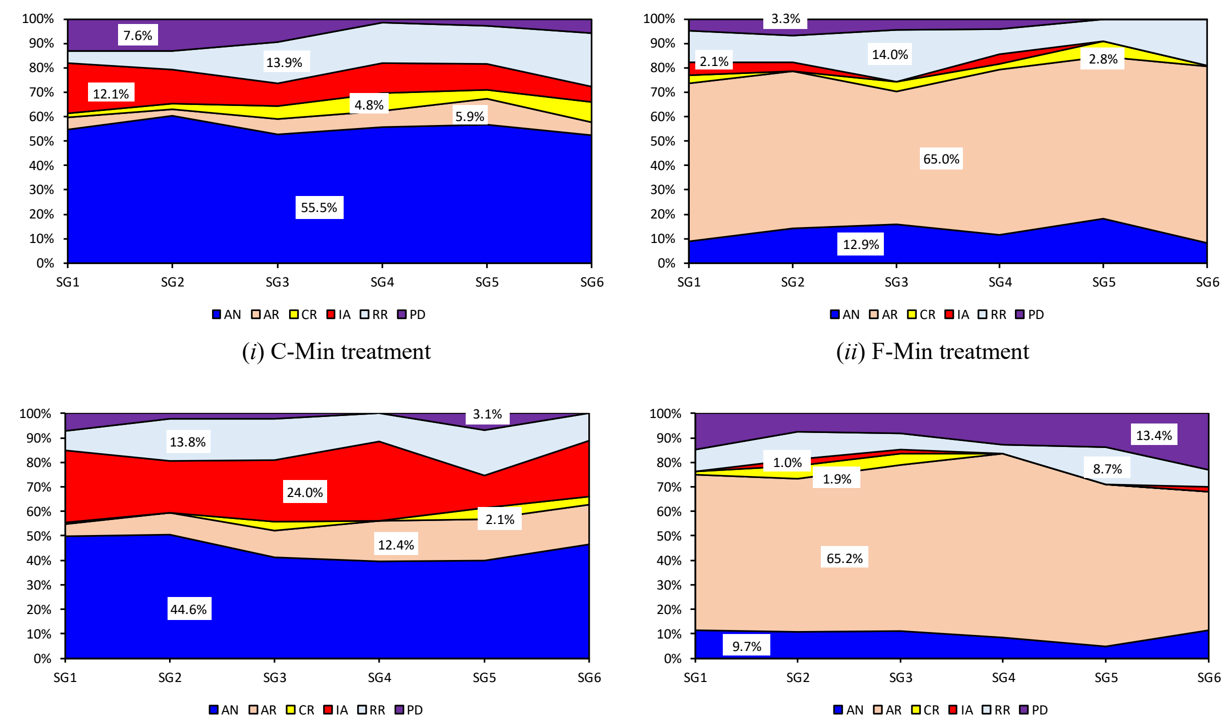
Six reporting strategies were assumed in this exercise. The first strategy is called the "Always Not Report" strategy, shortened as AN. A subject in this category never engages in reporting. The second strategy, called "Always Report" (shortened as AR), is defined literally as the one where a subject always engages in reporting. These two strategies are similar to the AD and AC strategies in the context of prisoner's dilemma interactions. Considering that subjects' reporting was on average conditional upon others' reporting (Table 4), the "Conditional Reporting" strategy (shortened as CR) is included as the third strategy. The CR subjects reciprocate others' reporting in the past. The specific definition is as follows: a CR subject *i* is assumed to report her partner in round *t* if *i* received a report in that round in the Min condition; and is assumed to report her partner if the matched partner was reported at least 50% so far in the Full condition. It is also assumed that the CR subject report in the first round of a supergame.

Three more strategies were further included to capture the possibility that their reporting was driven by other-regarding preferences or emotions. First, the IA (shortened from "Inequity Aversion") strategy is defined as one where subject *i* reports her partner only when *i* cooperated but her partner defected in the current interaction (*i* does not report her partner for the other three prisoner's dilemma outcomes). Notice that an inequity averse cooperator incurs a utility loss when exploited by a defector due to feeling of disadvantage (e.g., Fehr and Schmidt, 1999). Second, a RR (shortened from "Reciprocal Reporting") type *i* reports her partner when *i* cooperated, but not when *i* defected. This reporting is driven by reciprocity in the prisoner's dilemma interaction (e.g., Rabin, 1993; Dufwenberg and Kirchsteiger, 2004). It is assumed that a reciprocal cooperator engages in reporting when matched with a cooperator (defector) from positive (negative) reciprocity. Third, the PD (shortened from "Punishing Defecting Partner") strategy is defined as one where *i* always reports when matched with a defector due to negative emotions.

Fig. 5 reports the estimation results. Three clear patterns emerged. First, the AN strategy is by far the most popular strategy when reporting is costly. The percentages of the AN subjects are huge – 55.5% and 44.6% in the C-Min and C-Full treatments, respectively. By sharp contrast, almost all subjects were estimated to have engaged in (some) reporting when reporting does not involve a cost. The percentage of the AN subjects is only 12.9% (9.7%) in the F-Min (F-Full) treatment, which is significantly smaller than that in the C-Min (C-Full) treatment (see Appendix Table B.6). The difference in the reporting strategy choice between free versus costly reporting again suggests a strong discontinuity in people's decisions between zero and positive costs.

Second, remarkably, more than the majority of subjects acted according to the AR strategy when reporting did not involve a cost. This may mean that most subjects appreciated the beneficial effects of reputational information on cooperation. Interestingly, however, this result is in clear contrast with the costly reporting settings: unconditional reporting accounted for only 5.9% and 12.4% of the subjects' reporting strategies in the C-Min and C-Full treatments, respectively. This may mean that some non-material motives and/or emotions are required to overcome the hurdle of positive reporting costs. Third, consistent with this conjecture, a significantly larger fraction of subjects acted according to the IA strategy under costly than free reporting (Fig. 5, Appendix Table B.6). This suggests that perhaps, cooperators who are averse to disadvantageous inequality were motivated to warn others, in order to prevent the defecting partners from earning high by exploiting the peers.

Fig. 5: *Reporting Strategy Choices, Supergame by Supergame*



(*i*) C-Min treatment (*ii*) F-Min treatment

(*iii*) C-Full treatment (*iv*) F-Full treatment

Note: The percentage written in each region indicates the average percentage in which a given strategy was used by subjects across the six supergames. The detail of the estimation result can be found in Appendix Table B.6.

Result 7: *(a) The AN strategy was by far the most prevalent strategy when reporting was costly. By contrast, (b) this strategy was rarely selected when reporting did not involve a cost. Instead, around 65% of subjects acted according to the AR strategy in the F-Min and F-Full treatments. (c) Costly reporting was partly driven by cooperators' behindness aversion.*

5 Conclusion

This paper experimentally investigated how endogenous monitoring through gossiping can improve cooperation with strangers in an indefinitely repeated prisoner's dilemma game. The results first indicated that its effectiveness is severely affected by the reporting cost. On the one hand, when reporting did not involve a cost, subjects reported their partners' action choices more than 70% of the time on average and then achieved strong cooperation norms. Remarkably, the strong impact of endogenous monitoring did not depend on the availability of a platform whereby all future partners can check the previously reported information.

On the other hand, subjects only occasionally engaged in reporting when it was costly. As a result, costly reporting had almost no effects in boosting cooperation when the reported information was transmitted only to their next-round partners. By clear contrast, intriguingly, costly reporting had a positive effect when the publicly available platform that stores reputational information was present. The strong interaction effect between gossiping and the reputational platform can explain why reputation mechanisms in real online markets, such as eBay and Uber, are functioning effectively despite possible selection bias of reported information and unwanted side effects embedded in the mechanism (e.g., Dellarocas, 2003).

A regression analysis suggests that under endogenous monitoring, subjects on average cooperated conditionally upon the quality of their partners' reputational information, meaning that reputational information can effectively serve as a coordination device among strangers. Nevertheless, the percentage of the subjects who act according to such conditional strategy did differ according to the information structure. According to a structural estimation of subjects' strategy choices, only less than 15% of the subjects acted according to the Reputation strategy when reported information was not stored. By sharp contrast, with the reputational platform, remarkably, 31.3% (47.3%) of subjects were estimated to have acted based on such Reputation strategy when reporting was costly (cost-free). Hence, the availability of a publicly available reputation platform plays a vital role in inducing players to utilize the reputational information. Nevertheless, the analysis revealed strong heterogeneity in the subjects' strategy choices, suggesting that care should be exercised when analyzing subjects' cooperation behaviors under endogenous monitoring using theoretical models, simulations, etc.

Although the experimental findings are clear, there are many exciting directions for further research. For instance, it would definitely be meaningful to explore how the results obtained in the experiment are robust to the parameters of the experiment, such as the payoff matrix, the continuation probability, the group size, the size of the reporting cost, and the contents/formats of reporting. For example, the continuation probability was set at 95% in this study. The impact of endogenous monitoring may depend on the probability, considering the prior experiment research that suggests that subjects' decisions to cooperate may be strongly affected by the degree of subjects' patience (Dal Bó and Fréchette, 2018). Likewise, the functioning of endogenous monitoring may depend on the group size because the theoretical literature in repeated games discuss the effects of group size under random matching (Kandori, 1992). Alternatively, both the way in which players gossip, and how they respond to reputational information, may differ according to the flexibility of pairing and the contents of information. The standard random matching protocol was used in the experiment. In addition, the subjects were only able to truthfully report their opponents' action choices. These are good simplifications, because (a) the theoretical frameworks were well developed for the setup with random matching (e.g., Kandori, 1992; Ellison, 1994; Camera and Casari, 2009) and (b) the recent research suggests that most gossiping conveys truthful information even when lying is possible (Fonseca and Peters, 2018). Nevertheless, users in real online platforms can choose with whom they deal based on rating scores as well as (subjective) feedback comments. Such partner choice and detailed communication contents may further boost the effectiveness of endogenous monitoring, as was shown in the context of auctions (Brosig-Koch and Heinrich, 2018). It is undoubtedly worthwhile to explore the role of endogenous monitoring in more depth.

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NOT FOR PUBLICATION

Online Supplementary Appendix to: Kamei and Nesterov (2020):

"Endogenous Monitoring through Gossiping in an Infinitely

Repeated Prisoner's Dilemma Game"

Tables of Contents

Appendix A: ***Theoretical Analysis***

A.1. Transition Matrix and Standard Equilibrium Analysis

This section discusses threshold δ (δ^*, hereafter) above which selecting the grim trigger strategy (cooperative strategy) is a Nash equilibrium, assuming that the strategy space is restricted to only the grim trigger strategy and the always defect strategy. Note that it is also a NE for all players to act according to the always defect strategy for any δ.

The first step to find δ^* is to construct a Markov transition matrix that describes how defection spreads across a group, assuming that all members (other than a specific member *i* who deviates from the grim trigger strategy in a given round) act according to the grim trigger strategy. The value function of the player *i* can next be defined dependent on the matrix and the number of defectors in that round. Denote the value function when the number of defectors is *d* as V_d. δ^* can be derived by using the condition that the expected lifetime payoff of *i* is lower when deviating from than following the grim trigger strategy even when she is the first player to deviate from the trigger strategy in her group. The detail for this equilibrium-path case is summarized in Section A.1.1.

Nevertheless, once players are allowed to select any strategy, acting according to the grim trigger strategy is no longer an equilibrium, because players have certain incentives to refrain from punishing defectors in order to prevent defection from spreading in the group. This can be demonstrated by using an off-equilibrium case in which there is a member that chooses cooperation one time after observing a defection (Section A.1.2).

A.1.1. *Threshold δ above which everyone acts according to the grim trigger strategy*

Assume that everyone act according to the grim trigger strategy but one player decides to defect without observing defection. Consider this player who selects defection (player *i*, hereafter). p_d is used to express the probability for *i* to interact with a cooperator when the number of defectors is *d*. As the random matching protocol is used, the probability vector for *i*'s interacting with a cooperator can be found as follows:

$$p = (p_1, p_2, p_3, p_4, p_5, p_6, p_7, p_8) = (1, 6/7, 5/7, 4/7, 3/7, 2/7, 1/7, 0).$$

The Markov transition matrix (denoted as *M*) can be derived as follows:

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	0	1	0	0	0	0	0	0
2	0	1/7	0	6/7	0	0	0	0
3	0	0	0	3/7	0	4/7	0	0

4	0	0	0	3/35	0	24/35	0	8/35
5	0	0	0	0	0	3/7	0	4/7
6	0	0	0	0	0	1/7	0	6/7
7	0	0	0	0	0	0	0	1
8	0	0	0	0	0	0	0	1

Following the notations used in Camera and Casari (2009), the bold numbers in rows and in columns indicate the numbers of defectors in round t (current round) and in round $t + 1$ (next round), respectively. Derivations of some entries in M are worth explaining:

Pr[4|3] = 3/7. Consider any defector in round t (denoted as defector 1). The number of defectors will be four in round $t + 1$ if defector 1 is matched with another defector in round t, as the remaining defector should then be matched with a cooperator. This happens with a probability of 2/7. The number of defectors will also be four in round $t + 1$ if defector 1 is paired with a cooperator and the remaining two defectors are paired with each other. This happens with a probability of 1/7 (= 5/7×1/5). In other words, Pr[4|3] = 2/7+1/7 = 3/7.

Pr[6|3] = 4/7. The number of defectors will be six in round $t + 1$ when all three defectors are paired with cooperators in round t. The probability is: 5/7×4/5 = 4/7.

Pr[4|4] = 3/35. The number of defectors will remain unchanged if each defector is matched with a defector. This happens with a probability of 3/7×1/5 = 3/35.

Pr[6|4] = 24/35. Consider any defector (defector 1) in round t as in previous explanations. The number of defectors in round $t + 1$ will be six for the following two cases:

- Defector 1 is matched with another defector, while the two remaining defectors are matched with cooperators. This happens with a probability of 3/7×4/5 = 12/35.
- Defector 1 is matched with a cooperator, another defector is also matched with a cooperator, and the remaining two defectors are matched with each other. This happens with a probability of 4/7×(2/5+3/5×1/3) = 12/35.

Pr[8|4] = 8/35. This transition happens when all defectors are matched with cooperators. This situation happens with a probability of 4/7×3/5×2/3 = 8/35.

Pr[6|5] = 3/7. The number of defectors will increase by one if one cooperator is paired with a cooperator in round t. This happens with a probability of 2/7+5/7×1/5 = 3/7.

Pr[8|5] = 4/7. Each cooperator must be matched with a defector. This happens with a probability of 5/7×4/5 = 4/7.

The value function for player i can be expressed using the Markov transition matrix:

$$V_d = z + p_d(h - z) + \delta M_d V,$$

where M_d is the d^{th} row of M, h = 30 (defector's payoff when interacting with a cooperator), and z = 10 (mutual defection payoff).

Using the transition matrix M, V_d for each d can be expressed as follows:

- $V_1 = h + \delta V_2$.
- $V_2 = z + \frac{6}{7}(h - z) + \delta\left(\frac{1}{7}V_2 + \frac{6}{7}V_4\right)$.
- $V_3 = z + \frac{5}{7}(h - z) + \delta\left(\frac{3}{7}V_4 + \frac{4}{7}V_6\right)$.
- $V_4 = z + \frac{4}{7}(h - z) + \delta\left(\frac{3}{35}V_4 + \frac{24}{35}V_6 + \frac{8}{35}V_8\right)$.
- $V_5 = z + \frac{3}{7}(h - z) + \delta\left(\frac{3}{7}V_6 + \frac{4}{7}V_8\right)$.
- $V_6 = z + \frac{2}{7}(h - z) + \delta\left(\frac{1}{7}V_6 + \frac{6}{7}V_8\right)$.
- $V_7 = z + \frac{1}{7}(h - z) + \delta V_8$.
- $V_8 = \frac{z}{1-\delta}$.

The expected lifetime payoff of player i can be expressed in terms of h, z and δ using the above value functions recursively:

$$V_7 = z + \frac{1}{7}(h - z) + \frac{\delta z}{1-\delta}.$$

$$V_6 = \frac{z(5+\delta) + 2h(1-\delta)}{(\delta-1)(\delta-7)}.$$

$$V_5 = \frac{z(3\delta^2+11\delta+28)+3h(1-\delta)(7+\delta)}{7(\delta-1)(\delta-7)}.$$

$$V_4 = \frac{z(-31\delta^2-56\delta-105)-28h(1-\delta)(5+\delta)}{(3\delta-35)(\delta-1)(\delta-7)}.$$

$$V_3 = \frac{z(-75\delta^3-366\delta^2-413\delta-490)+h(75\delta^3+345\delta^2+805\delta-1{,}225)}{(3\delta-35)(7\delta-7)(\delta-7)}.$$

$$V_2 = \frac{z(183\delta^3+395\delta^2+329\delta+245)+h(-186\delta^3-318\delta^2-966\delta+1{,}470)}{(3\delta-35)(\delta-1)(\delta-7)^2}.$$

$$V_1 = h + \frac{z\delta(183\delta^3+395\delta^2+329\delta+245)+h\delta(-186\delta^3-318\delta^2-966\delta+1{,}470)}{(3\delta-35)(\delta-1)(\delta-7)^2}.$$

Deviating from the grim trigger strategy is not optimal if $\frac{y}{1-\delta} > V_1$. Here, y = 25 (stage game payoff from mutual cooperation). The condition $\frac{y}{1-\delta} > V_1$ reduces to: $\delta > \bar{\delta} \approx .574$.

A.1.2. Incentives to not exercise punishment even if a player observed defection.

Assume that everyone acts according to the grim trigger strategy, but one player who was betrayed still chooses cooperation in the next round (she reverts to the sanctioning strategy after the next). This is Case 2 of the theoretical analysis in the appendix of Camera and Casari (2009). Assume that only one player deviates from the grim trigger strategy in order to check the viability of the strategy. The motive behind this player's deviation can be interpreted as her attempt to prevent defection from quickly spreading to other members. The following shows that players have incentives to deviate from punishment under certain conditions, meaning that acting according to the grim trigger strategy does not constitute an equilibrium.

The term "player 1" is used to refer to the player who decided to deviate from the sanctioning rule by choosing cooperation one more time before reverting defection in the next round. The following considers player 1 and redoes the analysis as was done for Case 1 above.

In this case, the Markov transition matrix, denoted as $\widetilde{M}$, is different from M because of the presence of player 1. When the number of defectors (d) is more than one, d–1 defectors sanction according to the grim trigger strategy in this round. $\widetilde{M}$ can be thus derived as follows:

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	0	1	0	0	0	0	0	0
2	0	1/7	6/7	0	0	0	0	0
3	0	0	1/7	2/7	4/7	0	0	0
4	0	0	0	3/35	12/35	12/35	8/35	0
5	0	0	0	0	3/35	12/35	12/35	8/35
6	0	0	0	0	0	1/7	2/7	4/7
7	0	0	0	0	0	0	1/7	6/7
8	0	0	0	0	0	0	0	1

The bold numbers in rows (columns) indicate the numbers of players who are currently choosing to defect, or choosing to deviate from the trigger strategy despite her latest interaction with a defector, in round t (in round $t + 1$).

Rows 1 and 8:

Pr[2|1] = 1 and **Pr[8|8] = 1** by applying the same logic used in Camera and Casari (2009) to the setup in which group size is eight.

Row 7 (player 1, one cooperator and six defectors in round t):

The number of defectors will remain seven in round $t + 1$ if player 1 is paired with a cooperator in round t. Thus, **Pr[7|7] = 1/7**.

Row 6 (player 1, two cooperators and five defectors in round t):

There are three cases as summarized below:

(A) The number of defectors will remain six in round $t + 1$ if a cooperator i is matched with another cooperator in round t. Hence, **Pr[6|6] = 1/7**.
(B) The number of defectors will be seven in round $t + 1$ if player 1 is paired with one of the two cooperators in round t (the remaining cooperator must then interact with a defector in that round). Hence, **Pr[7|6] = 2/7.**
(C) Lastly, the number of defectors in round $t + 1$ will be eight if each cooperator interacts with a defector in round t. Thus, **Pr[8|6] = 5/7×4/5 = 4/7.**

Row 5 (player 1, three cooperators and four defectors in round t):

There are four cases as summarized below:
(A) The number of defectors will be five in round $t + 1$ if player 1 interacts with a cooperator and two cooperators are paired together in round t. In other words, **Pr[5|5] = 3/7×1/5 = 3/35.**
(B) The number of defectors will be six in round $t + 1$ under the following two situations:
(a) A cooperator i is paired with a cooperator in round t, while the remaining cooperator is paired with a defector in that round. This happens with a probability of 2/7×4/5 = 8/35.
(b) The cooperator i is paired with a defector in round t. The remaining two cooperators are paired together. This happens with a probability of 4/7×1/5 = 4/35.
In short, **Pr[6|5] = 8/35 + 4/35 = 12/35.**
(C) The number of defectors will be seven in round $t + 1$ if player 1 is paired with a cooperator while the remaining two cooperators are each paired with a defector in round t. In other words, **Pr[7|5] = 3/7×4/5 = 12/35.**
(D) The number of defectors will be eight in round $t + 1$ if three cooperators are all paired with defectors in round t. In other words, **Pr[8|5] = 4/7×3/5×2/3 = 8/35.**

Row 4 (player 1, four cooperators and three defectors in round t):

There are four cases as follows:
(A) The number of defectors will remain four in round $t + 1$ if player 1 is paired with a defector, while each cooperator is paired with a cooperator in round t. In other words, **Pr[4|4] = 3/7×3/5×1/3 = 3/35.**
(B) The number of defectors will be five in round $t + 1$ in the following two situations:
(a) Player 1 is paired with a cooperator in round t. Another cooperator i is paired with a cooperator while the remaining cooperator is paired with a defector in that round. This happens with a probability of 4/7×2/5 = 8/35.
(b) Player 1 is paired with a cooperator in round t. The cooperator i is paired with a defector while the remaining cooperator is paired with a cooperator in that round. This happens with a probability of 4/7×3/5×1/3 = 4/35.
In short, **Pr[5|4] = 8/35 + 4/35 = 12/35.**
(C) The number of defectors will be six in round $t + 1$ if player 1 is paired with a defector and the remaining two defectors are each paired with a cooperator in round t. In other words, **Pr[6|4] = 3/7×4/5 = 12/35.**
(D) The number of defectors will be seven in round $t + 1$ if player 1 is matched with a

cooperator, while the remaining cooperators are all paired with defectors in round *t*. Thus, **Pr[7|4] = 4/7×3/5×2/3 = 8/35.**

Row 3 (player 1, five cooperators and two defectors in round *t*):

A logic similar to the ones already discussed applies to **Pr[3|3] = 1/7** (the number of defectors will be three in round *t* +1 if the two defectors are paired together in round *t*)**, Pr[4|3] = 2/7** (the number of defectors will be four in round *t* + 1 if player 1 is paired with a defector in round *t*) and **Pr[5|3] = 5/7×4/5 = 4/7** (the number of defectors will be five in round *t* + 1 if the two defectors are each paired with a cooperator in round *t*).

Row 2 (player 1, six cooperators and one defector in round *t*):

Likewise, **Pr[2|2] = 1/7** (the number of defectors will be two in round *t* + 1 if player 1 is paired with a defector in round *t*); otherwise, **P[3|2] = 6/7**.

The value function for player 1, denoted as $\tilde{V}_d$ in this appendix, depends on *d* (the number of deviators). The expected lifetime payoff of player 1 can be expressed as follows:

$$\tilde{V}_d = \begin{cases} V_1 & if\ d = 1. \\ l + p_d(y - l) + \delta\widetilde{M}V & if\ d \geq 2. \end{cases}$$

Here, $l = 5$ (sucker payoff) and $y = 25$ (mutual cooperation payoff). When $d \geq 2$, $d - 1$ players follow the grim trigger strategy, while the remaining one player who has observed defection chooses cooperation, in this round. Here, the third term is $\delta\widetilde{M}V$, not $\delta\widetilde{M}\tilde{V}$, because player 1 reverts to the sanctioning strategy (defection) in the next round.

Using $\widetilde{M}$, the value function $\tilde{V}_d$ can be expressed as follows:

- $\tilde{V}_8 = l + \delta V_8$.
- $\tilde{V}_7 = l + \frac{1}{7}(y - l) + \delta\left(\frac{1}{7}V_7 + \frac{6}{7}V_8\right)$.
- $\tilde{V}_6 = l + \frac{2}{7}(y - l) + \delta\left(\frac{1}{7}V_6 + \frac{2}{7}V_7 + \frac{4}{7}V_8\right)$.
- $\tilde{V}_5 = l + \frac{15}{35}(y - l) + \delta\left(\frac{3}{35}V_5 + \frac{12}{35}V_6 + \frac{12}{35}V_7 + \frac{8}{35}V_8\right)$.
- $\tilde{V}_4 = l + \frac{20}{35}(y - l) + \delta\left(\frac{3}{35}V_4 + \frac{12}{35}V_5 + \frac{12}{35}V_6 + \frac{8}{35}V_7\right)$.
- $\tilde{V}_3 = l + \frac{5}{7}(y - l) + \delta\left(\frac{1}{7}V_3 + \frac{2}{7}V_4 + \frac{4}{7}V_5\right)$.
- $\tilde{V}_2 = l + \frac{6}{7}(y - l) + \delta\left(\frac{1}{7}V_2 + \frac{6}{7}V_3\right)$.

The remaining task is to check whether selecting cooperating after observing a defection can be optimal.

(i) $\tilde{V}_8 \leq V_8$:

This is straightforward since $l < z$. Thus, selecting cooperation after observing a defection is not optimal when $d = 8$.

(ii) $\tilde{V}_7 \leq V_7$:

The condition $\tilde{V}_7 \leq V_7$ reduces to the following condition:

$$\delta \leq \frac{-49y\ +294z\ +49h-294l}{h-z} = \frac{343}{4},$$

which always holds since δ used in the experiment is less than 1. This suggests that selecting cooperation after observing a defection is not optimal when $d = 7$.

(iii) $\tilde{V}_6 \leq V_6$:

The condition $\tilde{V}_6 \leq V_6$ reduces to the following condition:

$$\delta \leq \frac{14h - 35l - 14y + 35z}{2(h-z)} = \frac{49}{8},$$

which always holds since δ used in the experiment is less than 1. This suggests that selecting cooperation after observing a defection is not optimal when $d = 6$.

(iv) $\tilde{V}_5 \leq V_5$:

The condition $\tilde{V}_5 \leq V_5$ reduces to the following condition:

$$\delta \leq \frac{665}{24} - \frac{7\sqrt{7{,}345}}{24} \approx 2.712,$$

which always holds since δ used in the experiment is less than 1. This suggests that selecting cooperation after observing a defection is not optimal when $d = 5$.

(v) $\tilde{V}_4 \leq V_4$:

The condition $\tilde{V}_4 \leq V_4$ reduces to the following condition:

$$\delta \leq -\frac{115}{32} + \frac{\sqrt{28{,}905}}{32} \approx 1.719,$$

which always holds since δ used in the experiment is less than 1. Thus, selecting cooperation after observing a defection is not optimal when $d = 4$.

(vi) $\tilde{V}_3 \leq V_3$:

The condition $\tilde{V}_3 \leq V_3$ reduces to the following condition:

$$\delta \leq \frac{7\left(17{,}511{,}949+6{,}084\sqrt{8{,}165{,}949}\right)^{\frac{1}{3}}}{468} + \frac{8{,}827}{36\left(17{,}511{,}949+6{,}084\sqrt{8{,}165{,}949}\right)^{\frac{1}{3}}} - \frac{161}{36} \approx 1.166,$$

which always holds since δ used in the experiment is less than 1. Thus, selecting cooperation after observing a defection is not optimal when $d = 3$.

(vii) $\tilde{V}_2 \leq V_2$:

The condition $\tilde{V}_2 \leq V_2$ reduces to the following condition:

$$\delta \leq \frac{7\left(80{,}703{,}351+600\sqrt{18{,}321{,}963{,}933}\right)^{\frac{1}{3}}}{1800} - \frac{101{,}731}{600\left(80{,}703{,}351+600\sqrt{18{,}321{,}963{,}933}\right)^{\frac{1}{3}}} - \frac{581}{600} \approx 0.840.$$

This suggests that selecting cooperation after observing a defection is optimal, provided that the following two conditions are satisfied: (1) her partner is the only defector in the group; and (2) the game will continue with a probability of 84% or higher. These conditions hold since δ = 0.95 in the experiment. As discussed, the player's decision to deviate from the punishment mode delays the breakdown of cooperation in the group.

A.2. Simulations in the Presence of Conditional Cooperators

This section reports simulation results regarding player's optimal strategy choices, assuming that they choose one of the two strategies: (a) the Always Defect strategy (AD, hereafter), and (b) Conditional Cooperative strategy (CC, hereafter). The two strategies are defined in the context of each treatment as discussed in each subsection below. The probability distribution for the average lifetime payoffs of a specific player i was estimated given seven other group members' strategy choices. The distribution was derived when i acts according to the AD strategy, and also when she acts according to the CC strategy, respectively. A comparison of the distributions between the two strategies is suggestive for the degree of stability of the cooperative equilibrium in a given treatment.

A simulation involves a large volume of calculations. In order to reduce computer loads, a distribution of the average lifetime payoffs was estimated based on 50 iterations. One observation (average payoff when i selects the CC or AD strategy) was calculated by repeating the following calculation 500 times and then taking the average of 500 simulated total payoffs:

1. Random matching: the computer randomly forms pairs in the group of eight in every round.
2. The group has 100 rounds of interactions. Note that payoffs after round 100 are negligible due to discounting: $0.95^{100-1} = 0.0062 < 0.01$.
3. The strategies of all the seven other members in i's group are given. A member that uses the AD strategy (AD player, hereafter) selects D in every round. A member that uses the CC strategy (CC player, hereafter) selects C with a probability of 80% in round 1, and selects C stochastically in any other round conditional on other members cooperating.[1] The specific rule that the CC player follows after round 1 is defined in each subsection.
4. The simulated lifetime payoff of player i is calculated by: $\sum_{t=1}^{100} \delta^{t-1} \pi_{i,t}$, where $\delta = 0.95$ and $\pi_{i,t}$ is the payoff of player i in round t.

In other words, 100×500 rounds per average payoff × 4 pairs per group × 50 iterations = 10,000,000 rounds of pair interactions were simulated to obtain one probability distribution of her average total payoffs when i selects a specific strategy. This simulation was performed for each treatment (see Sections A.2.1, A.2.2 and A.2.3). All simulations were programmed and implemented using Python.

[1] Additional simulations were also performed by alternatively assuming that the CC players select C randomly (i.e., with a probability of 50%) in round 1 when no reputational information is available. The simulation results were omitted because the predicted treatment differences are qualitatively similar to the case presented in Appendix A.2.

A.2.1. N treatment

As subjects do not have any reputational information in the N treatment, the CC strategy can be defined based on their own interaction experiences as follows:

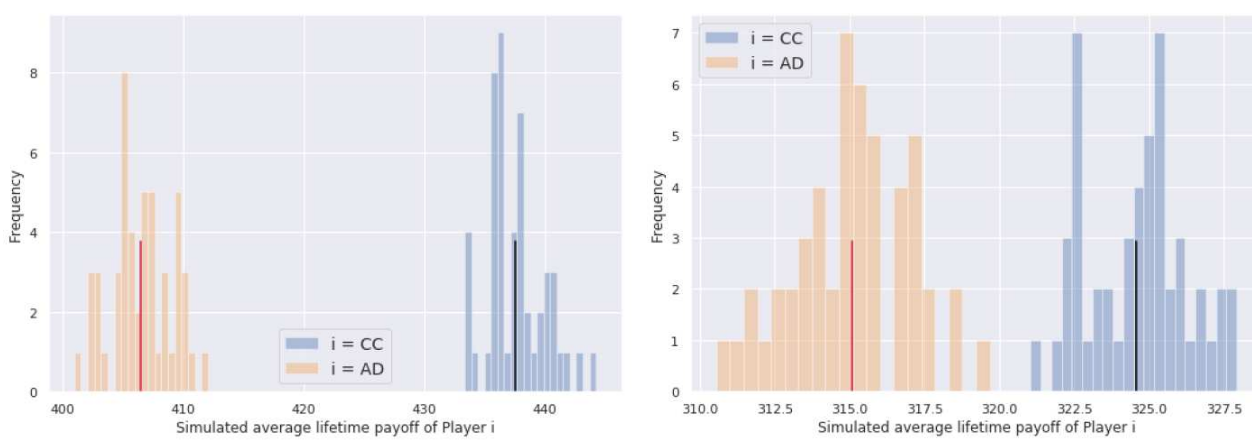
Assumption 1: *A CC player selects cooperation stochastically with a probability that her matched partners selected cooperation so far in a given supergame.*

By contrast, an AD player is defined as the one who always selects defection unconditionally.

Each panel in Fig. A.1 compares the distributions of a player *i*'s average lifetime payoffs when she acts according to the AD strategy and when she acts according to the CC strategy, given the seven other members' strategy choices. Panel *a* first shows that *i*'s optimal strategy choice is CC when all seven others do the same. Any other CC player has also no material incentives to switch to the AD strategy, meaning that a cooperative equilibrium exists. Nevertheless, this equilibrium is volatile. Panels *b* to *h* suggest that (i) *i*'s incentive to select the CC strategy quickly declines as the number of AD players increases, and that (ii) the symmetric cooperation situation collapses when more than one player deviates from the CC strategy. As shown in panels *c* to *h*, any CC player has a profitable deviation when more than one player deviates.

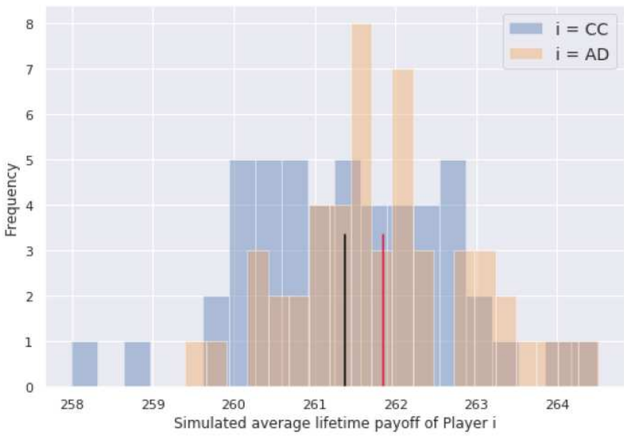
Fig. A.1. *Average Lifetime Payoffs Obtained by Player i, Conditional on the Seven Other Members' Strategy Choices* <u>*in the N treatment*</u>

The two distributions in each panel below are significantly different according to a two-sided Mann-Whitney test ($p < .00001$), except for panel *c*. p (two-sided) = .059 for panel *c*. These test results suggest that *i* does not have material incentives to act according to the CC strategy unless the number of the AD players is less than or equal to one.

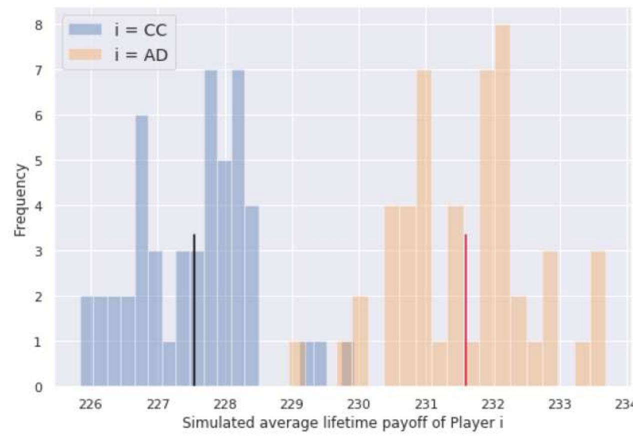


(*a*) When all the seven other members use the CC strategy

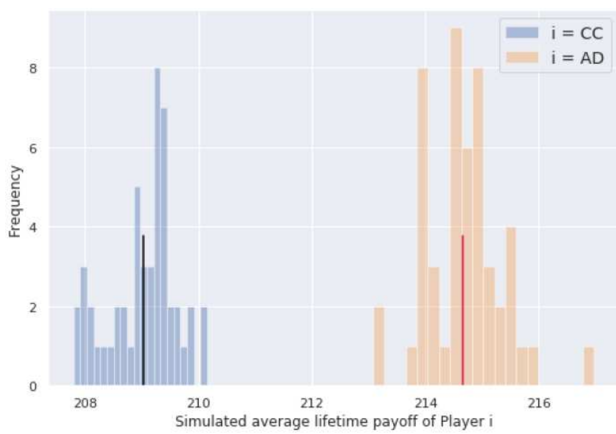
(*b*) When six use the CC strategy and one uses the AD strategy out of the seven other members



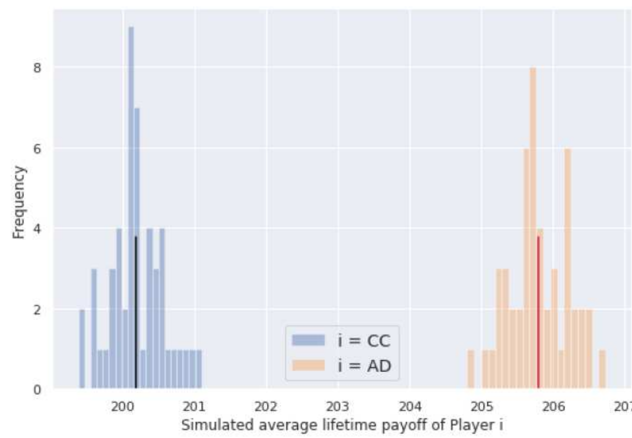
(*c*) When five use the CC strategy and two use the AD strategy out of the seven other members



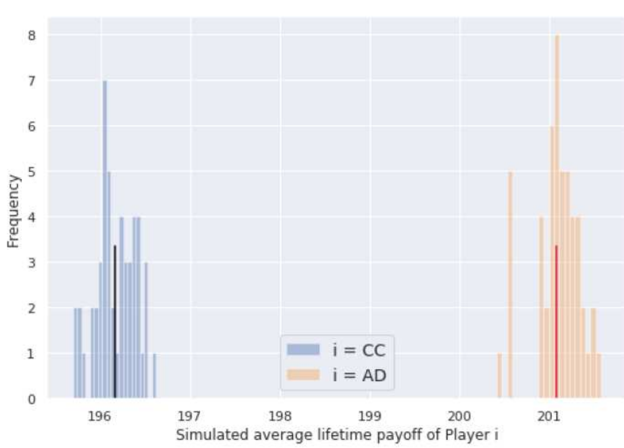
(*d*) When four use the CC strategy and three use the AD strategy out of the seven other members



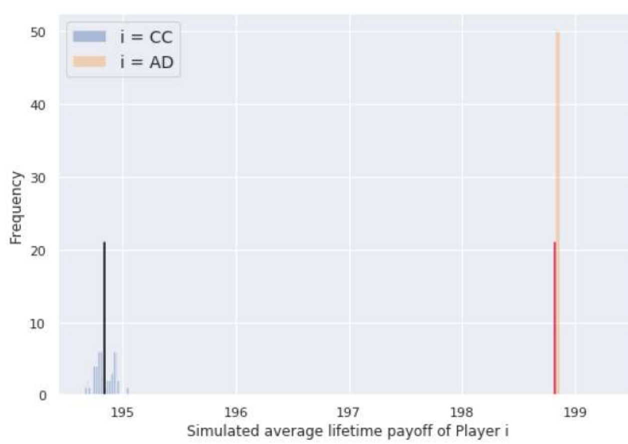
(*e*) When three use the CC strategy and four use the AD strategy out of the seven other members



(*f*) When two use the CC strategy and five use the AD strategy out of the seven other members



(*g*) When one uses the CC strategy and six use the AD strategy out of the seven other members



(*h*) When all the seven other members use the AD strategy

A.2.2. C-Min and F-Min treatments

In round t, subjects in the C-Min and F-Min treatments are aware of their matched partners' round $t-1$ action choices if the partners were reported in round $t-1$. The simplest strategy that conditional cooperators can take is to condition their decision *solely on their partners' last-round decisions*. This strategy can be defined as follows:

Assumption 2: *(a) CC players always engage in reporting regardless of the reporting cost.*[2] *(b) A CC player selects cooperation (defection) when her current-round partner's last-round action choice is cooperation (defection) and it is observable. When the partner has no history information, the CC player selects cooperation stochastically with a probability that her previous masked partners selected cooperation so far in a given supergame (as defined in Assumption 1 in the context of the N treatment).*

In other words, the reputational information can serve as a coordination device among CC players. Notice that the CC players' conditionality towards unmasked partners can be interpreted as being similar to the tit for tat strategy if the CC players are assumed to believe that their partners would select the same actions as in the previous round.

AD players select defection unconditionally. An assumption is, however, required for their reporting behaviors and can be set as follows, considering that AD players can free ride on peers' reporting acts if they are selfishly motivated and want to avoid paying for reporting:

Assumption 2: *(c) An AD player does not report her partner's action choice in the C-Min treatment, but she reports it always in the F-Min treatment.*[3]

Figs. A.2 and A.3 summarize simulation results for the F-Min and C-Min treatments, respectively. Panel *a* of each figure first shows that *i*'s optimal strategy choice is CC when all seven others do the same. Notice that any other CC player has also no profitable deviation to switching to the AD strategy, whose pattern is the same as in the N treatment. This implies that a cooperative equilibrium exists, irrespective of whether reporting is free or costly. Panels *b* to *h* of the two figures, however, reveal different patterns from the N treatment. Specifically, while *i*'s incentive to select the CC strategy relative to the AD strategy declines as the number of AD players increases in her group, the symmetric cooperation situation is stable such that a CC player has no profitable deviation to the AD strategy unless the number of the AD players is more than or equal to six (four) in the F-Min (C-Min) treatment. This supports the idea that endogenous monitoring can help sustain cooperation, aided by the reputational information.

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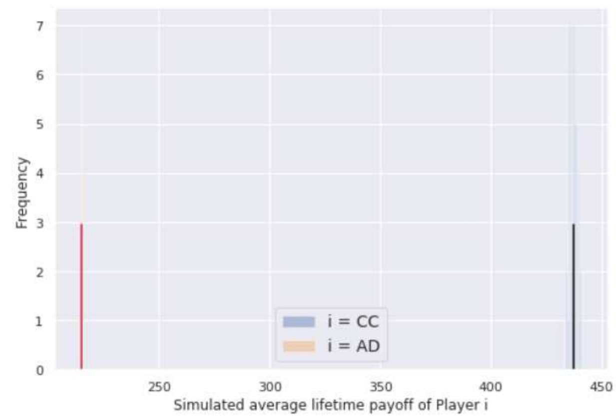
[2] This is a simplified assumption. However, a positive reporting cost may significantly keep CC players from reporting and behaving cooperatively if they overreact to the positive cost (e.g., Kamei, 2017, 2020).

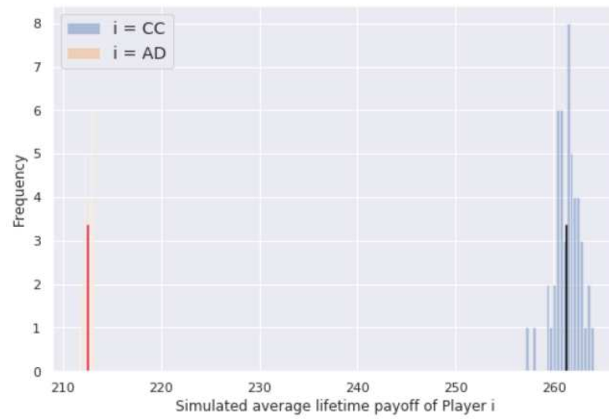
[3] As reputational information improves cooperation in infinitely repeated prisoner's dilemma games with random matching (Camera and Casari 2009; Kamei, 2017), one can assume that AD players report if reporting is cost-free.

Fig. A.2. *Average Lifetime Payoffs Obtained by Player i* *in the F-Min treatment* *when CC players Select Cooperation solely based on Partners' Last-round Action Choices*

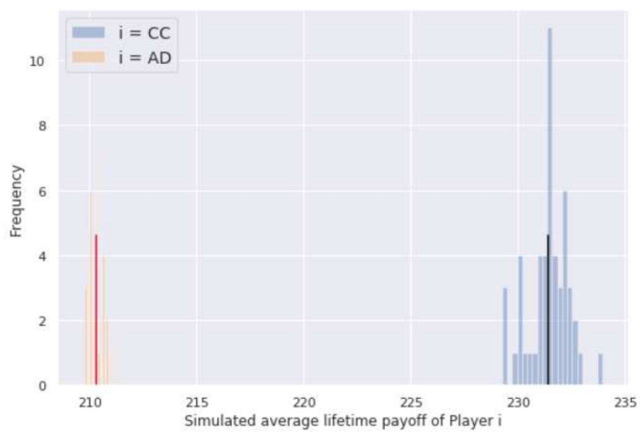
The two distributions in each panel below are significantly different according to a two-sided Mann-Whitney test ($p < .00001$). These test results suggest that *i* has material incentives to act according to the CC strategy unless the number of the AD players is more than or equal to six.



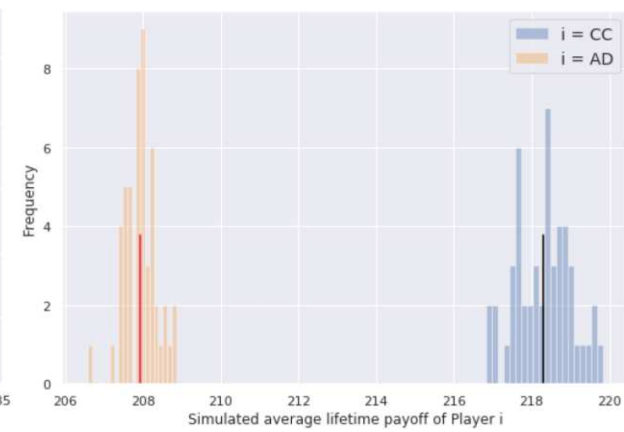
(*a*) When all the seven other members use the CC strategy



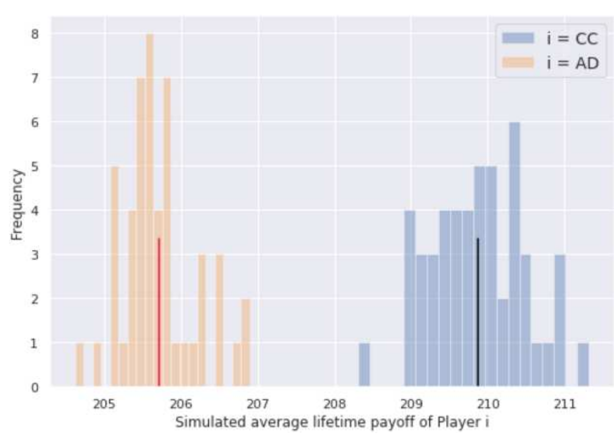
(*b*) When six use the CC strategy and one uses the AD strategy out of the seven other members



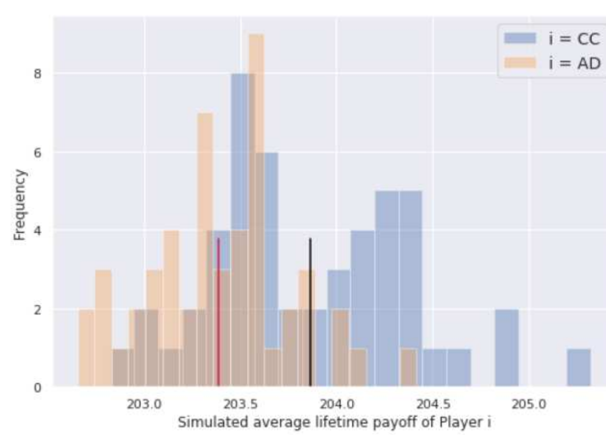
(*c*) When five use the CC strategy and two use the AD strategy out of the seven other members



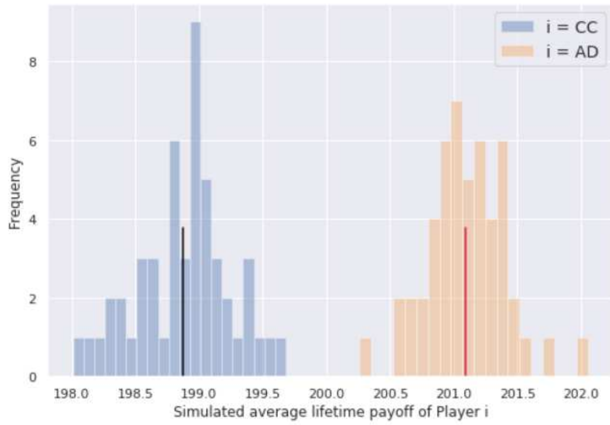
(*d*) When four use the CC strategy and three use the AD strategy out of the seven other members



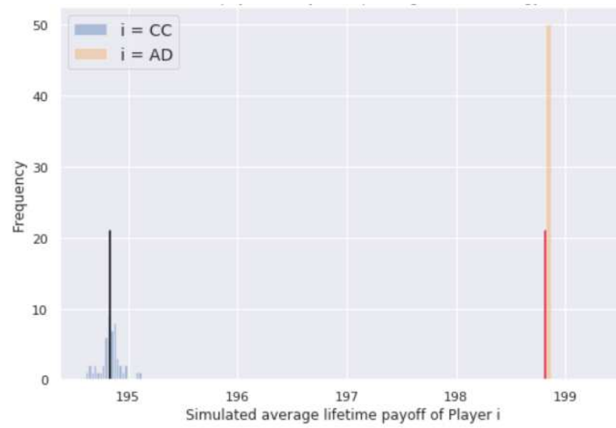
(*e*) When three use the CC strategy and four use the AD strategy out of the seven other members



(*f*) When two use the CC strategy and five use the AD strategy out of the seven other members



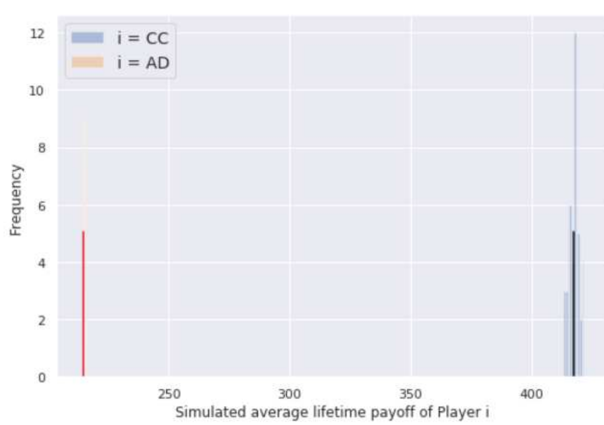
(*g*) When one uses the CC strategy and six use the AD strategy out of the seven other members



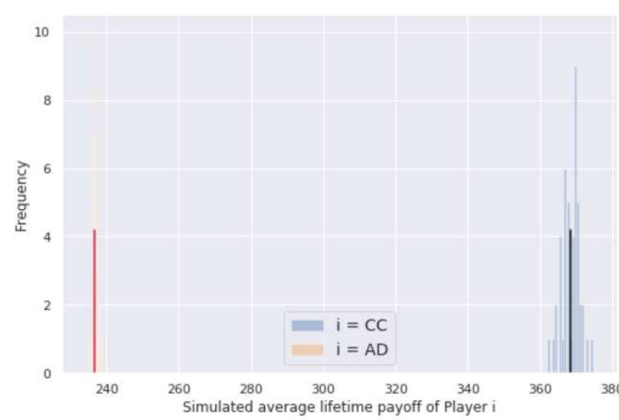
(*h*) When all the seven other members use the AD strategy

Fig. A.3. *Average Lifetime Payoffs Obtained by Player i* *<u>in the C-Min treatment</u>* *when CC players Select Cooperation solely based on Partners' Last-round Action Choices*

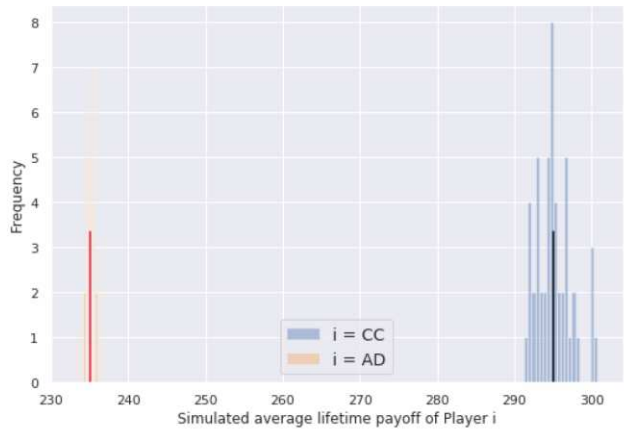
The two distributions in each panel below are significantly different according to a two-sided Mann-Whitney test ($p < .00001$). These test results suggest that *i* has material incentives to act according to the CC strategy unless the number of the AD players is more than or equal to four. While the symmetric cooperation situation is less stable compared with the F-Min treatment (see also Fig. A.2), it is much more stable compared with the N treatment.



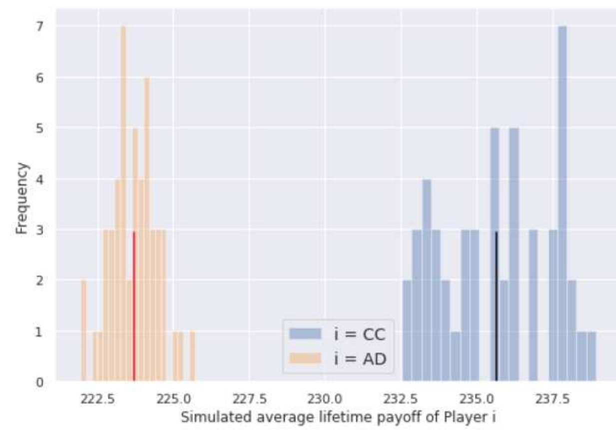
(*a*) When all the seven other members use the CC strategy



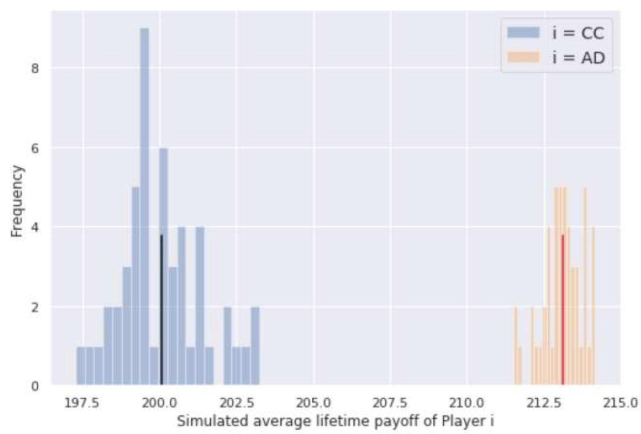
(*b*) When six use the CC strategy and one uses the AD strategy out of the seven other members



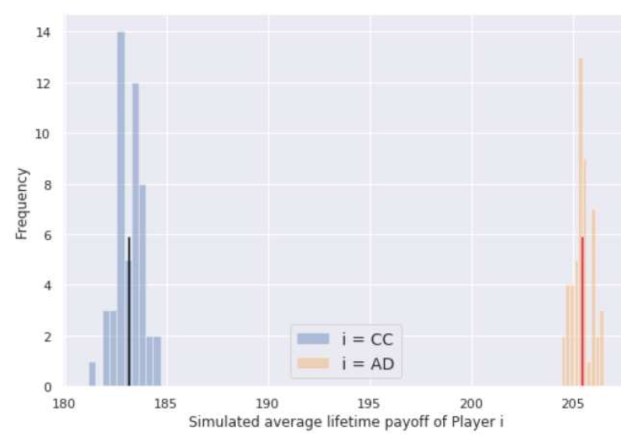
(*c*) When five use the CC strategy and two use the AD strategy out of the seven other members



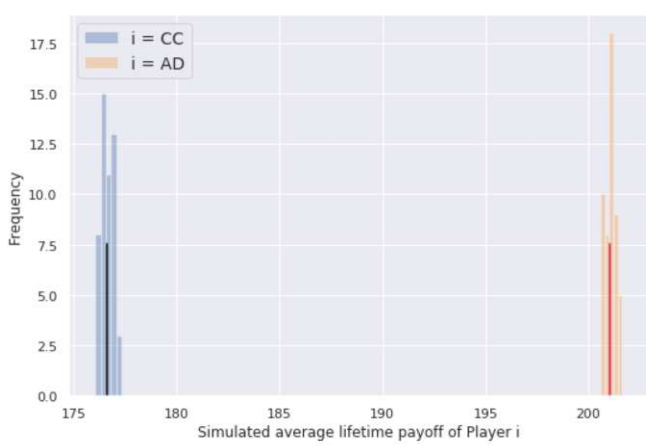
(*d*) When four use the CC strategy and three use the AD strategy out of the seven other members



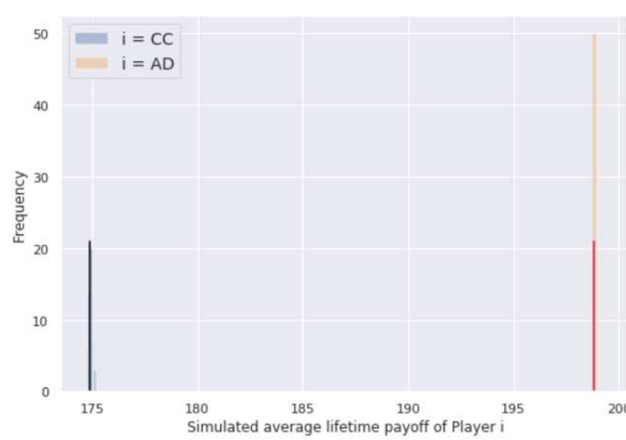
(*e*) When three use the CC strategy and four use the AD strategy out of the seven other members



(*f*) When two use the CC strategy and five use the AD strategy out of the seven other members



(*g*) When one uses the CC strategy and six use the AD strategy out of the seven other members



(*h*) When all the seven other members use the AD strategy

While the simulations in Figs. A.2 and A.3 were performed based on the simplest conditional strategy, there are a number of conditional cooperative strategies a player can take. Additional simulations suggest that the effectiveness of endogenous monitoring is more robust to the kinds of cooperative strategies a subject follows when reporting is free than costly. For example, one straightforward way to define the CC strategy is that a CC player adjusts action choices over time based on all her experiences so far in a given supergame as follows:

Assumption 3: *When a CC player i is matched with an unmasked person in round t, she conditions her action choice on the partner's action chosen for round t – 1 in the following way:*

- *If the partner has cooperated (defected) in round t – 1 and i has interaction experiences with such a partner in the past, i will select cooperation in round t with a probability that her previously-matched unmasked partners, whose last-round choice was cooperation, selected cooperation.*
- *The CC player i will select cooperation with a probability of 80% in round t when she has no relevant experiences in a given situation (e.g., in round 1 or when i meets for the first time with a person whose last-round action choice was cooperation).*

The CC player's decision towards masked partners is the same as defined in Assumption 1.

For example, suppose that a CC player *i* has interacted with those whose last-round action choice was cooperation five times so far in a given infinitely repeated game and that three out of the five persons selected cooperation to *i*. Suppose that *i* is now (in round *t*) matched with an unmasked member who selected cooperation in round *t* – 1. *i* will then select cooperation with a probability of 60% (= 3/5×100). In sum, under this assumption, CC players take all of their previous relevant experiences into account when deciding whether to cooperate. Assumption 2(b) is the extreme opposite to Assumption 3, in that CC players *do not consider any experiences* and just mimic their unmasked partner's last-round action choices. Subjects' actual conditional behaviors can be considered somewhere in the middle between Assumptions 2(b) and 3.

A simulation was conducted by assuming that AD player's behaviors are the same as in Assumption 2(c). It interestingly revealed that while a cooperative equilibrium exists in both the F-Min and C-Min treatments, the strategy relying on own interaction experiences in fact performed worse, compared with the simplified tit-for-tat-like strategy defined in Assumption 2(b). The reason is that, with such stochastic action choices, CC players fail to cooperate with other CC players with some probabilities. Losses from such mistakes gradually accumulated over the course of the plays. In addition, CC players mistakenly select cooperation with some probabilities when matched with AD players (notice that some CC players may select cooperation toward a person with a record of last-round defection with some probabilities). This simulation outcome is similar to the well-known simulation exercises by Axelrod and Hamilton (1981). Axelrod and Hamilton (1981) internationally solicited strategies that could help sustain cooperation (in an infinitely repeated prisoner's dilemma game under partner matching) from game theorists in economics, sociology, political science, mathematics, evolutionary biology, physics, computer science, and also computer hobbyists, and then conducted two computer tournaments in sequence. Among the numerous strategies proposed, "some of the strategies were quite intricate. An example is one which on each move models the behavior of the other player as a Markov process, and then uses Bayesian inference to select what seems the best choice for the long run." (page 1393). However, the two tournaments both found that the simplest tit for tat strategy, which was proposed by Professor Anatol Rapoport, performed the best.

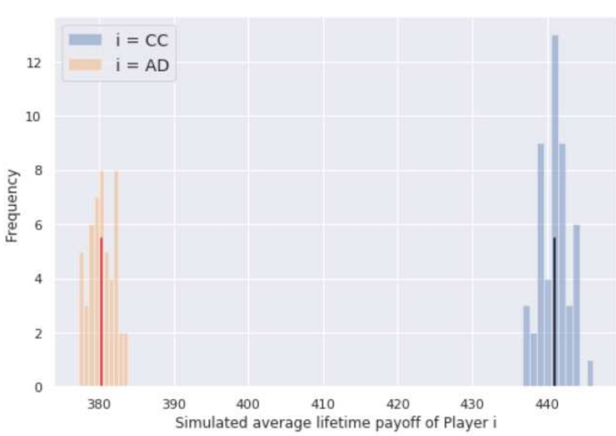
However, the negative effects differ by treatment. On the one hand, the symmetric cooperation situation is still quite stable in the F-Min treatment. Fig. A.4 indicates that CC players have no material incentives to switch to the AD strategy unless more than or equal to five group members deviate to the AD strategy. On the other hand, in the C-Min treatment, the symmetric cooperation situation is as volatile as in the N treatment. Fig. A.5 suggests that as soon as more than one person acts according to the AD strategy, no one has incentives to behave according to the CC strategy. These simulations thus suggest the following predictions:

(i) The average cooperation rate is higher in the F-Min than in the N treatment.
(ii) The average cooperation rate is higher in the F-Min than in the C-Min treatment.

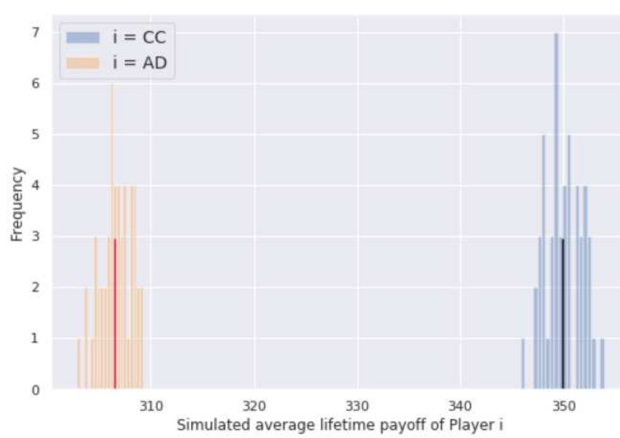
The effectiveness of costly reporting highly depends on what strategy CC players select. Hence, a clear prediction cannot be provided for a comparison between the N and C-Min treatments.

Fig. A.4. *Average Lifetime Payoffs Obtained by Player i in the F-Min treatment when CC players Select Cooperation Stochastically based on their Own Experiences and the Partner's Reputational Information*

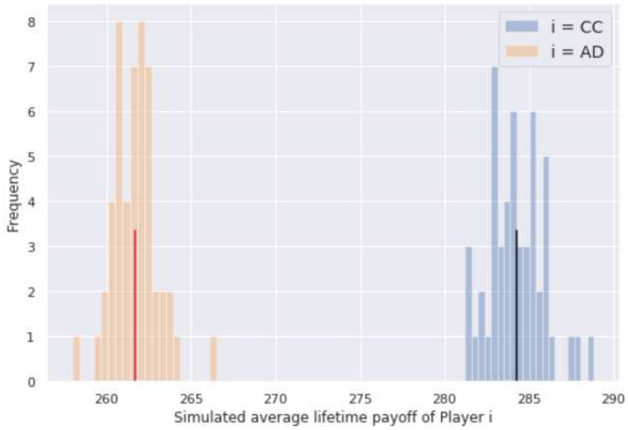
The two distributions in each panel below are significantly different according to a two-sided Mann-Whitney test ($p < .00001$), except for panel *e*. *p* (two-sided) = .2937 for panel *e*. These test results suggest that a conditional cooperator does not have material incentives to switch to the AD strategy unless the number of the AD players is more than or equal to five.



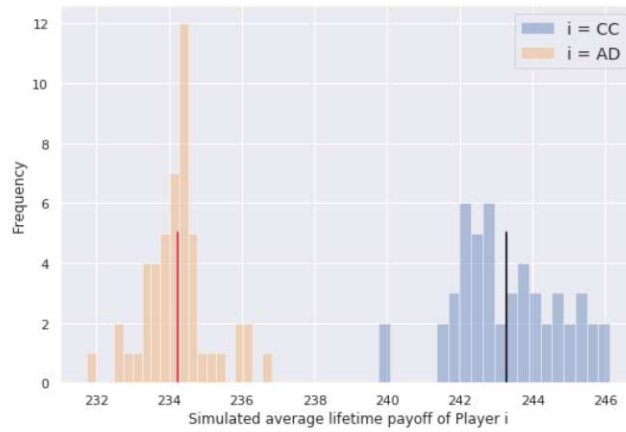
(*a*) When all the seven other members use the CC strategy



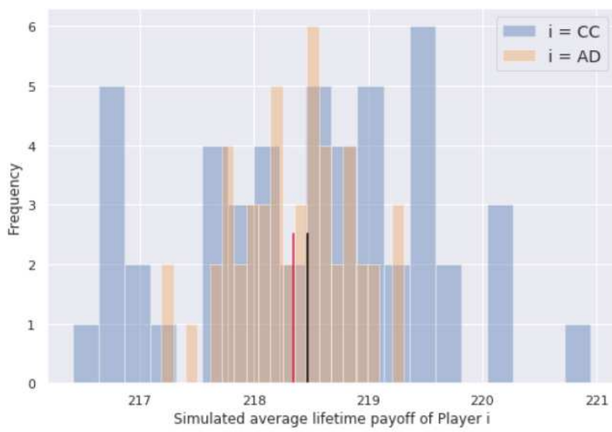
(*b*) When six use the CC strategy and one uses the AD strategy out of the seven other members



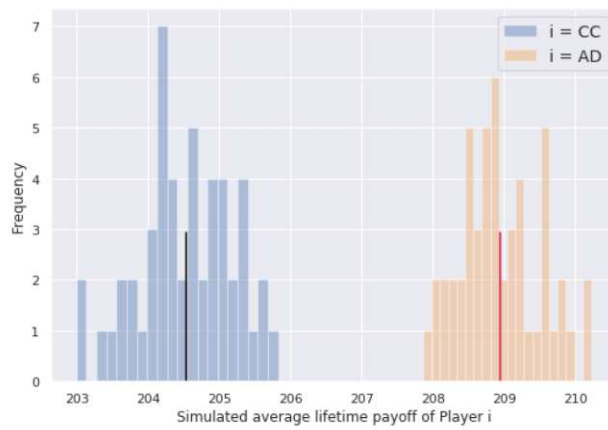
(*c*) When five use the CC strategy and two use the AD strategy out of the seven other members



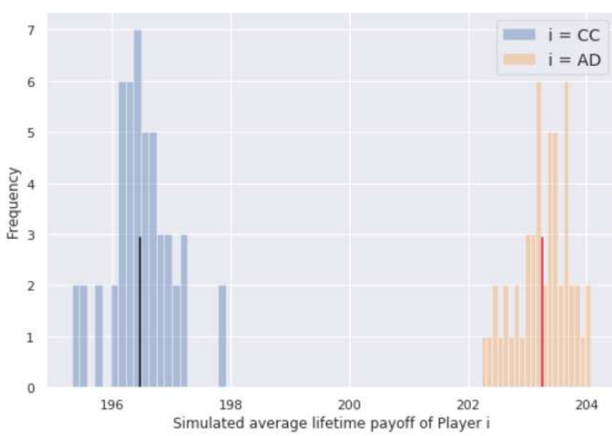
(*d*) When four use the CC strategy and three use the AD strategy out of the seven other members



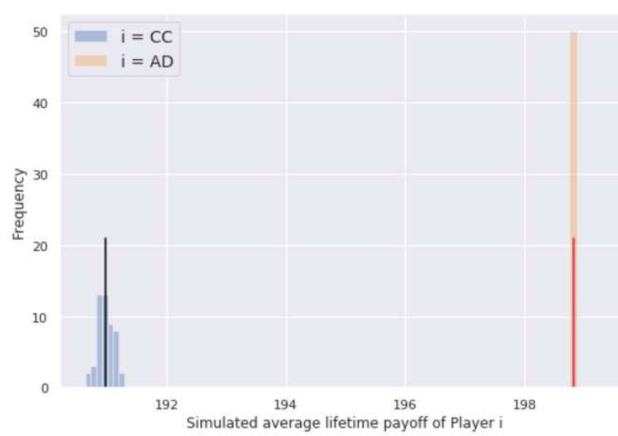
(*e*) When three use the CC strategy and four use the AD strategy out of the seven other members



(*f*) When two use the CC strategy and five use the AD strategy out of the seven other members



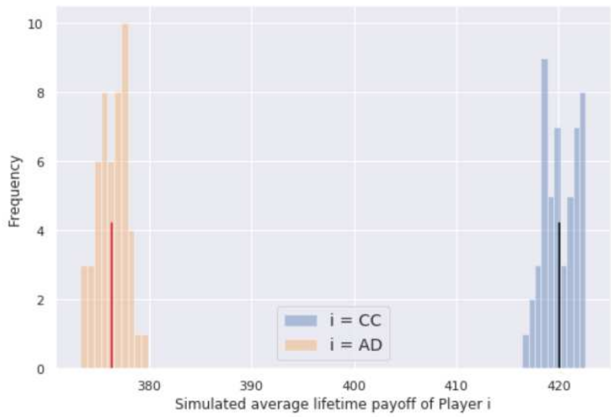
(*g*) When one uses the CC strategy and six use the AD strategy out of the seven other members



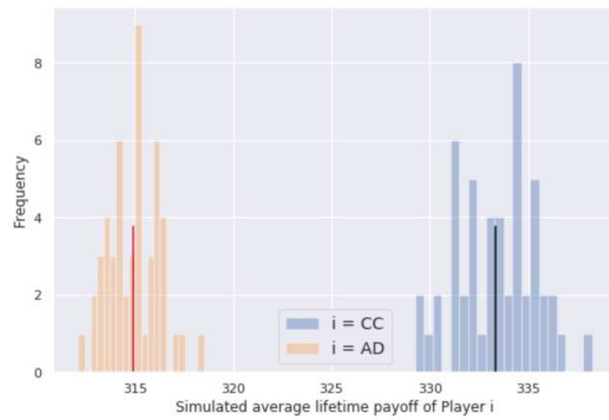
(*h*) When all the seven other members use the AD strategy

Fig. A.5. *Average Lifetime Payoffs Obtained by Player i* *<u>in the C-Min treatment</u>* *when CC players Select Cooperation Stochastically based on their Own Experiences and the Partner's Reputational Information*

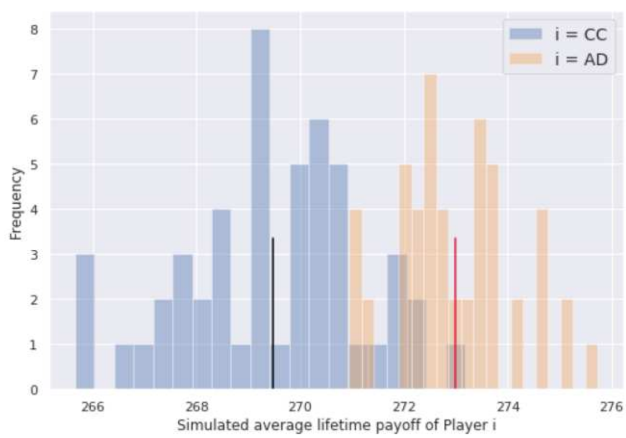
The two distributions in each panel below are significantly different according to a two-sided Mann-Whitney test ($p < .00001$). These test results suggest that i does not have material incentives to act according to the CC strategy unless the number of the AD players is less than or equal to one.



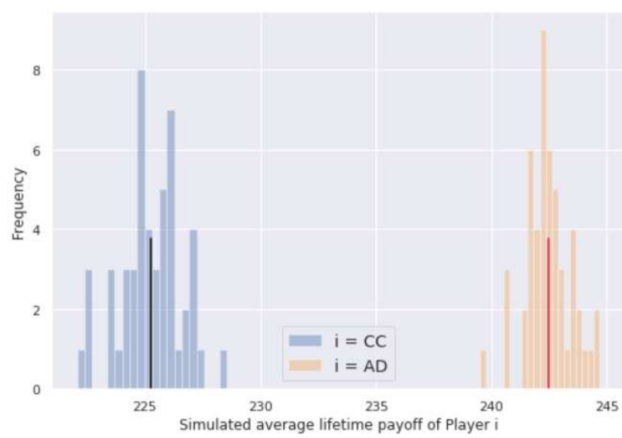
(*a*) When all the seven other members use the CC strategy



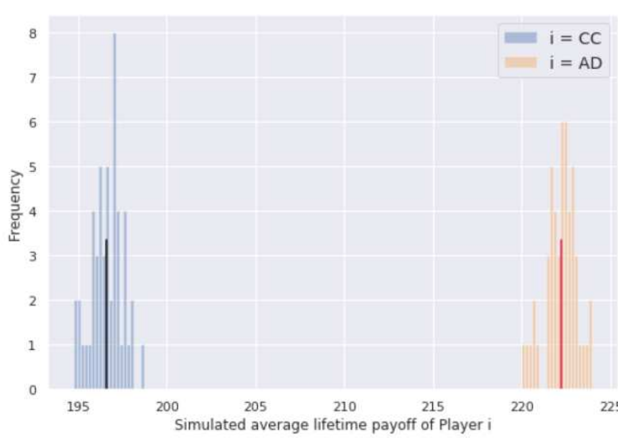
(*b*) When six use the CC strategy and one uses the AD strategy out of the seven other members



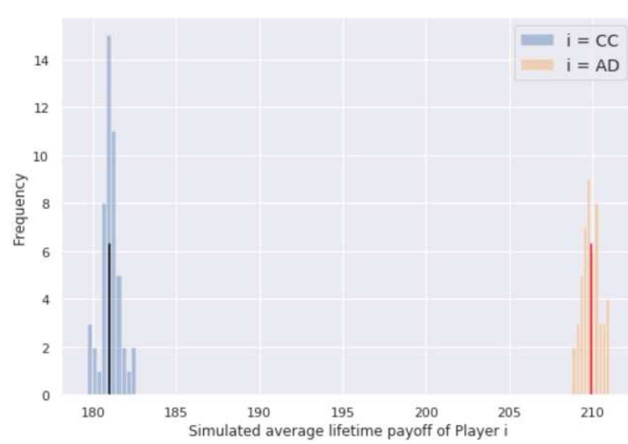
(*c*) When five use the CC strategy and two use the AD strategy out of the seven other members



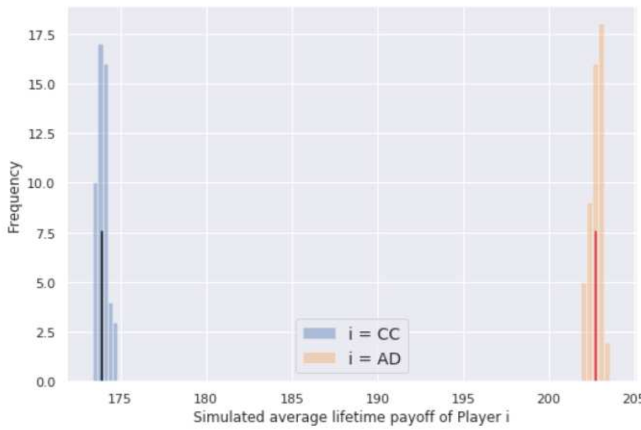
(*d*) When four use the CC strategy and three use the AD strategy out of the seven other members



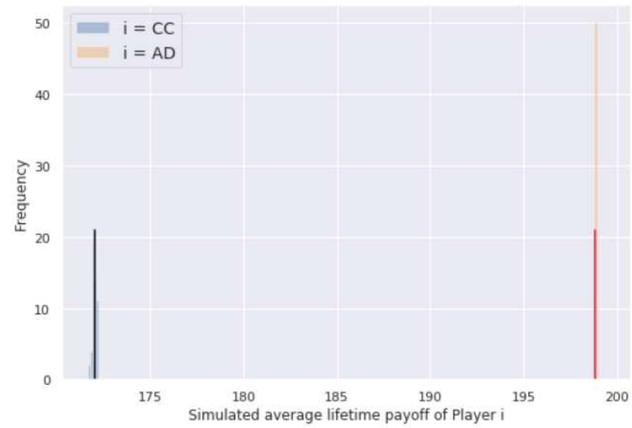
(*e*) When three use the CC strategy and four use the AD strategy out of the seven other members



(*f*) When two use the CC strategy and five use the AD strategy out of the seven other members



(*g*) When one uses the CC strategy and six use the AD strategy out of the seven other members

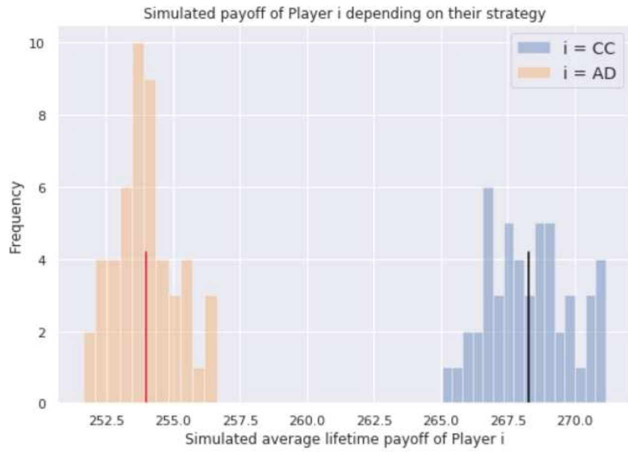


(*h*) When all the seven other members use the AD strategy

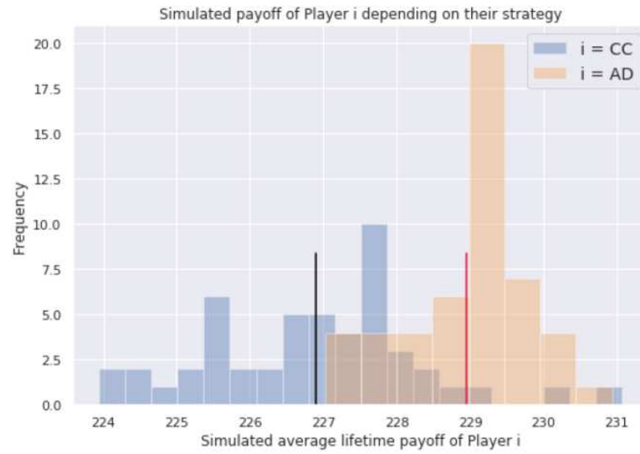
As discussed, it can be assumed that real subjects' conditional cooperative behaviors are somewhere in the middle between Assumptions 2(b) and 3. It is worth noting that if a strategy taken by the CC players is defined somewhere between Assumptions 2(b) and 3, the stability of the cooperative equilibrium is also characterized somewhere in the middle between the ones described by Figs. A.3 and A.5 (Figs. A.2 and A.4). As an illustration, another simulation was conducted for the C-Min treatment by assuming the CC players' strategy as follows:

- A CC player *j* selects cooperation with a probability of 80% in round 1 (when she has no experiences in a given indefinitely repeated prisoner's dilemma game).
- A CC player *j* selects cooperation with a probability of 100% (0%) when the partner selected cooperation (defection) in the last round, it was reported but *j* does not have any relevant experiences in the situation.
- A CC player *j* selects cooperation as defined in Assumption 3 if she is matched with an unmasked person who selected cooperation (defection) in the last round and she has already interacted with such a person in the past.

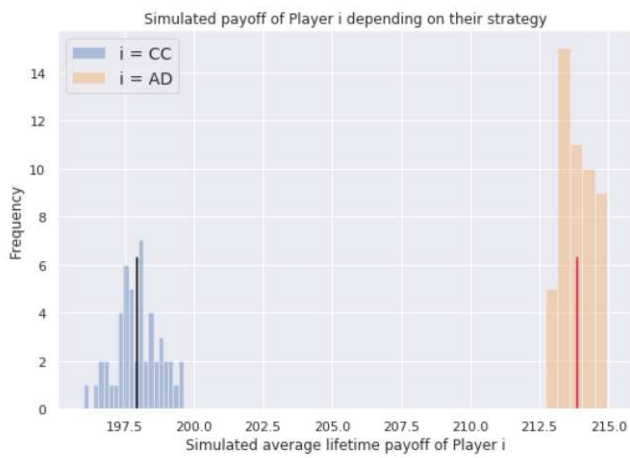
The simulation reveals that under costly reporting, a player *i* does not have material incentives to act according to the CC strategy unless the number of the AD players is less than or equal to two, whose condition is a little less strict compared with the simulation result summarized in Fig. A.5. See the following three graphs that compare the distributions of a player *i*'s average lifetime payoffs when she acts according to the AD versus CC strategy, given the seven other members' strategy choices. The two distributions in each of the three panels on the next page are significantly different according to a two-sided Mann-Whitney test ($p < .00001$).



(*a*) When five use the CC strategy and two use the AD strategy out of the seven other members



(*b*) When four use the CC strategy and three use the AD strategy out of the seven other members



(*c*) When three use the CC strategy and four use the AD strategy out of the seven other members

There are eight situations regarding the seven other members' strategy choices. The results for the other five situations are omitted to conserve the space.

A.2.3. C-Full and F-Full treatments

In round *t*, subjects in the C-Full and F-Full treatments are aware of their matched partners' action choices in all previous rounds in which the partners were reported. While CC players in these treatments can act according to the simple tit-for-tat-like strategy based on the last-round information as described in Assumption 2(b) of Section A.2.2, they can adopt a more sophisticated discriminatory strategy such that they condition their cooperation decisions *on all the previous rounds in which the partners were reported* (Assumption 4). This strategy strengthens the positive effects of conditionality found in Section A.2.2.

Assumption 4: *When matched with a person with some history information, a CC player selects cooperation stochastically with a probability that the partner selected cooperation in previous rounds in which he was reported. When matched with someone without any history information, the CC player selects cooperation stochastically with a probability that her previous masked partners selected cooperation so far in a given supergame (as defined in Assumption 1 in the context of the N treatment).*

For example, suppose that a CC player *i* is matched with someone with history information. Suppose also that the record indicates that the partner selected cooperation in five out of eight reported rounds so far. Under this circumstance, Assumption 4 indicates that *i* selects cooperation with a probability of $5/8 \times 100 = 62.5\%$. A simulation analysis, summarized in Figs. A.6 and A.7, found that this sophisticated conditional strategy magnifies the stability of a cooperative equilibrium, whether reporting is free or costly, compared with the ones discussed in Section A.2.2. This effect was driven by the increased quantity of reputational information, thereby enabling CC players to discriminate group members more accurately. This feature, hence, makes the CC strategy more profitable than the AD strategy thanks to the improved coordination device.

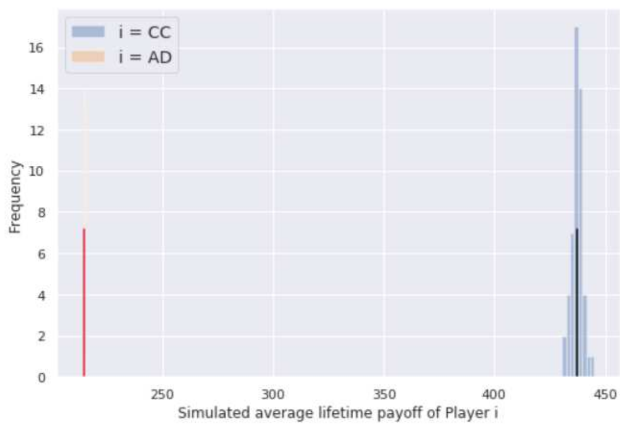
In summary, this simulation exercise suggests that having a public record of reported action choices may further help improve cooperation, thus providing the following predictions:

(i) The average cooperation rate is higher in the F-Full than in the F-Min treatment.
(ii) The average cooperation rate is higher in the C-Full than in the C-Min treatment.

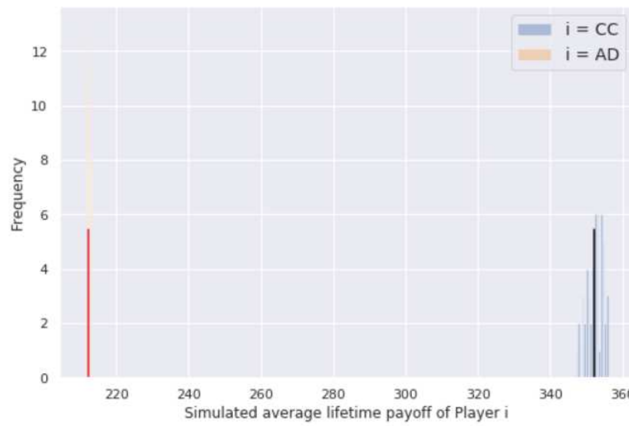
It is worth noting here that despite (i), the impact of having a publicly available record under free reporting (if any) may be small, considering the simulation result that free reporting has a strong effect even in the absence of such a record (see the discussion made in Section A.2.2).

Fig. A.6. *Average Lifetime Payoffs Obtained by Player i* <u>*in the F-Full treatment*</u>

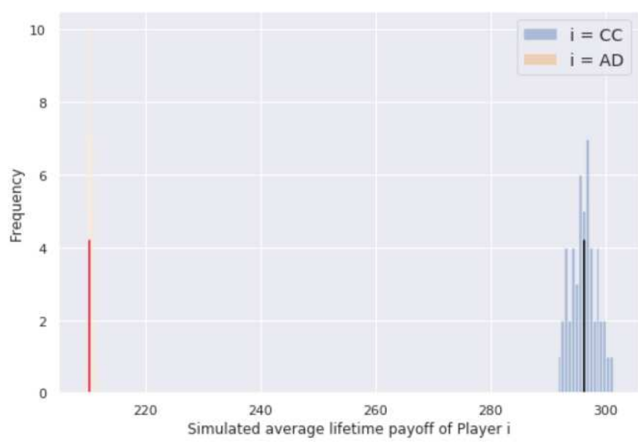
The two distributions in each panel below are significantly different according to a two-sided Mann-Whitney test ($p < .00001$). These test results suggest that *i* <u>has material incentives to act according to the CC strategy unless all the seven other members are the AD players</u>.



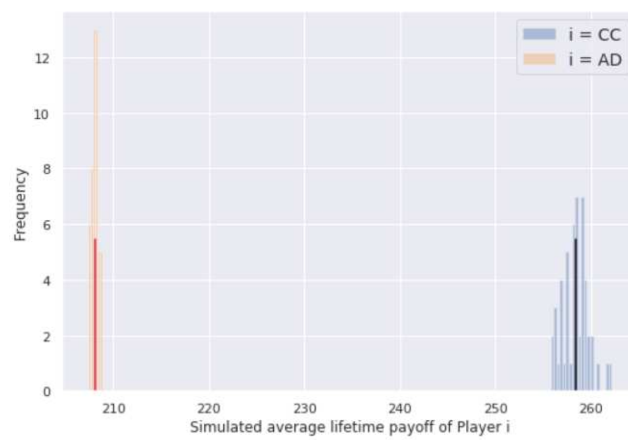
(*a*) When all the seven other members use the CC strategy



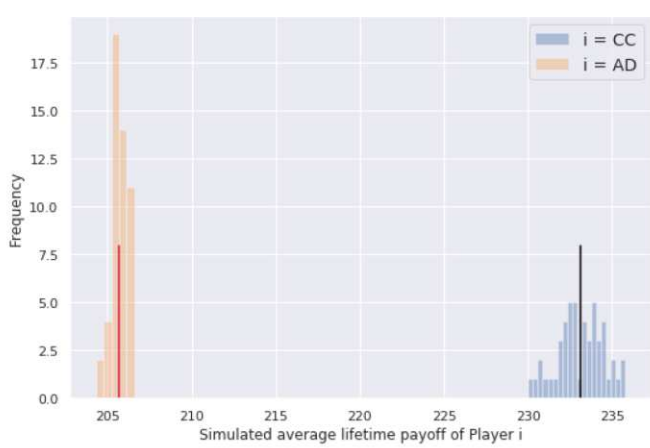
(*b*) When six use the CC strategy and one uses the AD strategy out of the seven other members



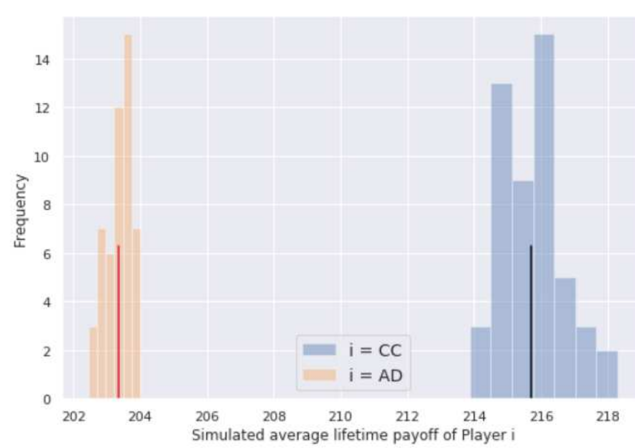
(*c*) When five use the CC strategy and two use the AD strategy out of the seven other members



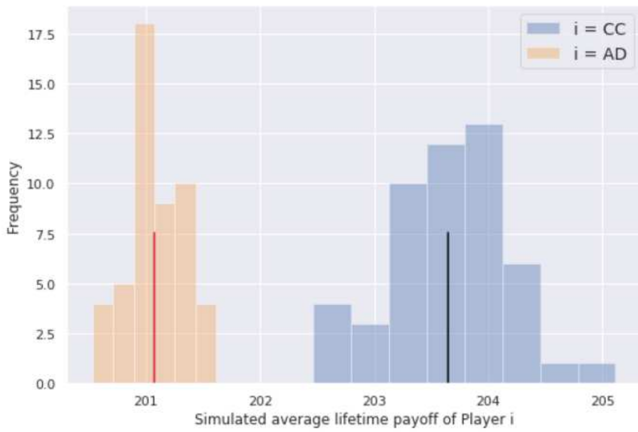
(*d*) When four use the CC strategy and three use the AD strategy out of the seven other members



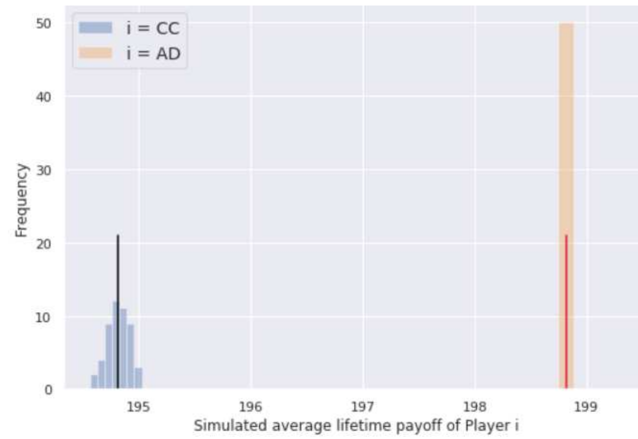
(*e*) When three use the CC strategy and four use the AD strategy out of the seven other members



(*f*) When two use the CC strategy and five use the AD strategy out of the seven other members



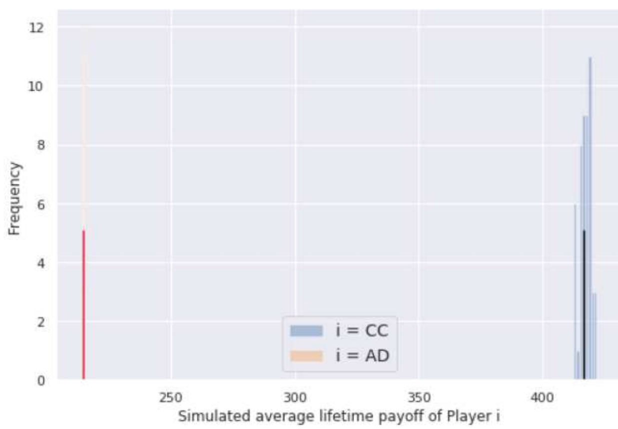
(*g*) When one uses the CC strategy and six use the AD strategy out of the seven other members



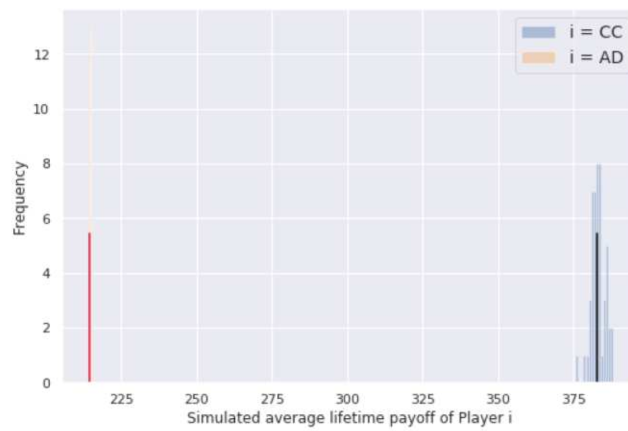
(*h*) When all the seven other members use the AD strategy

Fig. A.7. *Average Lifetime Payoffs Obtained by Player i* <u>*in the C-Full treatment*</u>

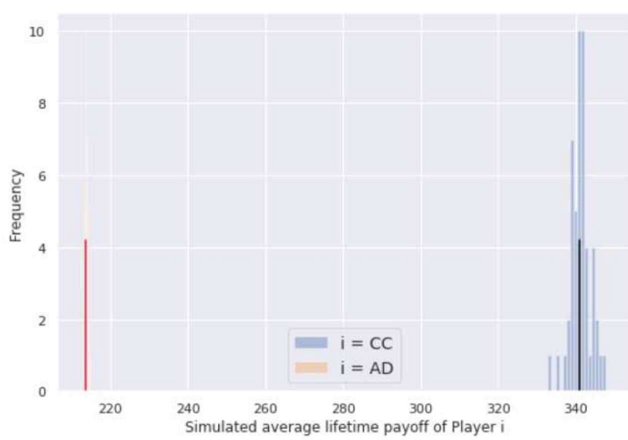
The two distributions in each panel below are significantly different according to a two-sided Mann-Whitney test ($p < .00001$), except for panel *f*. *p* (two-sided) = .8259 for panel *f*. These test results suggest that a conditional cooperator <u>does not have material incentives to switch to the AD strategy unless the number of the AD players is more than five</u>.



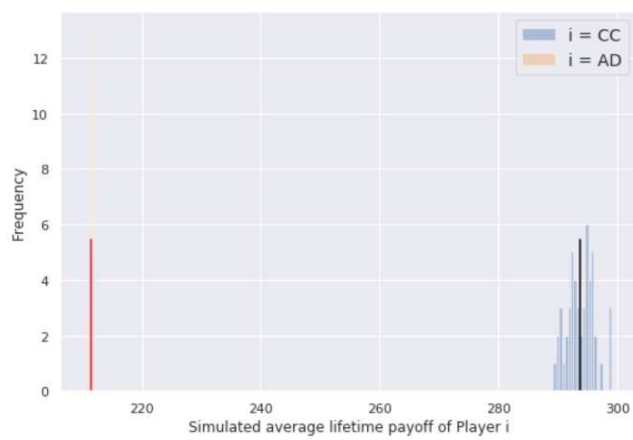
(*a*) When all the seven other members use the CC strategy



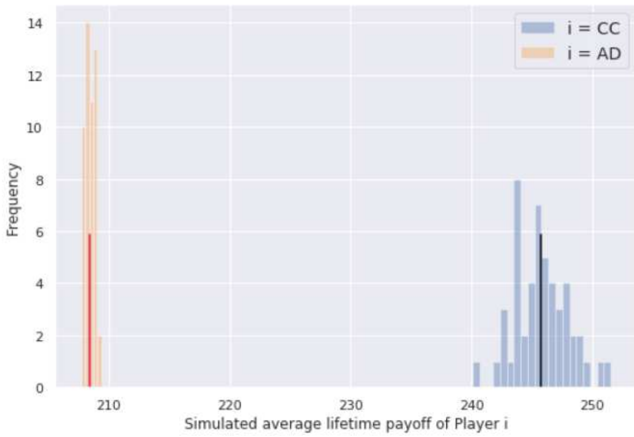
(*b*) When six use the CC strategy and one uses the AD strategy out of the seven other members



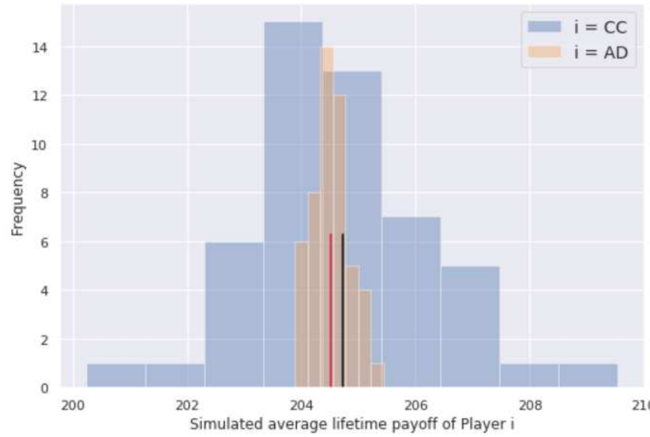
(*c*) When five use the CC strategy and two use the AD strategy out of the seven other members



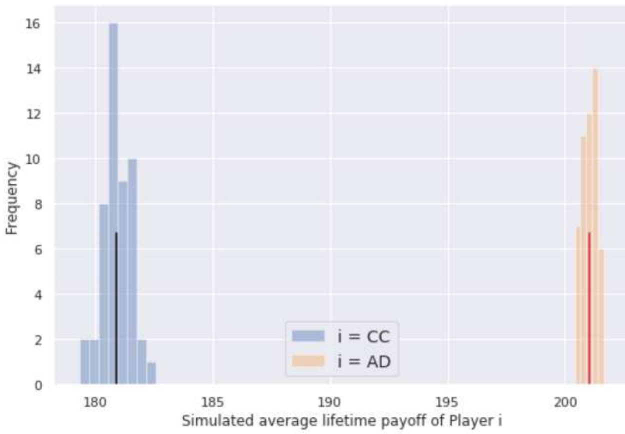
(*d*) When four use the CC strategy and three use the AD strategy out of the seven other members



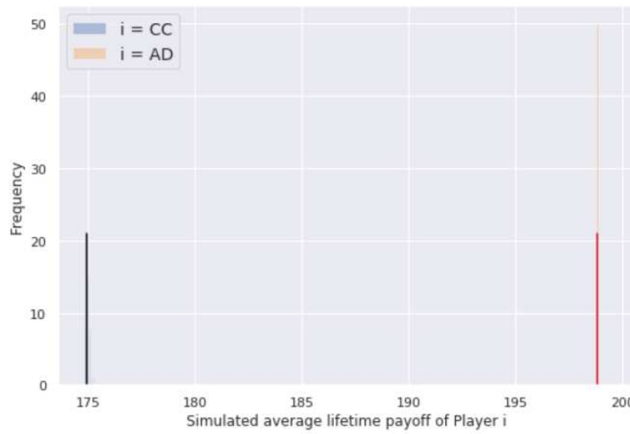
(*e*) When three use the CC strategy and four use the AD strategy out of the seven other members



(*f*) When two use the CC strategy and five use the AD strategy out of the seven other members



(*g*) When one uses the CC strategy and six use the AD strategy out of the seven other members



(*h*) When all the seven other members use the AD strategy

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Camera, Gabriele, and Marco Casari. 2009. "Cooperation among Strangers under the Shadow of the Future." *American Economic Review*, 99(3), 979-1005.

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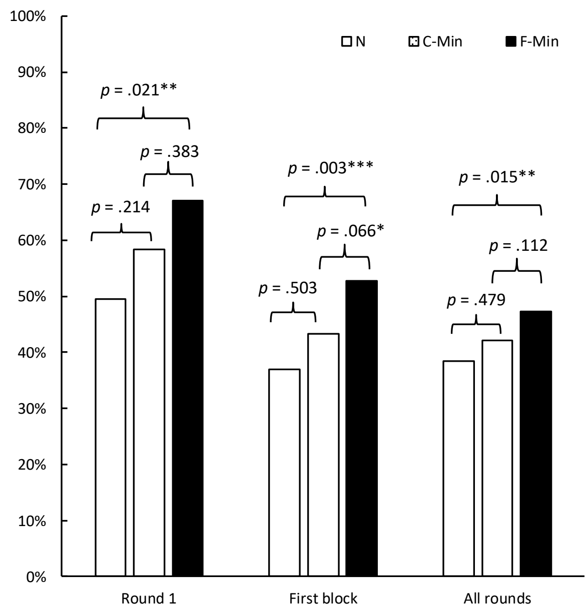
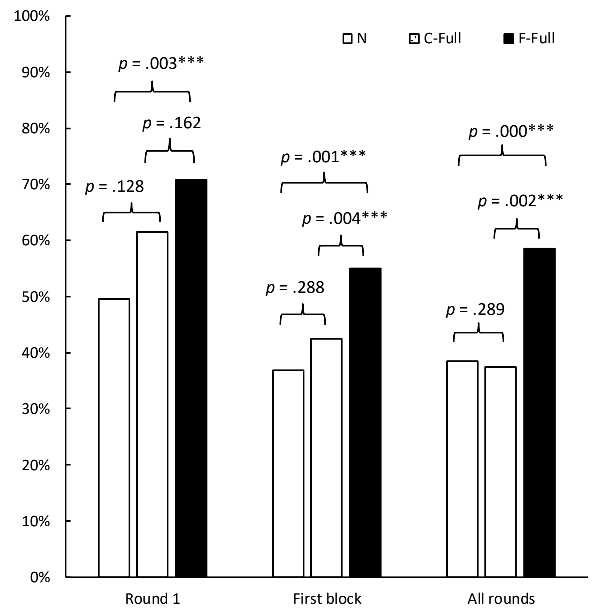
Appendix B: *Additional Tables and Figures*

Fig. B.1: *Average Cooperation Rate in the First and Second Halves of the Experiment (supplementing Fig. 2 of the paper)*

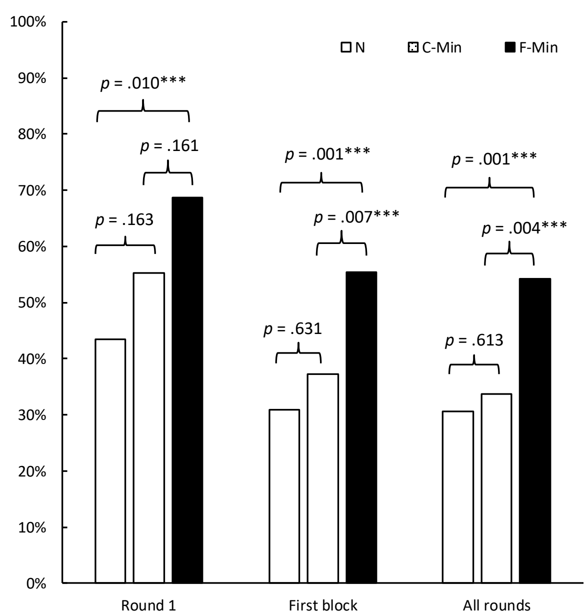


(*i*) C-Min and F-Min treatments

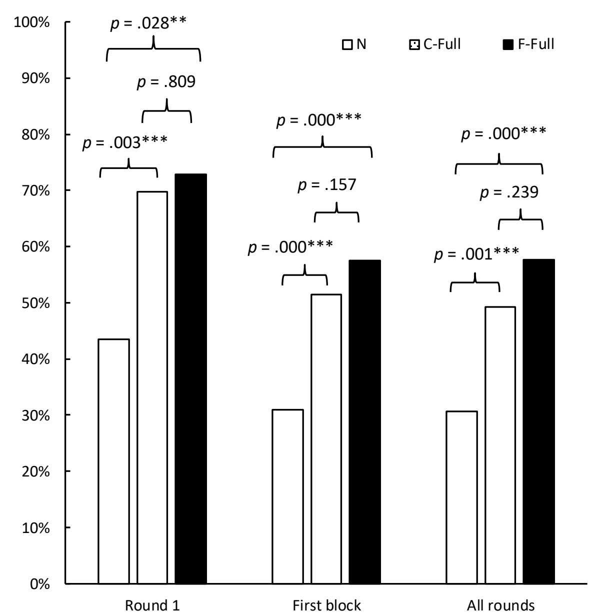


(*ii*) C-Full and F-Full treatments

(A) First Half of the Experiment (Supergames 1 to 3)



(*i*) C-Min and F-Min treatments

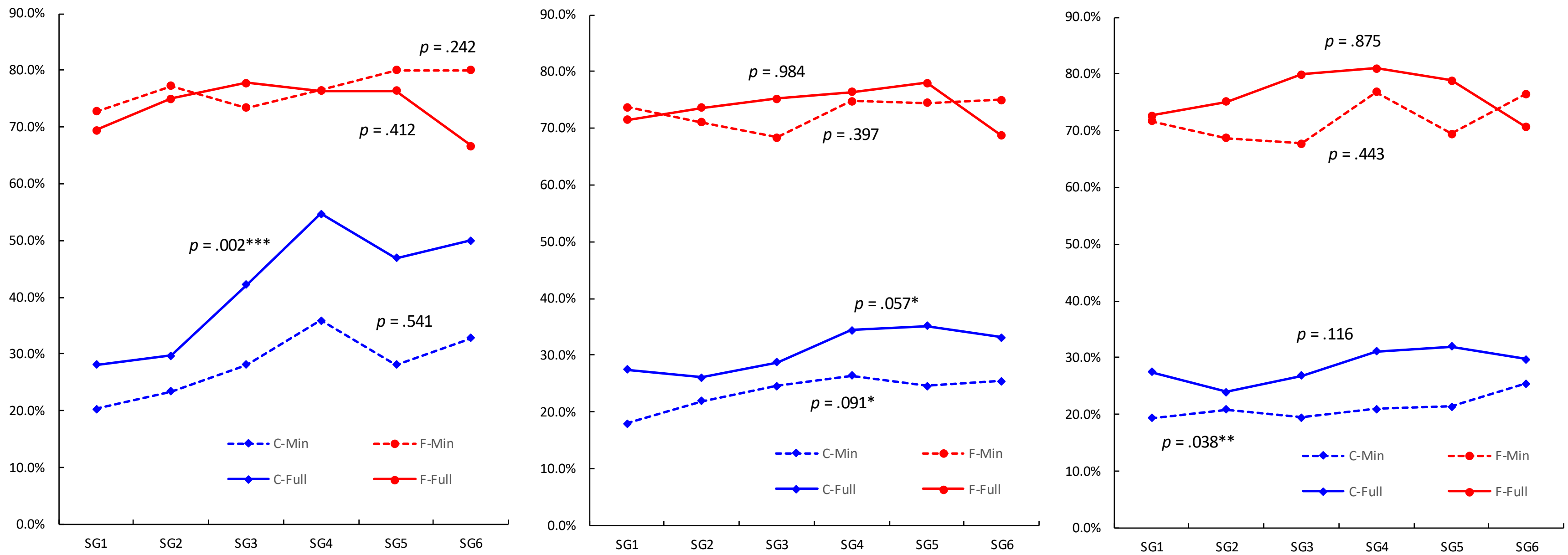


(*ii*) C-Full and F-Full treatments

(B) Second Half of the Experiment (Supergames 4 to 6)

Notes: p-values (two-sided) were calculated based on subject random effects probit regressions with robust bootstrapped standard errors (300 replications). In the regressions, the length of previous supergame was controlled as an independent variable for observations after the first supergame while having a dummy which equals 1 for the first supergame. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Fig. B.2: *Average Reporting Rates, Supergame by Supergame (supplementing Table 2 of the paper)*



(*i*) Round 1 (*ii*) First block (*iii*) All rounds

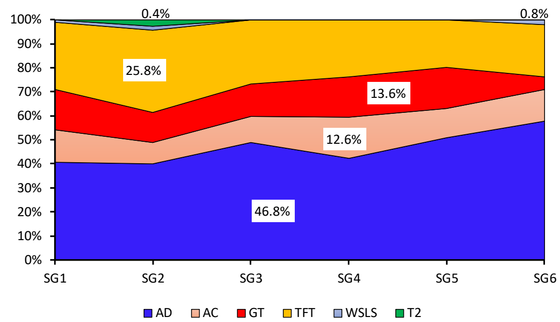
Notes: p-values (two-sided) indicate significance of the across-supergame trends in a given treatment. Each *p*-value was calculated based on a subject random effects probit regression with robust bootstrapped standard errors (300 replications), in which the dependent variable is a subject's decision to report in a given round, and the supergame number variable is an independent variable. For example, these calculation suggest that subjects learned to engage in reporting in round 1 from supergame to supergame in the C-Full treatment (panel *i*). In the regressions, the length of previous supergame was controlled as an independent variable for observations after the first supergame while having a dummy which equals 1 for the first supergame. Appendix Table B.2 reports the trends of supergame-average reporting rates by stage game outcome.

*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01.

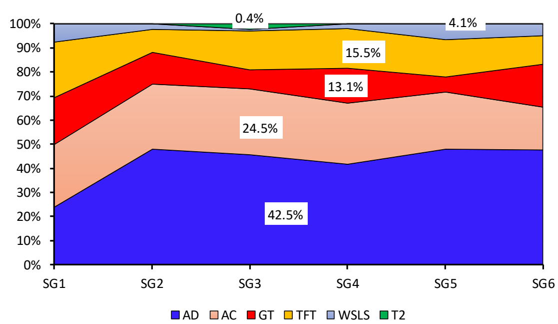
Fig. B.3: *Strategy Choices, Supergame by Supergame (supplementing Fig. 4 of the paper)*

A structural estimation of subjects' strategy choices was performed using exactly the same set of strategies included in Dal Bó and Fréchette (2011) as a preliminary analysis. The set of strategies were as follows:

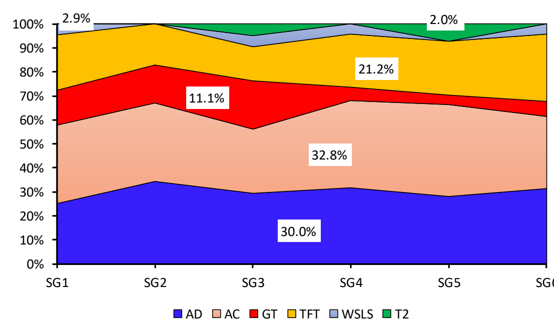
AD: an AD subject always selects defection unconditionally.
AC: an AC subject always selects cooperation unconditionally.
TFT: a TFT subject cooperates (defects) in round t if her round $t-1$ partner cooperated (defected).
GT: a GT subject cooperates in round t as long as her all matched partners so far selected cooperation.
WSLS: a WSLS subject decides whether to cooperate in round t based on the outcome in round t–1. If either both cooperated or neither cooperate, then she cooperates; otherwise she defects.
T2: a defection by the other triggers two rounds of defection, after which the strategy of a T2 player goes back to cooperation.



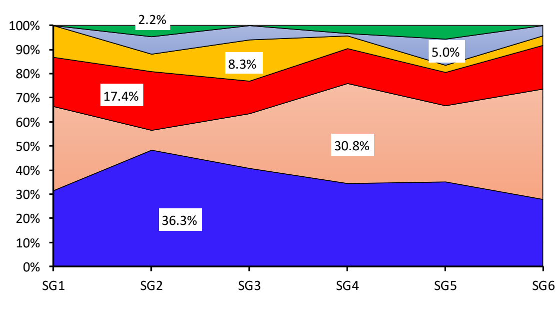
(*i*) N treatment



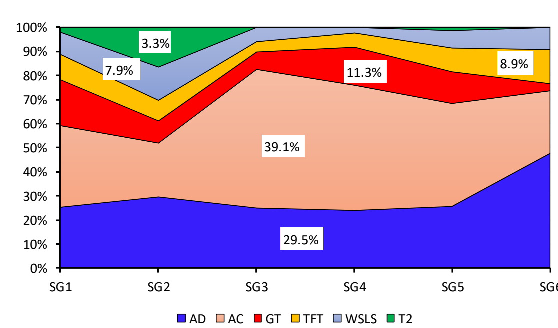
(*ii*) C-Min treatment



(*iii*) F-Min treatment



(*iv*) C-Full treatment



(*v*) F-Full treatment

Note: The percentage written in each region indicates the average percentage in which a given strategy was used by subjects across the six supergames. The detail of the estimation result can be found in Appendix Table B.3. As discussed in the paper, strategy choices were estimated while amending the set of strategies for endogenous monitoring by having a strategy that assumes a subject utilizes partners' reputations (Fig. 4 of the paper).

Table B.1: *Cooperation Trends by Treatment (supplementing Fig. 3 of the paper)*

Dependent variable: A dummy that equals 1(0) if a subject chose to cooperate (defect) in round *t*

Treatment: / Independent variables:	N treatment Round 1 (1)	N treatment First block (2)	N treatment All rounds (3)	C-Min treatment Round 1 (4)	C-Min treatment First block (5)	C-Min treatment All rounds (6)	F-Min treatment Round 1 (7)	F-Min treatment First block (8)	F-Min treatment All rounds (9)
Supergame number {= 1, 2, 3, 4, 5, 6}	-.142 (.091)	-.116*** (.043)	-.103*** (.038)	.031 (.086)	-.034 (.041)	-.049 (.040)	.030 (.112)	.090** (.046)	.117** (.048)
Rounds within supergame	---	-.103*** (.017)	-.012*** (.002)	---	-.091*** (.013)	-.011*** (.002)	---	-.077*** (.012)	-.028*** (.004)
1st supergame dummy {= 1 for the first supergame; 0, otherwise}	.007 (.401)	-.146 (.179)	-.278 (.172)	.916** (.399)	.564*** (.173)	.243 (.148)	-.290 (.459)	.488** (.249)	.424* (.242)
Previous supergame length	-.011* (.006)	-.0004 (.003)	-.0005 (.003)	-.002 (.005)	.001 (.002)	-.002 (.003)	-.028* (.017)	.003 (.008)	-.001 (.009)
Constant	.522 (.510)	.358 (.295)	-.154 (.236)	.190 (.512)	.024 (.286)	-.236 (.267)	1.472** (.743)	.084 (.275)	-.198 (.293)
# of Observations	432	4,320	9,120	384	3,840	10,080	384	3,840	7,336
Wald chi-squared	8.30	41.54	57.48	10.31	63.53	47.79	4.22	46.39	57.91
Prob > Wald chi-squared	.0402	.0000	.0000	.0161	.0000	.0000	.2390	.0000	.0000

Notes: Subject random effects probit regressions with robust bootstrapped standard errors (300 replications). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Independent variables: / Treatment:	C-Full treatment Round 1 (10)	First block (11)	All rounds (12)	F-Full treatment Round 1 (13)	First block (14)	All rounds (15)
Supergame number {= 1, 2, 3, 4, 5, 6}	.179** (.076)	.110*** (.029)	.149*** (.030)	-.021 (.083)	.022 (.026)	.022 (.024)
Rounds within supergame	---	-.068*** (.012)	-.019*** (.003)	---	-.076*** (.009)	-.003* (.001)
1st supergame dummy {= 1 for the first supergame; 0, otherwise}	.530 (.380)	.283* (.154)	.401*** (.142)	.148 (.389)	.078 (.104)	-.093 (.094)
Previous supergame length	.002 (.009)	-.001 (.005)	-.002 (.004)	.009 (.008)	.007*** (.002)	.002 (.001)
Constant	-.026 (.413)	-.188 (.188)	-.626 (.157)	1.000*** (.467)	.406** (.160)	.037 (.129)
# of Observations	384	3,840	6,480	408	4,080	10,320
Wald chi-squared	5.53	43.01	66.43	1.52	73.67	25.30
Prob > Wald chi-squared	.1368	.0000	.0000	.6775	.0000	.0000

Table B.2: *Average Reporting Rates by Stage Game Outcome, Supergame by supergame (supplementing Table 3 of the paper)*

(A) Average reporting rates in round 1

treatment		**Average**	SG1	SG2	SG3	SG4	SG5	SG6
F-Min	all data	**76.0%**	72.7%	77.3%	73.4%	76.6%	80.0%	80.0%
	cooperator-cooperator reporting	***86.3%***	*79.5%*	*77.8%*	*86.7%*	*90.6%*	*95.0%*	*100%*
	cooperator-defector reporting	***82.1%***	*94.4%*	*95.2%*	*83.3%*	*75.0%*	*62.5%*	*42.9%*
	defector-cooperator reporting	***59.0%***	*44.4%*	*66.7%*	*58.3%*	*50.0%*	*75.0%*	*71.4%*
	defector-defector reporting	***54.3%***	*50.0%*	*60.0%*	*40.0%*	*62.5%*	*50.0%*	*66.7%*
C-Min	all data	**28.1%**	20.3%	23.4%	28.1%	35.9%	28.1%	32.8%
	cooperator-cooperator reporting	***31.5%***	*15.6%*	*33.3%*	*22.7%*	*50.0%*	*37.5%*	*43.8%*
	cooperator-defector reporting	***47.9%***	*61.5%*	*46.2%*	*50.0%*	*47.1%*	*30.0%*	*58.8%*
	defector-cooperator reporting	***19.1%***	*0.0%*	*23.1%*	*21.4%*	*29.4%*	*20.0%*	*17.6%*
	defector-defector reporting	***8.3%***	*0.0%*	*0.0%*	*21.4%*	*0.0%*	*25.0%*	*7.1%*
F-Full	all data	**74.0%**	69.4%	75.0%	77.8%	76.4%	76.4%	66.7%
	cooperator-cooperator reporting	***82.0%***	*71.1%*	*80.6%*	*93.8%*	*85.7%*	*84.1%*	*71.4%*
	cooperator-defector reporting	***85.1%***	*100.0%*	*80.0%*	*88.9%*	*71.4%*	*90.9%*	*80.0%*
	defector-cooperator reporting	***44.8%***	*35.7%*	*53.3%*	*44.4%*	*50.0%*	*45.5%*	*40.0%*
	defector-defector reporting	***9.7%***	*66.7%*	*83.3%*	*50.0%*	*100.0%*	*50.0%*	*100.0%*
C-Full	all data	**41.9%**	28.1%	29.7%	42.2%	54.7%	46.9%	50.0%
	cooperator-cooperator reporting	***48.9%***	*18.8%*	*26.9%*	*61.5%*	*67.9%*	*55.9%*	*61.8%*
	cooperator-defector reporting	***77.8%***	*70.0%*	*90.9%*	*61.5%*	*81.3%*	*80.0%*	*83.3%*
	defector-cooperator reporting	***13.9%***	*40.0%*	*9.1%*	*15.4%*	*18.8%*	*0.0%*	*0.0%*
	defector-defector reporting	***11.7%***	*8.3%*	*6.3%*	*8.3%*	*0.0%*	*30.0%*	*16.7%*

(B) Average reporting rates in the first block

treatment		**Average**	SG1	SG2	SG3	SG4	SG5	SG6
F-Min	all data	**72.6%**	73.8%	71.0%	68.4%	74.8%	74.5%	75.0%
	cooperator-cooperator reporting	***86.5%***	*82.8%*	*81.5%*	*86.9%*	*92.7%*	*88.1%*	*91.8%*
	cooperator-defector reporting	***77.6%***	*82.6%*	*78.9%*	*74.5%*	*76.5%*	*72.2%*	*74.6%*
	defector-cooperator reporting	***67.3%***	*64.1%*	*70.2%*	*61.3%*	*73.5%*	*67.1%*	*67.8%*
	defector-defector reporting	***55.3%***	*58.6%*	*56.8%*	*50.5%*	*54.4%*	*54.1%*	*57.3%*
C-Min	all data	**23.5%**	18.0%	21.9%	24.5%	26.4%	24.5%	25.5%
	cooperator-cooperator reporting	***36.6%***	*15.8%*	*27.1%*	*42.6%*	*50.8%*	*45.9%*	*58.3%*
	cooperator-defector reporting	***42.4%***	*44.0%*	*44.8%*	*40.9%*	*42.5%*	*38.0%*	*44.3%*
	defector-cooperator reporting	***19.1%***	*8.0%*	*21.6%*	*17.4%*	*23.6%*	*20.9%*	*23.0%*
	defector-defector reporting	***9.4%***	*8.9%*	*9.1%*	*11.0%*	*7.4%*	*9.6%*	*10.3%*

F-Full	all data	**74.2%**	71.5%	73.6%	75.3%	76.4%	78.1%	68.8%
	cooperator-cooperator reporting	***84.8%***	*74.6%*	*82.6%*	*87.5%*	*86.8%*	*90.1%*	*82.5%*
	cooperator-defector reporting	***79.7%***	*83.3%*	*78.9%*	*77.0%*	*79.0%*	*83.2%*	*76.5%*
	defector-cooperator reporting	***52.9%***	*54.2%*	*61.0%*	*54.0%*	*58.1%*	*47.4%*	*39.2%*
	defector-defector reporting	***69.2%***	*71.9%*	*66.7%*	*68.6%*	*68.5%*	*67.6%*	*72.4%*
C-Full	all data	**30.8%**	27.5%	26.1%	28.8%	34.4%	35.2%	33.1%
	cooperator-cooperator reporting	**38.6%**	*23.8%*	*22.1%*	*42.5%*	*44.1%*	*44.4%*	*43.3%*
	cooperator-defector reporting	**59.8%**	*51.1%*	*61.6%*	*58.0%*	*66.3%*	*63.0%*	*62.0%*
	defector-cooperator reporting	**17.8%**	*23.4%*	*16.8%*	*13.2%*	*14.4%*	*21.5%*	*13.2%*
	defector-defector reporting	**17.0%**	*15.0%*	*14.4%*	*17.0%*	*19.6%*	*22.0%*	*20.7%*

(C) Average reporting rates for all rounds

treatment		**Average**	SG1	SG2	SG3	SG4	SG5	SG6
F-Min	all data	**71.7%**	71.7%	68.8%	67.7%	76.9%	69.5%	76.6%
	cooperator-cooperator reporting	***87.2%***	*84.4%*	*82.0%*	*88.5%*	*92.9%*	*86.0%*	*91.2%*
	cooperator-defector reporting	***75.6%***	*77.5%*	*74.2%*	*73.1%*	*77.1%*	*71.6%*	*77.4%*
	defector-cooperator reporting	***66.0%***	*64.1%*	*67.5%*	*56.6%*	*71.2%*	*65.1%*	*71.3%*
	defector-defector reporting	***57.5%***	*57.6%*	*59.6%*	*52.8%*	*58.7%*	*51.3%*	*59.3%*
C-Min	all data	**20.7%**	19.3%	20.8%	19.4%	21.0%	21.4%	25.5%
	cooperator-cooperator reporting	***35.5%***	*19.4%*	*30.0%*	*27.1%*	*50.7%*	*46.0%*	*58.3%*
	cooperator-defector reporting	***38.6%***	*40.7%*	*42.5%*	*41.8%*	*33.4%*	*39.3%*	*44.3%*
	defector-cooperator reporting	***17.7%***	*15.0%*	*20.1%*	*16.0%*	*22.3%*	*18.3%*	*23.0%*
	defector-defector reporting	***7.6%***	*9.3%*	*8.2%*	*8.3%*	*5.6%*	*8.6%*	*10.3%*
F-Full	all data	**77.5%**	72.7%	75.1%	79.9%	81.0%	78.9%	70.6%
	cooperator-cooperator reporting	***86.3%***	*78.5%*	*83.1%*	*87.1%*	*88.2%*	*90.7%*	*81.1%*
	cooperator-defector reporting	***79.3%***	*82.0%*	*82.2%*	*74.7%*	*81.0%*	*84.0%*	*76.5%*
	defector-cooperator reporting	***57.9%***	*55.0%*	*58.1%*	*65.2%*	*61.3%*	*54.0%*	*38.6%*
	defector-defector reporting	***73.6%***	*71.7%*	*72.5%*	*74.6%*	*78.1%*	*68.2%*	*75.1%*
C-Full	all data	**28.4%**	27.5%	23.9%	26.8%	31.1%	32.0%	29.7%
	cooperator-cooperator reporting	***39.2%***	*23.8%*	*31.2%*	*43.0%*	*46.5%*	*39.5%*	*40.5%*
	cooperator-defector reporting	***56.2%***	*51.1%*	*52.6%*	*53.6%*	*70.1%*	*54.4%*	*56.4%*
	defector-cooperator reporting	***18.0%***	*15.0%*	*17.4%*	*19.9%*	*14.3%*	*22.8%*	*18.6%*
	defector-defector reporting	***14.4%***	*9.3%*	*6.0%*	*6.1%*	*5.0%*	*9.3%*	*7.1%*

Table B.3: *Strategy Choices Regarding Cooperation, Supergame by Supergame (supplementing Fig. B.3 of the Appendix)*

This table summarizes the details of the structural estimation results reported in Fig. B.3. Please see Dal Bó and Fréchette (2011) for the estimation method. This is a preliminary analysis performed before estimating the amended version in Fig. 4.

I. N treatment

a. 1st supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.407	0.064	6.366	0.000
AC	0.136	0.089	1.522	0.064
GT	0.168	0.074	2.281	0.011
TFT	0.278	0.107	2.591	0.005
WSLS	0.011	0.088	0.125	0.450
T2	0.000	0.025	0.000	0.500
Gamma	0.588			

b. 2nd supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.399	0.065	6.111	0.000
AC	0.091	0.105	0.868	0.193
GT	0.124	0.074	1.659	0.049
TFT	0.344	0.085	4.068	0.000
WSLS	0.016	0.110	0.148	0.441
T2	0.026	0.027	0.964	0.168
Gamma	0.578			

c. 3rd supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.489	0.076	6.451	0.000
AC	0.110	0.124	0.887	0.188
GT	0.132	0.103	1.277	0.101
TFT	0.269	0.091	2.968	0.002
WSLS	0.000	0.129	0.000	0.500
T2	0.000	0.000	0.292	0.385
Gamma	0.526			

d. 4th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.424	0.049	8.731	0.000
AC	0.170	0.125	1.359	0.087
GT	0.168	0.107	1.566	0.059
TFT	0.238	0.105	2.273	0.012
WSLS	0.000	0.087	0.000	0.500
T2	0.000	0.003	0.000	0.500
Gamma	0.429			

e. 5th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.509	0.095	5.382	0.000
AC	0.121	0.183	0.662	0.254
GT	0.171	0.102	1.672	0.047
TFT	0.199	0.105	1.901	0.029
WSLS	0.000	0.132	0.000	0.500
T2	0.000	0.005	0.000	0.500
Gamma	0.523			

f. 6th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.579	0.104	5.569	0.000
AC	0.129	0.128	1.008	0.157
GT	0.053	0.059	0.890	0.187
TFT	0.218	0.085	2.564	0.005
WSLS	0.022	0.125	0.173	0.431
T2	0.000	0.028	0.000	0.500
Gamma	0.532			

II. C-Min treatment

a. 1st supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.239	0.095	2.523	0.006
AC	0.261	0.116	2.254	0.012
GT	0.193	0.132	1.467	0.071
TFT	0.230	0.092	2.500	0.006
WSLS	0.077	0.094	0.825	0.205
T2	0.000	0.051	0.000	0.500
Gamma	0.659			

b. 2nd supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.481	0.052	9.183	0.000
AC	0.269	0.109	2.464	0.007
GT	0.130	0.095	1.379	0.084
TFT	0.097	0.085	1.141	0.127
WSLS	0.023	0.078	0.298	0.383
T2	0.000	0.038	0.000	0.500
Gamma	0.512			

c. 3rd supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.455	0.081	5.621	0.000
AC	0.276	0.099	2.787	0.003
GT	0.077	0.117	0.657	0.255
TFT	0.162	0.069	2.360	0.009
WSLS	0.006	0.082	0.071	0.472
T2	0.024	0.022	1.073	0.142
Gamma	0.560			

d. 4th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.418	0.077	5.391	0.000
AC	0.252	0.091	2.754	0.003
GT	0.145	0.115	1.262	0.103
TFT	0.165	0.080	2.064	0.019
WSLS	0.021	0.083	0.254	0.400
T2	0.000	0.052	0.000	0.500
Gamma	0.657			

e. 5th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.480	0.080	5.989	0.000
AC	0.236	0.086	2.735	0.003
GT	0.063	0.079	0.795	0.213
TFT	0.155	0.070	2.213	0.013
WSLS	0.065	0.069	0.946	0.172
T2	0.000	0.058	0.000	0.500
Gamma	0.563			

f. 6th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.476	0.053	8.914	0.000
AC	0.178	0.102	1.742	0.041
GT	0.177	0.067	2.636	0.004
TFT	0.118	0.104	1.136	0.128
WSLS	0.051	0.075	0.676	0.249
T2	0.000	0.062	0.000	0.500
Gamma	0.514			

III. F-Min treatment

a. 1st supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.251	0.121	2.072	0.019
AC	0.328	0.109	3.006	0.001
GT	0.145	0.102	1.419	0.078
TFT	0.230	0.081	2.851	0.002
WSLS	0.046	0.093	0.497	0.309
T2	0.000	0.038	0.000	0.500
Gamma	0.654			

b. 2nd supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.345	0.082	4.190	0.000
AC	0.325	0.104	3.118	0.001
GT	0.160	0.118	1.359	0.087
TFT	0.170	0.112	1.516	0.065
WSLS	0.000	0.091	0.000	0.500
T2	0.000	0.028	0.000	0.500
Gamma	0.622			

c. 3rd supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.294	0.081	3.652	0.000
AC	0.266	0.107	2.478	0.007
GT	0.203	0.138	1.470	0.071
TFT	0.142	0.118	1.207	0.114
WSLS	0.046	0.076	0.605	0.273
T2	0.048	0.053	0.904	0.183
Gamma	0.509			

d. 4th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.317	0.066	4.812	0.000
AC	0.363	0.114	3.187	0.001
GT	0.058	0.121	0.475	0.317
TFT	0.221	0.051	4.299	0.000
WSLS	0.042	0.092	0.450	0.326
T2	0.000	0.093	0.000	0.500
Gamma	0.505			

e. 5th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.280	0.087	3.199	0.001
AC	0.385	0.125	3.086	0.001
GT	0.039	0.118	0.331	0.370
TFT	0.226	0.069	3.259	0.001
WSLS	0.000	0.090	0.000	0.500
T2	0.070	0.009	7.700	0.000
Gamma	0.590			

f. 6th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.315	0.087	3.626	0.000
AC	0.299	0.170	1.759	0.039
GT	0.063	0.152	0.413	0.340
TFT	0.282	0.054	5.243	0.000
WSLS	0.042	0.086	0.489	0.313
T2	0.000	0.037	0.000	0.500
Gamma	0.650			

IV. C-Full treatment

1st supergame	fraction	S.D	z	*p (two-sided)*
AD	0.315	0.161	1.952	0.025
AC	0.348	0.117	2.963	0.002
GT	0.203	0.178	1.144	0.126
TFT	0.134	0.110	1.219	0.112
WSLS	0.000	0.082	0.000	0.500
T2	0.000	0.030	0.000	0.500
Gamma	0.800			

2nd supergame	fraction	S.D	z	*p (two-sided)*
AD	0.481	0.123	3.902	0.000
AC	0.085	0.091	0.935	0.175
GT	0.242	0.073	3.311	0.000
TFT	0.071	0.101	0.709	0.239
WSLS	0.075	0.066	1.135	0.128
T2	0.046	0.060	0.761	0.223
Gamma	0.804			

3rd supergame	fraction	S.D	z	*p (two-sided)*
AD	0.409	0.182	2.241	0.013
AC	0.225	0.103	2.192	0.014
GT	0.136	0.114	1.191	0.117
TFT	0.169	0.102	1.666	0.048
WSLS	0.061	0.109	0.558	0.288
T2	0.000	0.078	0.000	0.500
Gamma	0.688			

4th supergame	fraction	S.D	z	*p (two-sided)*
AD	0.343	0.089	3.849	0.000
AC	0.417	0.086	4.847	0.000
GT	0.144	0.102	1.407	0.080
TFT	0.051	0.080	0.641	0.261
WSLS	0.011	0.088	0.127	0.449
T2	0.034	0.046	0.725	0.234
Gamma	0.568			

5th supergame	fraction	S.D	z	*p (two-sided)*
AD	0.351	0.169	2.071	0.019
AC	0.315	0.126	2.504	0.006
GT	0.138	0.139	0.994	0.160
TFT	0.032	0.096	0.332	0.370
WSLS	0.109	0.048	2.285	0.011
T2	0.056	0.105	0.528	0.299
Gamma	0.771			

6th supergame	fraction	S.D	z	*p (two-sided)*
AD	0.279	0.143	1.949	0.026
AC	0.456	0.108	4.236	0.000
GT	0.181	0.135	1.337	0.091
TFT	0.042	0.096	0.433	0.333
WSLS	0.043	0.053	0.815	0.208
T2	0.000	0.057	0.000	0.500
Gamma	0.739			

V. F-Full treatment

1st supergame	fraction	S.D	z	*p (two-sided)*
AD	0.253	0.147	1.724	0.042
AC	0.340	0.112	3.048	0.001
GT	0.190	0.186	1.026	0.152
TFT	0.103	0.133	0.770	0.221
WSLS	0.094	0.064	1.461	0.072
T2	0.020	0.108	0.183	0.427
Gamma	0.975			

2nd supergame	fraction	S.D	z	*p (two-sided)*
AD	0.296	0.182	1.624	0.052
AC	0.224	0.123	1.813	0.035
GT	0.091	0.148	0.615	0.269
TFT	0.084	0.084	1.007	0.157
WSLS	0.139	0.062	2.231	0.013
T2	0.166	0.080	2.062	0.020
Gamma	0.861			

3rd supergame	fraction	S.D	z	*p (two-sided)*
AD	0.250	0.176	1.417	0.078
AC	0.574	0.131	4.389	0.000
GT	0.073	0.185	0.393	0.347
TFT	0.045	0.076	0.591	0.277
WSLS	0.058	0.075	0.776	0.219
T2	0.000	0.093	0.000	0.500
Gamma	0.892			

4th supergame	fraction	S.D	z	*p (two-sided)*
AD	0.238	0.199	1.198	0.115
AC	0.520	0.124	4.190	0.000
GT	0.159	0.185	0.862	0.194
TFT	0.059	0.121	0.487	0.313
WSLS	0.024	0.060	0.396	0.346
T2	0.000	0.032	0.000	0.500
Gamma	0.846			

5th supergame	fraction	S.D	z	*p (two-sided)*
AD	0.255	0.216	1.177	0.120
AC	0.428	0.121	3.547	0.000
GT	0.132	0.197	0.672	0.251
TFT	0.100	0.106	0.944	0.173
WSLS	0.070	0.067	1.057	0.145
T2	0.014	0.067	0.211	0.416
Gamma	0.745			

6th supergame	fraction	S.D	z	*p (two-sided)*
AD	0.476	0.128	3.704	0.000
AC	0.259	0.101	2.557	0.005
GT	0.031	0.126	0.247	0.402
TFT	0.142	0.091	1.568	0.058
WSLS	0.091	0.071	1.288	0.099
T2	0.000	0.117	0.000	0.500
Gamma	0.905			

The following summarizes test results to compare subjects' strategy choices among the treatments based on the tables in the previous two pages.

	(*i*) % of the subjects who acted according to the AD strategy					(*ii*) % of the subjects who acted according to the AC strategy				
	N	C-Min	F-Min	C-Full	F-Full	N	C-Min	F-Min	C-Full	F-Full
N	---	.6141	.0295**	.2164	.0325**	---	.0726*	.0028***	.0095***	.0003***
C-Min	---	---	.1130	.4750	.1140	---	---	.2670	.4256	.0690*
F-Min	---	---	---	.4158	.9386	---	---	---	.7940	.4078
C-Full	---	---	---	---	.3967	---	---	---	---	.3117
F-Full	---	---	---	---	---	---	---	---	---	---

	(*iii*) % of the subjects who acted according to the GT strategy					(*iv*) % of the subjects who acted according to the TFT strategy				
	N	C-Min	F-Min	C-Full	F-Full	N	C-Min	F-Min	C-Full	F-Full
N	---	.9318	.6310	.5399	.6760	---	.1407	.4933	.0074***	.0074***
C-Min	---	---	.7073	.4987	.7484	---	---	.3745	.2084	.2372
F-Min	---	---	---	.2655	.9682	---	---	---	.0312**	.0332**
C-Full	---	---	---	---	.3086	---	---	---	---	.9010
F-Full	---	---	---	---	---	---	---	---	---	---

Notes: The numbers are *p*-values (two-sided) based on two-sample tests of proportions. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively. The percentages of those who selected the WSLS strategy or the T2 strategy were less than 10% in all treatments, whereby making treatment comparisons not meaningful.

Table B.4: *Strategy Choices Regarding Cooperation, Supergame by Supergame (supplementing Fig. 4 of the paper)*

This table summarizes the details of the structural estimation results reported in Fig. 4 of the paper. See the paper for the definition of each strategy.

I. N treatment

a. 1st supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.407	0.064	6.366	0.000
AC	0.136	0.089	1.522	0.064
GT	0.168	0.074	2.281	0.011
TFT	0.278	0.107	2.591	0.005
WSLS	0.011	0.088	0.125	0.450
T2	0.000	0.025	0.000	0.500
Gamma	0.588			

b. 2nd supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.399	0.065	6.111	0.000
AC	0.091	0.105	0.868	0.193
GT	0.124	0.074	1.659	0.049
TFT	0.344	0.085	4.068	0.000
WSLS	0.016	0.110	0.148	0.441
T2	0.026	0.027	0.964	0.168
Gamma	0.578			

c. 3rd supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.489	0.076	6.451	0.000
AC	0.110	0.124	0.887	0.188
GT	0.132	0.103	1.277	0.101
TFT	0.269	0.091	2.968	0.002
WSLS	0.000	0.129	0.000	0.500
T2	0.000	0.000	0.292	0.385
Gamma	0.526			

d. 4th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.424	0.049	8.731	0.000
AC	0.170	0.125	1.359	0.087
GT	0.168	0.107	1.566	0.059
TFT	0.238	0.105	2.273	0.012
WSLS	0.000	0.087	0.000	0.500
T2	0.000	0.003	0.000	0.500
Gamma	0.429			

e. 5th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.509	0.095	5.382	0.000
AC	0.121	0.183	0.662	0.254
GT	0.171	0.102	1.672	0.047
TFT	0.199	0.105	1.901	0.029
WSLS	0.000	0.132	0.000	0.500
T2	0.000	0.005	0.000	0.500
Gamma	0.523			

f. 6th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.579	0.104	5.569	0.000
AC	0.129	0.128	1.008	0.157
GT	0.053	0.059	0.890	0.187
TFT	0.218	0.085	2.564	0.005
WSLS	0.022	0.125	0.173	0.431
T2	0.000	0.028	0.000	0.500
Gamma	0.532			

II. C-Min treatment

a. 1st supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.230	0.106	2.168	0.015
AC	0.259	0.117	2.210	0.014
SGT	0.125	0.073	1.702	0.044
TFT	0.223	0.089	2.503	0.006
WSLS	0.083	0.093	0.889	0.187
Reputation	0.080	0.047	1.720	0.043
Gamma	0.658			

b. 2nd supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.478	0.051	9.373	0.000
AC	0.274	0.116	2.354	0.009
SGT	0.020	0.092	0.216	0.414
TFT	0.125	0.075	1.662	0.048
WSLS	0.006	0.079	0.073	0.471
Reputation	0.097	0.024	4.119	0.000
Gamma	0.513			

c. 3rd supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.418	0.062	6.774	0.000
AC	0.274	0.103	2.672	0.004
SGT	0.004	0.106	0.033	0.487
TFT	0.151	0.036	4.182	0.000
WSLS	0.007	0.082	0.084	0.466
Reputation	0.147	0.024	6.130	0.000
Gamma	0.543			

d. 4th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.362	0.068	5.362	0.000
AC	0.234	0.088	2.649	0.004
SGT	0.087	0.114	0.764	0.222
TFT	0.083	0.071	1.172	0.121
WSLS	0.023	0.067	0.340	0.367
Reputation	0.211	0.043	4.909	0.000
Gamma	0.624			

e. 5th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.448	0.067	6.716	0.000
AC	0.236	0.095	2.492	0.006
SGT	0.103	0.080	1.282	0.100
TFT	0.148	0.088	1.684	0.046
WSLS	0.065	0.071	0.919	0.179
Reputation	0.000	0.056	0.000	0.500
Gamma	0.560			

f. 6th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.448	0.048	9.338	0.000
AC	0.164	0.103	1.596	0.055
SGT	0.093	0.052	1.781	0.037
TFT	0.120	0.093	1.284	0.100
WSLS	0.055	0.064	0.847	0.199
Reputation	0.120	0.060	2.007	0.022
Gamma	0.488			

III. F-Min treatment

a. 1st supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.255	0.114	2.246	0.012
AC	0.322	0.121	2.665	0.004
SGT	0.042	0.094	0.450	0.326
TFT	0.220	0.062	3.556	0.000
WSLS	0.047	0.096	0.491	0.312
Reputation	0.113	0.040	2.850	0.002
Gamma	0.640			

b. 2nd supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.337	0.064	5.263	0.000
AC	0.259	0.107	2.415	0.008
SGT	0.023	0.097	0.234	0.408
TFT	0.119	0.039	3.080	0.001
WSLS	0.000	0.091	0.000	0.500
Reputation	0.262	0.000	>100	0.000
Gamma	0.543			

c. 3rd supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.294	0.078	3.773	0.000
AC	0.268	0.106	2.529	0.006
SGT	0.104	0.095	1.094	0.137
TFT	0.149	0.083	1.787	0.037
WSLS	0.023	0.070	0.322	0.374
Reputation	0.163	0.041	3.956	0.000
Gamma	0.493			

d. 4th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.300	0.078	3.846	0.000
AC	0.331	0.091	3.628	0.000
SGT	0.038	0.085	0.446	0.328
TFT	0.120	0.033	3.585	0.000
WSLS	0.000	0.066	0.000	0.500
Reputation	0.211	0.095	2.219	0.013
Gamma	0.460			

e. 5th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.292	0.065	4.483	0.000
AC	0.418	0.096	4.355	0.000
SGT	0.000	0.090	0.000	0.500
TFT	0.239	0.000	>100	0.000
WSLS	0.000	0.096	0.000	0.500
Reputation	0.051	0.017	2.987	0.001
Gamma	0.581			

f. 6th supergame

	fraction	S.D	z	*p (two-sided)*
AD	0.278	0.094	2.977	0.001
AC	0.235	0.137	1.717	0.043
SGT	0.096	0.081	1.183	0.118
TFT	0.256	0.074	3.479	0.000
WSLS	0.048	0.082	0.589	0.278
Reputation	0.086	0.046	1.875	0.030
Gamma	0.619			

IV. C-Full treatment				
1st supergame				
	fraction	S.D	z	*p (two-sided)*
AD	0.320	0.138	2.320	0.010
AC	0.306	0.128	2.379	0.009
SGT	0.079	0.111	0.717	0.237
TFT	0.173	0.091	1.908	0.028
WSLS	0.000	0.087	0.000	0.500
Reputation	0.122	0.049	2.470	0.007
Gamma	0.801			
2nd supergame				
	fraction	S.D	z	*p (two-sided)*
AD	0.414	0.071	5.862	0.000
AC	0.069	0.130	0.528	0.299
SGT	0.085	0.045	1.896	0.029
TFT	0.079	0.099	0.799	0.212
WSLS	0.021	0.059	0.352	0.362
Reputation	0.333	0.029	11.425	-
Gamma	0.693			
3rd supergame				
	fraction	S.D	z	*p (two-sided)*
AD	0.375	0.084	4.493	0.000
AC	0.164	0.127	1.298	0.097
SGT	0.067	0.105	0.637	0.262
TFT	0.088	0.058	1.520	0.064
WSLS	0.031	0.051	0.615	0.269
Reputation	0.274	0.037	7.436	0.000
Gamma	0.554			
4th supergame				
	fraction	S.D	z	*p (two-sided)*
AD	0.305	0.056	5.480	0.000
AC	0.249	0.105	2.366	0.009
SGT	0.053	0.080	0.663	0.254
TFT	0.027	0.047	0.571	0.284
WSLS	0.029	0.049	0.599	0.275
Reputation	0.337	0.049	6.859	0.000
Gamma	0.430			
5th supergame				
	fraction	S.D	z	*p (two-sided)*
AD	0.288	0.065	4.396	0.000
AC	0.189	0.113	1.666	0.048
SGT	0.075	0.093	0.804	0.211
TFT	0.019	0.055	0.340	0.367
WSLS	0.038	0.040	0.953	0.170
Reputation	0.392	0.038	10.198	0.000
Gamma	0.602			
6th supergame				
	fraction	S.D	z	*p (two-sided)*
AD	0.235	0.075	3.150	0.001
AC	0.178	0.106	1.678	0.047
SGT	0.101	0.069	1.472	0.071
TFT	0.012	0.058	0.203	0.420
WSLS	0.052	0.033	1.585	0.056
Reputation	0.422	0.047	9.006	0.000
Gamma	0.530			

V. F-Full treatment				
1st supergame				
	fraction	S.D	z	*p (two-sided)*
AD	0.190	0.163	1.159	0.123
AC	0.151	0.072	2.100	0.018
SGT	0.110	0.080	1.379	0.084
TFT	0.108	0.113	0.960	0.168
WSLS	0.055	0.070	0.794	0.214
Reputation	0.386	0.069	5.619	0.000
Gamma	0.778			
2nd supergame				
	fraction	S.D	z	*p (two-sided)*
AD	0.249	0.151	1.649	0.050
AC	0.086	0.112	0.764	0.222
SGT	0.053	0.127	0.416	0.339
TFT	0.047	0.070	0.671	0.251
WSLS	0.099	0.035	2.868	0.002
Reputation	0.466	0.051	9.100	-
Gamma	0.713			
3rd supergame				
	fraction	S.D	z	*p (two-sided)*
AD	0.241	0.099	2.442	0.007
AC	0.108	0.077	1.404	0.080
SGT	0.008	0.057	0.146	0.442
TFT	0.027	0.045	0.604	0.273
WSLS	0.031	0.040	0.757	0.224
Reputation	0.585	0.048	12.274	0.000
Gamma	0.691			
4th supergame				
	fraction	S.D	z	*p (two-sided)*
AD	0.210	0.104	2.029	0.021
AC	0.134	0.107	1.256	0.105
SGT	0.079	0.072	1.108	0.134
TFT	0.024	0.072	0.340	0.367
WSLS	0.000	0.028	0.000	0.500
Reputation	0.552	0.000	>100	0.000
Gamma	0.650			
5th supergame				
	fraction	S.D	z	*p (two-sided)*
AD	0.187	0.175	1.071	0.142
AC	0.165	0.087	1.896	0.029
SGT	0.095	0.116	0.821	0.206
TFT	0.055	0.118	0.461	0.322
WSLS	0.047	0.061	0.770	0.221
Reputation	0.451	0.054	8.334	0.000
Gamma	0.613			
6th supergame				
	fraction	S.D	z	*p (two-sided)*
AD	0.285	0.053	5.390	0.000
AC	0.081	0.096	0.839	0.201
SGT	0.103	0.068	1.508	0.066
TFT	0.079	0.120	0.654	0.256
WSLS	0.054	0.048	1.107	0.134
Reputation	0.399	0.056	7.092	0.000
Gamma	0.661			

The following summarizes test results to compare subjects' strategy choices among the treatments based on the tables in the previous two pages.

	(*i*) % of the subjects who acted according to the AD strategy					(*ii*) % of the subjects who acted according to the AC strategy				
	N	C-Min	F-Min	C-Full	F-Full	N	C-Min	F-Min	C-Full	F-Full
N	---	.4044	.0227**	.0849*	.0326**	---	.0839*	.0069***	.2910	.9273
C-Min	---	---	.1804	.3832	.2110	---	---	.3770	.5094	.0695*
F-Min	---	---	---	.6918	.9780	---	---	---	.1157	.0053***
C-Full	---	---	---	---	.7241	---	---	---	---	.2527
F-Full	---	---	---	---	---	---	---	---	---	---

	(*iii*) % of the subjects who acted according to the GT or SGT strategy					(*iv*) % of the subjects who acted according to the TFT strategy				
	N	C-Min	F-Min	C-Full	F-Full	N	C-Min	F-Min	C-Full	F-Full
N	---	.2260	.0606*	.2690	.2335	---	.0935*	.2588	.0028***	.0009***
C-Min	---	---	.5899	.9142	.9467	---	---	.4923	.1590	.0946*
F-Min	---	---	---	.5115	.5305	---	---	---	.0352**	.0163**
C-Full	---	---	---	---	.9649	---	---	---	---	.8270
F-Full	---	---	---	---	---	---	---	---	---	---

	(*v*) % of the subjects who acted according to the Rep strategy			
	C-Min	F-Min	C-Full	F-Full
C-Min	---	.4825	.0047***	.0000***
F-Min	---	---	.0149**	.0000***
C-Full	---	---	---	.0571*
F-Full	---	---	---	---

Notes: The numbers are *p*-values (two-sided) based on two-sample tests of proportions. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Table B.5: *Average Reporting Rate by Strategy Choice (supplementing Fig. 4 of the paper)*

C-Min treatment

Round 1

	SG1	SG2	SG3	SG4	SG5	SG6	Average
AD	0.0%	8.0%	26.1%	15.8%	26.1%	11.5%	14.6%
GT	12.5%	0.0%	0.0%	25.0%	50.0%	0.0%	14.6%
TFT	30.8%	42.9%	44.4%	16.7%	0.0%	20.0%	25.8%
AC	25.0%	33.3%	35.3%	46.7%	35.7%	63.6%	39.9%
Rep	33.3%	36.4%	16.7%	57.1%	28.6%	50.0%	37.0%

First Block

	SG1	SG2	SG3	SG4	SG5	SG6	Average
AD	9.0%	9.2%	9.6%	12.6%	11.3%	8.8%	10.1%
GT	7.6%	0.0%	10.0%	12.5%	10.0%	16.0%	9.4%
TFT	22.1%	27.1%	31.1%	3.3%	22.2%	32.0%	23.0%
AC	30.7%	38.0%	38.8%	46.0%	41.4%	54.5%	41.6%
Rep	23.3%	20.9%	26.7%	42.1%	34.3%	29.2%	29.4%

All rounds

	SG1	SG2	SG3	SG4	SG5	SG6	Average
AD	9.0%	9.0%	8.2%	10.2%	9.5%	8.8%	9.1%
GT	7.6%	0.0%	5.0%	5.9%	5.4%	16.0%	6.7%
TFT	22.1%	24.3%	23.1%	12.8%	22.2%	32.0%	22.7%
AC	30.7%	38.7%	35.4%	38.9%	45.5%	54.5%	40.6%
Rep	23.3%	22.7%	25.8%	32.7%	24.3%	29.2%	26.3%

F-Min treatment

Round 1

	SG1	SG2	SG3	SG4	SG5	SG6	Average
AD	35.0%	65.4%	41.2%	58.8%	63.6%	70.0%	55.7%
GT	60.0%	71.4%	71.4%	50.0%	0.0%	60.0%	52.1%
TFT	94.1%	87.5%	100.0%	100.0%	83.3%	85.7%	91.8%
AC	85.7%	77.8%	88.9%	83.3%	80.0%	71.4%	81.2%
Rep	75.0%	88.9%	76.9%	87.5%	100.0%	100.0%	88.1%

First Block

	SG1	SG2	SG3	SG4	SG5	SG6	Average
AD	48.1%	53.1%	41.2%	53.5%	52.7%	55.0%	50.6%
GT	66.5%	60.0%	61.4%	50.0%	0.0%	58.0%	49.3%
TFT	78.7%	88.8%	91.7%	82.9%	75.0%	90.0%	84.5%
AC	83.7%	75.6%	86.7%	88.9%	79.0%	78.6%	82.1%
Rep	71.9%	84.1%	76.9%	87.5%	95.0%	92.9%	84.7%

All rounds

	SG1	SG2	SG3	SG4	SG5	SG6	Average
AD	47.4%	51.0%	39.1%	52.9%	50.5%	55.5%	49.4%
GT	66.5%	58.1%	61.4%	50.0%	0.0%	57.0%	48.8%
TFT	77.8%	92.5%	86.7%	84.7%	75.0%	85.7%	83.7%
AC	83.1%	73.9%	86.4%	89.4%	76.0%	79.3%	81.4%
Rep	71.0%	83.8%	76.9%	89.5%	95.0%	91.4%	84.6%

C-Full treatment

Round 1

	SG1	SG2	SG3	SG4	SG5	SG6	Average
AD	25.0%	8.7%	4.8%	12.5%	18.8%	7.1%	12.8%
GT	40.0%	28.6%	33.3%	20.0%	33.3%	28.6%	30.6%
TFT	10.0%	14.3%	100.0%	100.0%	20.0%	0.0%	40.7%
AC	28.6%	50.0%	54.5%	81.8%	70.0%	75.0%	60.0%
Rep	38.5%	52.6%	58.8%	68.0%	66.7%	72.4%	59.5%

First Block

	SG1	SG2	SG3	SG4	SG5	SG6	Average
AD	9.4%	8.7%	5.7%	9.4%	20.6%	13.6%	11.2%
GT	40.0%	22.9%	10.0%	18.0%	15.0%	12.9%	19.8%
TFT	26.0%	11.4%	48.0%	53.3%	26.0%	0.0%	27.5%
AC	35.0%	60.0%	46.4%	64.5%	49.0%	58.8%	52.3%
Rep	39.2%	45.3%	41.8%	38.0%	48.8%	43.1%	42.7%

All rounds

	SG1	SG2	SG3	SG4	SG5	SG6	Average
AD	9.4%	9.8%	5.7%	9.8%	20.5%	13.3%	11.4%
GT	40.0%	18.6%	13.3%	14.7%	12.9%	9.0%	18.1%
TFT	26.0%	12.6%	44.0%	53.3%	26.0%	0.0%	27.0%
AC	35.0%	47.9%	44.1%	64.5%	47.0%	56.3%	49.1%
Rep	39.2%	42.8%	40.9%	34.1%	44.5%	41.1%	40.4%

F-Full treatment

Round 1

	SG1	SG2	SG3	SG4	SG5	SG6	Average
AD	54.5%	62.5%	46.2%	57.1%	50.0%	50.0%	53.4%
GT	76.9%	100.0%	75.0%	62.5%	55.6%	80.0%	75.0%
TFT	57.1%	100.0%	75.0%	66.7%	75.0%	66.7%	73.4%
AC	88.9%	85.7%	87.5%	70.0%	88.9%	66.7%	81.3%
Rep	77.8%	75.0%	87.5%	88.9%	93.8%	82.4%	84.2%

First Block

	SG1	SG2	SG3	SG4	SG5	SG6	Average
AD	58.6%	60.6%	50.0%	57.9%	55.0%	61.7%	57.3%
GT	62.7%	84.0%	62.5%	67.5%	58.9%	54.0%	64.9%
TFT	70.0%	75.0%	60.0%	46.7%	67.5%	58.3%	62.9%
AC	85.6%	84.3%	85.0%	77.0%	88.9%	96.7%	86.2%
Rep	78.9%	77.8%	84.5%	87.2%	91.3%	81.2%	83.5%

All rounds

	SG1	SG2	SG3	SG4	SG5	SG6	Average
AD	58.6%	62.0%	54.5%	65.2%	60.4%	61.9%	60.4%
GT	62.7%	84.5%	65.0%	67.6%	63.3%	52.7%	66.0%
TFT	70.0%	75.0%	63.8%	45.6%	68.8%	65.6%	64.8%
AC	85.6%	84.3%	92.4%	77.7%	88.3%	92.2%	86.7%
Rep	78.9%	77.9%	83.9%	86.5%	91.1%	80.8%	83.2%

Note: Calculation results for those who selected the WSLS strategy were omitted since the percentages of the WSLS subjects were less than 5% in all treatments (see Fig. 4 of the paper), whereby making comparisons not meaningful.

Table B.6: *Reporting Strategy Choices, Supergame by Supergame (supplementing Fig. 5 of the paper)*

This table summarizes the details of the structural estimation results reported in Fig. 5 of the paper. See the paper for the definition of each strategy.

I. C-Min treatment					**II. F-Min treatment**				
a. 1st supergame					a. 1st supergame				
	fraction	S.D	z	*p (two-sided)*		fraction	S.D	z	*p (two-sided)*
AN	0.549	0.059	9.221	0.000	AN	0.089	0.086	1.026	0.152
AR	0.047	0.106	0.446	0.328	AR	0.647	0.078	8.247	0.000
CR	0.017	0.039	0.448	0.327	CR	0.033	0.080	0.414	0.339
IA	0.207	0.028	7.451	0.000	IA	0.053	0.027	1.945	0.026
RR	0.050	0.097	0.515	0.303	RR	0.131	0.044	2.954	0.002
PD	0.130	0.062	2.108	0.018	PD	0.046	0.080	0.583	0.280
Gamma	0.453				Gamma	0.582			
b. 2nd supergame					b. 2nd supergame				
	fraction	S.D	z	*p (two-sided)*		fraction	S.D	z	*p (two-sided)*
AN	0.604	0.059	10.220	0.000	AN	0.144	0.101	1.419	0.078
AR	0.025	0.117	0.214	0.415	AR	0.644	0.080	8.059	0.000
CR	0.025	0.030	0.849	0.198	CR	0.000	0.073	0.000	0.500
IA	0.137	0.038	3.657	0.000	IA	0.035	0.002	16.264	0.000
RR	0.078	0.107	0.729	0.233	RR	0.109	0.039	2.780	0.003
PD	0.131	0.061	2.156	0.016	PD	0.069	0.068	1.012	0.156
Gamma	0.445				Gamma	0.479			
c. 3rd supergame					c. 3rd supergame				
	fraction	S.D	z	*p (two-sided)*		fraction	S.D	z	*p (two-sided)*
AN	0.528	0.042	12.538	0.000	AN	0.160	0.049	3.266	0.001
AR	0.063	0.113	0.555	0.290	AR	0.543	0.076	7.141	0.000
CR	0.054	0.049	1.084	0.139	CR	0.041	0.069	0.586	0.279
IA	0.093	0.040	2.311	0.010	IA	0.000	0.037	0.000	0.500
RR	0.168	0.096	1.746	0.040	RR	0.213	0.000	> 100	0.000
PD	0.095	0.085	1.116	0.132	PD	0.043	0.082	0.525	0.300
Gamma	0.417				Gamma	0.419			
d. 4th supergame					d. 4th supergame				
	fraction	S.D	z	*p (two-sided)*		fraction	S.D	z	*p (two-sided)*
AN	0.557	0.057	9.739	0.000	AN	0.116	0.041	2.843	0.002
AR	0.067	0.110	0.608	0.272	AR	0.677	0.062	10.935	0.000
CR	0.073	0.037	1.985	0.024	CR	0.024	0.075	0.325	0.373
IA	0.123	0.058	2.119	0.017	IA	0.039	0.037	1.049	0.147
RR	0.165	0.069	2.401	0.008	RR	0.103	0.031	3.350	0.000
PD	0.016	0.055	0.286	0.387	PD	0.041	0.078	0.527	0.299
Gamma	0.507				Gamma	0.385			
e. 5th supergame					e. 5th supergame				
	fraction	S.D	z	*p (two-sided)*		fraction	S.D	z	*p (two-sided)*
AN	0.569	0.057	10.020	0.000	AN	0.181	0.062	2.930	0.002
AR	0.104	0.115	0.907	0.182	AR	0.664	0.088	7.573	0.000
CR	0.038	0.046	0.826	0.204	CR	0.063	0.093	0.683	0.247
IA	0.104	0.041	2.518	0.006	IA	0.000	0.045	0.000	0.500
RR	0.158	0.113	1.406	0.080	RR	0.092	0.000	> 100	0.000
PD	0.027	0.091	0.296	0.384	PD	0.000	0.071	0.000	0.500
Gamma	0.486				Gamma	0.519			
f. 6th supergame					f. 6th supergame				
	fraction	S.D	z	*p (two-sided)*		fraction	S.D	z	*p (two-sided)*
AN	0.525	0.070	7.537	0.000	AN	0.083	0.049	1.671	0.047
AR	0.050	0.122	0.413	0.340	AR	0.723	0.045	16.148	0.000
CR	0.084	0.051	1.634	0.051	CR	0.004	0.067	0.057	0.477
IA	0.065	0.073	0.889	0.187	IA	0.000	0.016	0.000	0.500
RR	0.216	0.095	2.283	0.011	RR	0.191	0.000	> 100	0.000
PD	0.059	0.148	0.398	0.345	PD	0.000	0.077	0.000	0.500
Gamma	0.496				Gamma	0.470			

III. C-Full treatment				
	1st supergame			
	fraction	S.D	z	*p (two-sided)*
AN	0.498	0.080	6.248	0.000
AR	0.050	0.087	0.574	0.283
CR	0.007	0.049	0.147	0.442
IA	0.294	0.044	6.637	0.000
RR	0.078	0.128	0.609	0.271
PD	0.073	0.062	1.178	0.119
Gamma	0.551			

IV. F-Full treatment				
	1st supergame			
	fraction	S.D	z	*p (two-sided)*
AN	0.115	0.091	1.270	0.102
AR	0.634	0.064	9.833	0.000
CR	0.014	0.098	0.146	0.442
IA	0.000	0.055	0.000	0.500
RR	0.089	0.045	1.964	0.025
PD	0.148	0.063	2.352	0.009
Gamma	0.589			

	2nd supergame			
	fraction	S.D	z	*p (two-sided)*
AN	0.505	0.080	6.310	0.000
AR	0.089	0.118	0.752	0.226
CR	0.000	0.045	0.000	0.500
IA	0.211	0.017	12.372	0.000
RR	0.173	0.110	1.564	0.059
PD	0.023	0.096	0.237	0.406
Gamma	0.507			

	2nd supergame			
	fraction	S.D	z	*p (two-sided)*
AN	0.109	0.068	1.592	0.056
AR	0.624	0.054	11.553	0.000
CR	0.055	0.093	0.588	0.278
IA	0.024	0.073	0.331	0.370
RR	0.113	0.056	2.024	0.021
PD	0.076	0.070	1.084	0.139
Gamma	0.506			

	3rd supergame			
	fraction	S.D	z	*p (two-sided)*
AN	0.413	0.070	5.924	0.000
AR	0.109	0.100	1.093	0.137
CR	0.037	0.059	0.627	0.265
IA	0.251	0.040	6.284	0.000
RR	0.167	0.123	1.349	0.089
PD	0.023	0.110	0.207	0.418
Gamma	0.488			

	3rd supergame			
	fraction	S.D	z	*p (two-sided)*
AN	0.111	0.051	2.202	0.014
AR	0.679	0.059	11.561	0.000
CR	0.044	0.090	0.491	0.312
IA	0.017	0.056	0.296	0.384
RR	0.068	0.060	1.137	0.128
PD	0.081	0.063	1.271	0.102
Gamma	0.446			

	4th supergame			
	fraction	S.D	z	*p (two-sided)*
AN	0.396	0.096	4.137	0.000
AR	0.164	0.131	1.249	0.106
CR	0.000	0.083	0.000	0.500
IA	0.325	0.015	20.981	-
RR	0.115	0.136	0.848	0.198
PD	0.000	0.112	0.000	0.500
Gamma	0.485			

	4th supergame			
	fraction	S.D	z	*p (two-sided)*
AN	0.085	0.064	1.327	0.092
AR	0.750	0.057	13.121	0.000
CR	0.000	0.084	0.000	0.500
IA	0.000	0.033	0.000	0.500
RR	0.035	0.000	> 100	0.000
PD	0.129	0.050	2.575	0.005
Gamma	0.472			

	5th supergame			
	fraction	S.D	z	*p (two-sided)*
AN	0.400	0.137	2.924	0.002
AR	0.168	0.079	2.134	0.016
CR	0.047	0.077	0.616	0.269
IA	0.131	0.097	1.344	0.090
RR	0.185	0.090	2.050	0.020
PD	0.069	0.080	0.857	0.196
Gamma	0.575			

	5th supergame			
	fraction	S.D	z	*p (two-sided)*
AN	0.048	0.066	0.716	0.237
AR	0.662	0.039	16.964	0.000
CR	0.000	0.077	0.000	0.500
IA	0.000	0.025	0.000	0.500
RR	0.151	0.020	7.531	0.000
PD	0.139	0.082	1.710	0.044
Gamma	0.431			

	6th supergame			
	fraction	S.D	z	*p (two-sided)*
AN	0.465	0.080	5.795	0.000
AR	0.162	0.091	1.785	0.037
CR	0.032	0.075	0.434	0.332
IA	0.228	0.040	5.771	0.000
RR	0.112	0.112	1.005	0.157
PD	0.000	0.080	0.000	0.500
Gamma	0.502			

	6th supergame			
	fraction	S.D	z	*p (two-sided)*
AN	0.114	0.051	2.258	0.012
AR	0.565	0.067	8.397	0.000
CR	0.000	0.099	0.000	0.500
IA	0.022	0.006	3.869	0.000
RR	0.068	0.025	2.674	0.004
PD	0.231	0.028	8.213	0.000
Gamma	0.501			

The following summarizes test results to compare subjects' reporting strategy choices among the treatments based on the tables in the previous two pages.

	(*i*) % of the subjects who acted according to the AN strategy				(*ii*) % of the subjects who acted according to the AR strategy			
	C-Min	F-Min	C-Full	F-Full	C-Min	F-Min	C-Full	F-Full
C-Min	---	.0000***	.2045	.0000***	---	.0000***	.1935	.0000***
F-Min	---	---	.0000***	.5423	---	---	.0000***	.9796
C-Full	---	---	---	.0000***	---	---	---	.0000***
F-Full	---	---	---	---	---	---	---	---

	(*iii*) % of the subjects who acted according to the CR strategy				(*iv*) % of the subjects who acted according to the IA strategy			
	C-Min	F-Min	C-Full	F-Full	C-Min	F-Min	C-Full	F-Full
C-Min	---	.5158	.3838	.3619	---	.0123**	.0738*	.0111**
F-Min	---	---	.7772	.7215	---	---	.0000***	.5977
C-Full	---	---	---	.9338	---	---	---	.0001***
F-Full	---	---	---	---	---	---	---	---

	(*v*) % of the subjects who acted according to the RR strategy				(*vi*) % of the subjects who acted according to the PD strategy			
	C-Min	F-Min	C-Full	F-Full	C-Min	F-Min	C-Full	F-Full
C-Min	---	.9860	.9866	.3528	---	.2346	.2388	.2845
F-Min	---	---	.9710	.3167	---	---	.9431	.0200**
C-Full	---	---	---	.3503	---	---	---	.0266**
F-Full	---	---	---	---	---	---	---	---

Notes: The numbers are *p*-values (two-sided) based on two-sample tests of proportions. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Appendix C: ***Sample Instructions Used in the Experiment***

This part of the Appendix includes instructions for the C-Min and F-Full treatments as examples.

C.1. The C-Min treatment

[The following instructions were read aloud to the subjects at the onset of the experiment:]

Instructions

You are now taking part in a decision-making experiment. Depending on your decisions and the decisions of other participants, you will be able to earn money in addition to the £3 guaranteed for your participation. Please read the following instructions carefully.

During the experiment, you are not allowed to communicate with other participants. Please switch off all of your electronic devices (e.g., mobile phone). If you have a question, please raise your hand.

In the experiment, your earnings will be calculated in points. During the experiment, you can accumulate earnings through your decisions explained below. At the end of the experiment, points will be converted to UK pounds at the following rate:

150 points = 1 pound.

Your total earnings (including the £3 for participation) will be paid out to you in cash once the experiment is over. Your payment will be rounded to the nearest 10 pence (e.g., £12.30 if it is £12.33; and £12.40 if it is £12.37).

There are **6 phases** in the experiment. In each phase, all participants are randomly divided into **groups of 8 individuals**. This means that you are in a group with 7 other participants and play with them in that phase. Once a phase is over, your group composition will randomly change (you will be randomly assigned to a group with 7 participants in this room). Each phase consists of multiple periods. You will interact with your 7 group members in each period. You will not interact with participants outside your group in each period. No one knows which other participants are in their group, and no one will be informed who was in which group after the experiment. The following sections will first explain the details of each period in a phase. We will then explain the duration of each phase.

Your decisions in each phase:

In each phase, participants are randomly given an identification number. However, this is private information of participants. All periods have the same structure. At the onset of a given period, each participant is randomly matched with a member in his or her group. The pairing is random.

Neither your decisions in previous periods in this phase nor your decisions in previous phases affect the pairing process. In each period, participants will not be informed of the identification numbers of their partners in each period. In other words, you might have already interacted with the current partner, or you might not have interacted with that person so far. Since there are 8 individuals in your group, the probability that you will be matched with the same individual in 2 consecutive periods of a given phase is 1/7.

Each period consists of **two** stages. The first stage is an interaction stage. The second stage is a reporting-decision stage.

Stage 1: *Making binary choice between Y or Z*

At the onset of a given period, **you and your partner simultaneously choose Y or Z**. As both you and your partner make binary choices, there are 4 possible interaction outcomes. The earnings consequence of each scenario will be summarized as below:

(a) If you choose Y and your counterpart also chooses Y, you earn 25 points.
(b) If you choose Z and your counterpart also chooses Z, you earn 10 points.
(c) If you choose Y and your counterpart chooses Z, you earn 5 points.
(d) If you choose Z and your counterpart chooses Y, you earn 30 points.

Your partner has the same earnings formulas as yours (see also screen shots on the next page).

When you make binary choice, you will be informed of your counterpart's choice of Y or Z in the last period if that person's last interaction counterpart reported that person's choice (You will not be informed of the choice if that person's last interaction counterpart did not report it). No such information is available in period 1 as there is no previous round. We will explain the detail of the reporting process in Stage 2 below.

Once all participants in a session make decisions and click the "Submit" button, you will be informed of the outcome of the interactions in a given period. Specifically, you will be informed of (1) your partner's choice and (2) your earnings in that period.

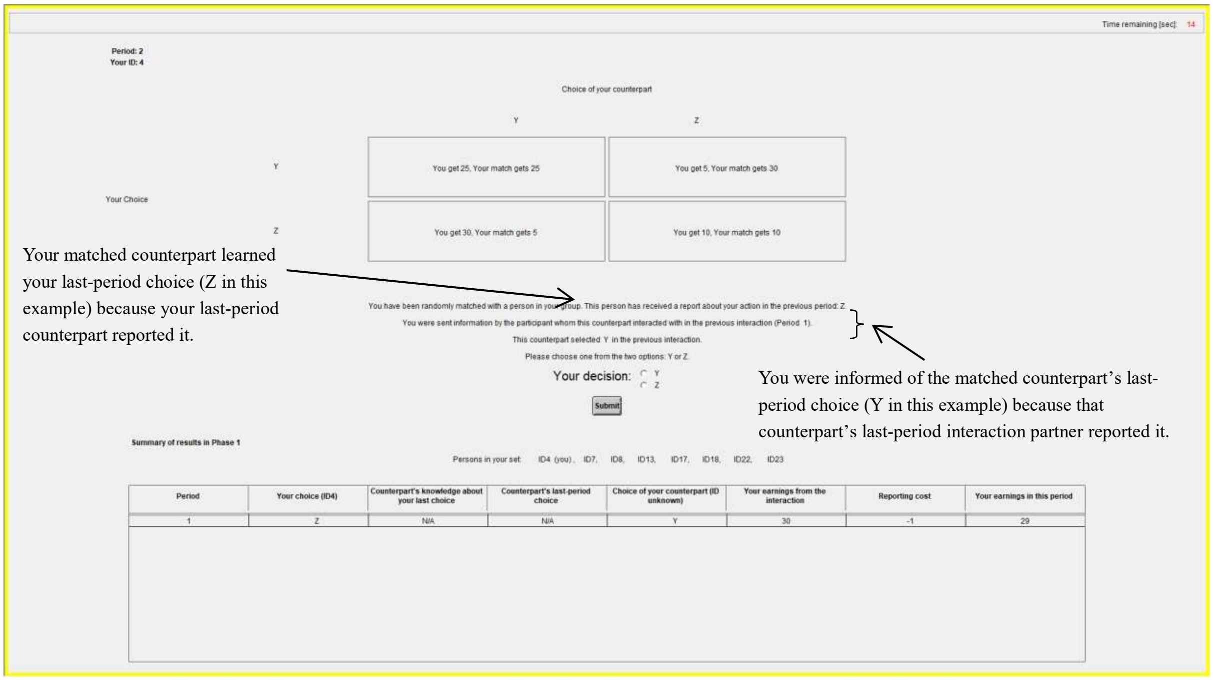
Stage 2: *Choosing whether to report your counterpart's action*

Once you review the interaction outcome in Stage 1, you will be asked to decide whether you wish to report your interaction counterpart's choice, Y or Z, to that person's next-period interaction counterpart. Reporting is costly. If you report it in a given period, one point will be deducted from your payoff at the end of that period. If you do not report it, no points will be deducted.

If you decide to report it in period t, the counterpart's next-period counterpart will make binary choice of Y or Z in period $t + 1$ knowing that the partner selected Y or Z in the interaction with you in period t.

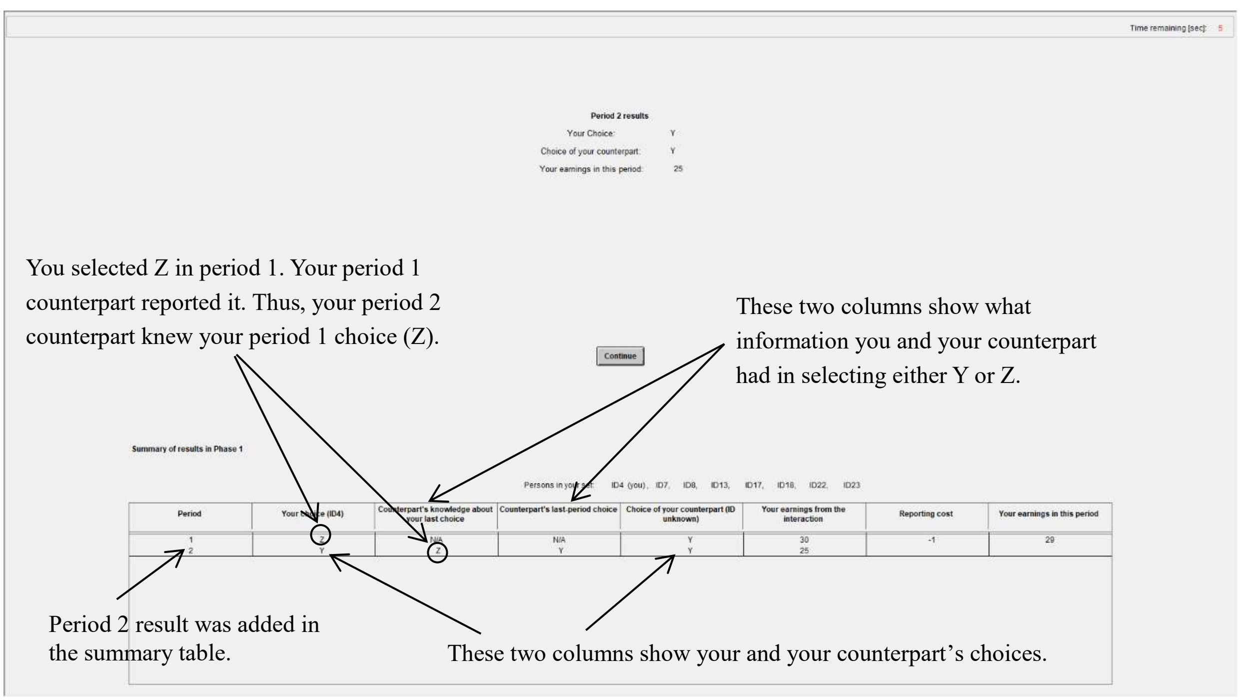
By contrast, if you decide not to report it in period t, the counterpart's next-period counterpart will not be informed of the counterpart's choice when making decision in period $t + 1$.

An Example of Computer Screen 1: (when making decisions)



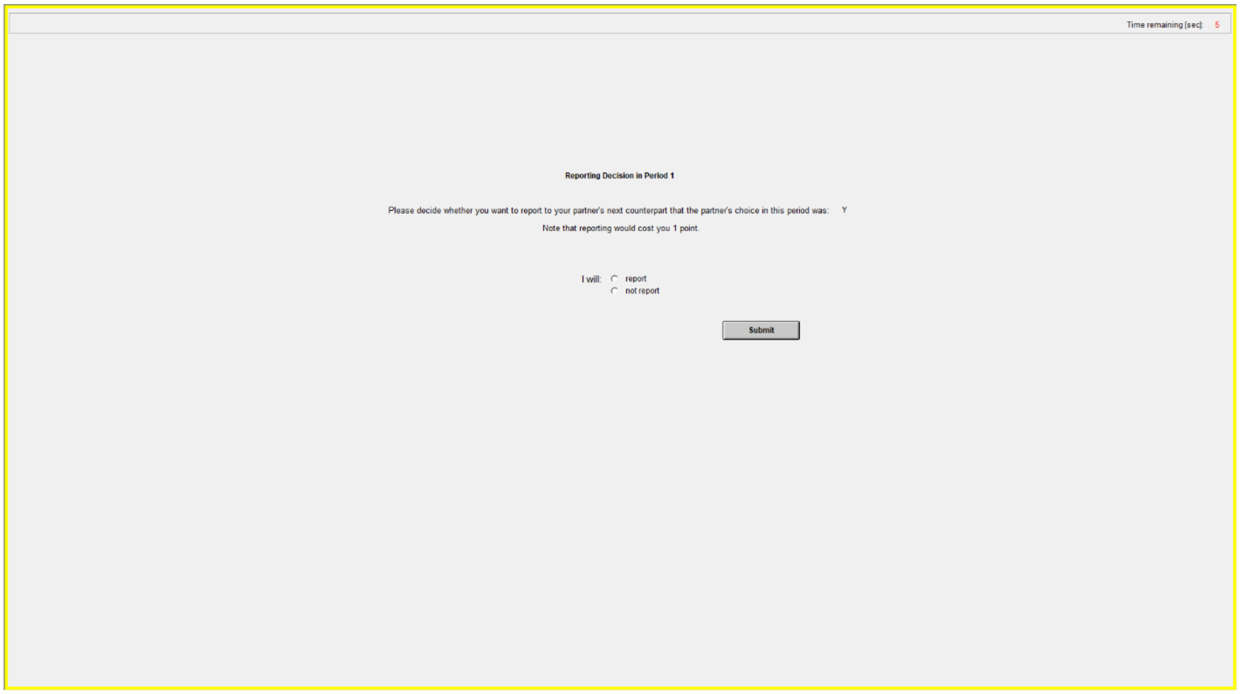
Note: Period 2. Decisions here are for illustration only.

An Example of Computer Screen 2: (the outcome screen)



Note: Period 2. Decisions here are for illustration only.

An Example of Computer Screen 3: (the reporting decision)



Note: Decisions here are for illustration only.

The Number of Periods in Each Phase:

The number of periods is not predetermined. **The probability that you will have another period in a given phase is 95%**. Specifically, at the end of each period, the computer randomly draws an integer between 1 and 100 for this session. If the drawn integer is less than or equal to 95, your interaction in the present phase continues. If the drawn integer is greater than 95, then the present phase is over.

Nevertheless, the experimental procedure is different. Operationally, you will play **blocks of 10 periods** in sequence as follows:

1. At the onset of a given phase, you will play 10 periods, assuming the random continuation rule described above. In each period, you will randomly be paired with an individual in your group and will interact with each other by selecting Y or Z. However, you will not be informed of an integer randomly drawn in each period until the end of the tenth period.

2. Once you finish the interaction in period 10, you will be informed of integers randomly drawn in all the 10 periods. For example suppose that the ten randomly drawn integers were: 1, 84, 34, 56, 32, 3, 72, 45, 14, 32 in sequence. In this situation, you will move on to the next block of 10 periods because the ten randomly drawn integers were all less than or equal to 95. In each period in the next block, you will be randomly paired with an individual in your group and will interact with each other as in the previous block; once you play the ten interactions,

you will be informed of ten realized integers at the end of the 10 periods, as in the previous block.

For another example suppose that the ten randomly drawn integers were: 4, 34, 98, 56, 32, 93, 2, 45, 14, 32 in sequence. In this situation, your total payoff in this phase is calculated by your interaction outcomes and costs of reporting in periods 1 to 3 because an integer greater than 95 was first realized at the end of period 3. Your interaction outcomes and costs for reporting from period 4 will not be counted in calculating your total payoff in that phase; and you will not move on to the next block of 10 periods in the phase. Instead you will move on to the next phase, will be randomly given a new identification number, and will be randomly assigned to a group of 8. The nature of interactions in the next phase is exactly the same as the present one.

Mathematically, since the probability that you have the next period is 95%, the expected number of periods that are used for payment in a given phase is 20 periods. However, since the decision to discontinue your interactions in each phase is randomly exerted by the computer, you may have a phase with valid periods that are much longer or shorter than 20. In case that the total number of periods across the six phases reaches 220 (it could happen although the likelihood is very small), the experiment will be finished due to operational reasons (the experiment duration becomes longer than what was announced in the recruiting message for this experiment).

Your Earnings:

At the end of the experiment, you will be paid privately based on your accumulated earnings across the six phases.

If you have any questions at this time, please raise your hand. If all questions have been answered, we will move on to the experiment.

Comprehension questions:

Please answer the following questions to check your understanding of the instructions. Please raise your hand if you have any questions.

1. How many phases do you have? ____________________

2. How many individuals are there in your group in a given phase? ____________________

3. Suppose that you choose Y and your partner chooses Z in a period of a given phase. What are your earnings in that period? What are your partner's earnings in that period?

a) Your earnings ____________________

b) Your partner's earnings ___________________

4. How much does it cost you to report your interaction partner's choice to that partner's next interaction partner?

____

5. What is the probability that your interaction continues within your group in a given period?

____

Any questions?

[Once everyone finished answering the comprehension questions and the experimenter explained the answers, the experiment began.]

C.2. The F-Full treatment

[The following instructions were read aloud to the subjects at the onset of the experiment:]

Instructions

You are now taking part in a decision-making experiment. Depending on your decisions and the decisions of other participants, you will be able to earn money in addition to the £3 guaranteed for your participation. Please read the following instructions carefully.

During the experiment, you are not allowed to communicate with other participants. Please switch off all of your electronic devices (e.g., mobile phone). If you have a question, please raise your hand.

In the experiment, your earnings will be calculated in points. During the experiment, you can accumulate earnings through your decisions as explained below. At the end of the experiment, points will be converted to UK pounds at the following rate:

150 points = 1 pound.

Your total earnings (including the £3 for participation) will be paid out to you in cash once the experiment is over. Your payment will be rounded to the nearest 10 pence (e.g., £12.30 if it is £12.33; and £12.40 if it is £12.37).

There are **6 phases** in the experiment. In each phase, all participants are randomly divided into **groups of 8 individuals**. This means that you are in a group with 7 other participants and play with them in that phase. Once a phase is over, your group composition will randomly change (you will be randomly assigned to a group with 7 participants in this room). Each phase consists of multiple periods. You will interact with the 7 group members in each period. You will not interact with participants outside your group in each period. No one knows which other participants are in their group, and no one will be informed who was in which group after the experiment. The following sections will first explain the details of each period in a phase. We will then explain the duration of each phase.

Your decisions in each phase:

In each phase, participants are randomly given an identification number. However, this is private information of participants. All periods have the same structure. At the onset of a given period, each participant is randomly matched with a member in his or her group. The pairing is random. Neither your decisions in previous periods in this phase nor your decisions in previous phases affect the pairing process. Participants will not be informed of the identification numbers of their partners in each period. In other words, you might have already interacted with the current partner, or you might not have interacted with that person so far. Since there are 8 individuals in your group, the probability that you will be matched with the same individual in 2 consecutive periods of a given phase is 1/7.

Each period consists of **two** stages. The first stage is an interaction stage. The second stage is a reporting-decision stage.

Stage 1: *Making binary choice between Y or Z*

At the onset of a given period, **you and your partner simultaneously choose Y or Z**. As both you and your partner make binary choices, there are 4 possible interaction outcomes. The earnings consequence of each scenario will be summarized as below:

(a) If you choose Y and your counterpart also chooses Y, you earn 25 points.
(b) If you choose Z and your counterpart also chooses Z, you earn 10 points.
(c) If you choose Y and your counterpart chooses Z, you earn 5 points.
(d) If you choose Z and your counterpart chooses Y, you earn 30 points.

Your partner has the same earnings formulas as yours (see also the screen shots on the next page).

When you make binary choice, you will be informed of your counterpart's choices of Y or Z in the previous periods in that given phase if that person's interaction counterparts reported that person's choices (You will not be informed of the choices that counterpart made in periods where that person's interaction counterparts did not report). You will learn the average percentage in which the counterpart selected Y in the past based on the reporting. For example, suppose that it is now in period 8. Also suppose that your counterpart's interaction partners in periods 1, 4, and 7 reported the choices your counterpart made in those periods. Also suppose that that counterpart selected Y, Z and Y in those three periods. Then you will be informed that your counterpart's frequency of selecting Y is 66.7%, along with the counterparts' choices in periods 1, 4 and 7. Such information is not available in period 1 as there is no previous round. We will explain the detail of the reporting process in Stage 2 below.

Once all participants in a session make decisions and click the "Submit" button, you will be informed of the outcome of the interactions in a given period. Specifically, you will be informed of (1) your partner's choice and (2) your earnings in that period.

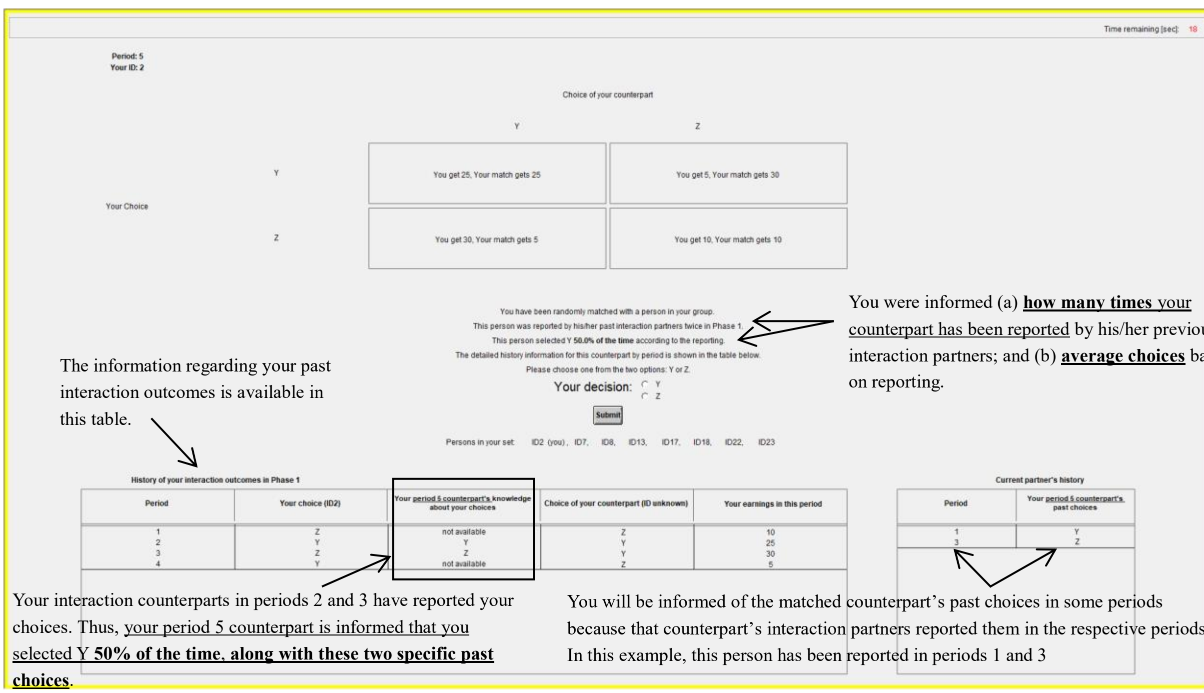
Stage 2: *Choosing whether to report your counterpart's action*

Once you review the interaction outcome in Stage 1, you will be asked to decide whether you wish to report your interaction counterpart's choice, Y or Z, to that person's future-period interaction counterparts. Reporting would not cost you.

If you decide to report it in period *t*, the counterpart's interaction counterparts in all periods after period *t* will be informed of that choice before making binary choice of Y or Z.

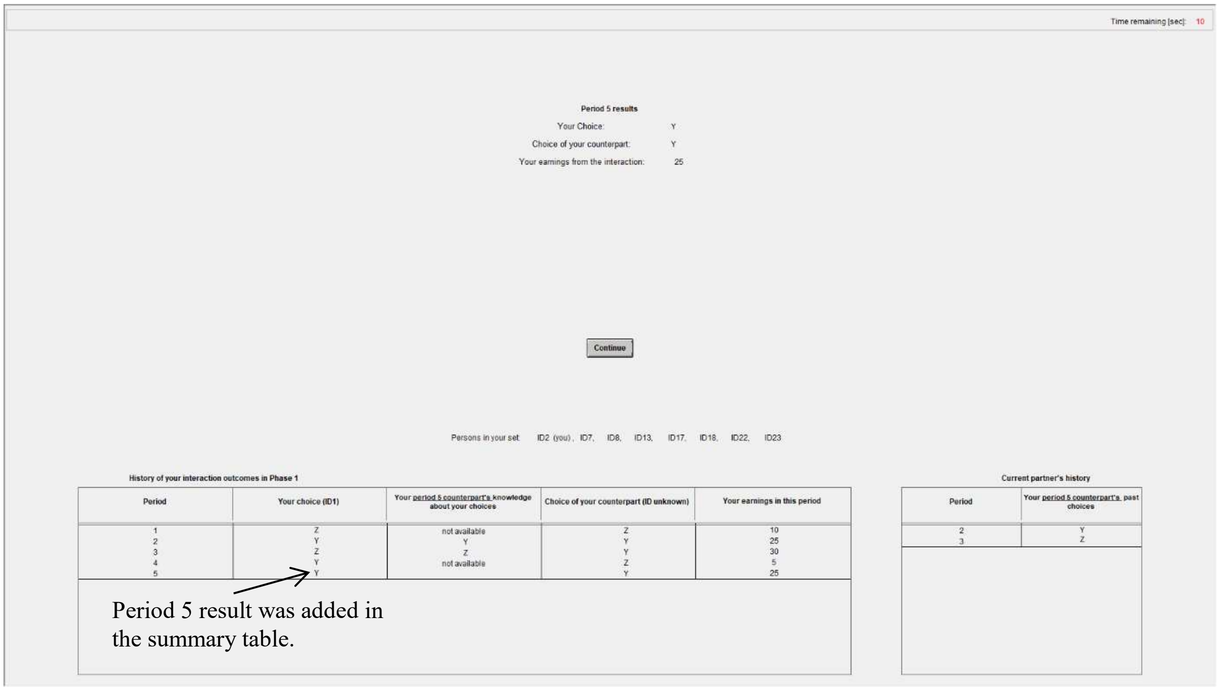
By contrast, if you decide not to report it in period *t*, the counterpart's future counterparts will not be informed of the period *t* counterpart's choice when making binary decision of Y or Z.

An Example of Computer Screen 1: (when making decisions)



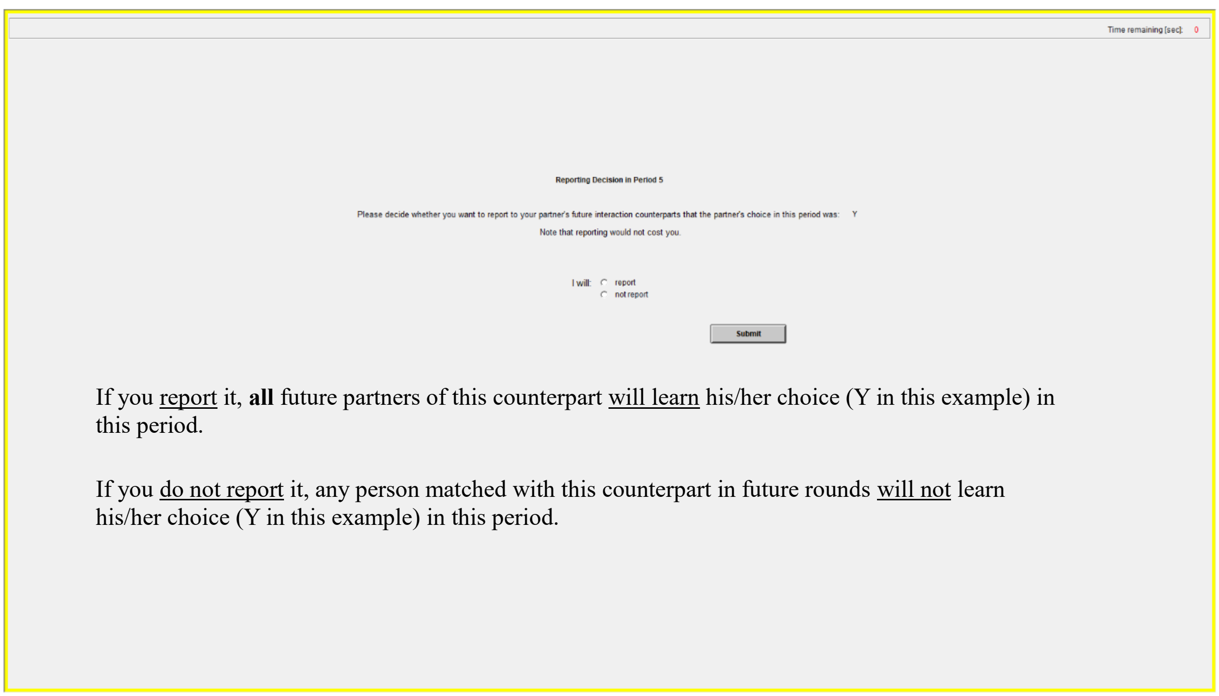
Note: Period 5. Decisions here are for illustration only.

An Example of Computer Screen 2: (the outcome screen)



Note: Period 5. Decisions here are for illustration only.

An Example of Computer Screen 3: (the reporting decision)



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b) Your partner's earnings ____________________

4. How much does it cost you to report your interaction partner's choice to that partner's future interaction partners?

____

5. What is the probability that your interaction continues within your group in a given period?

____

Any questions?

[Once everyone finished answering the comprehension questions and the experimenter explained the answers, the experiment began.]