Full Title: "Play it Again: Partner Choice, Reputation Building and Learning from Finitely-Repeated Dilemma Games"

Short Title: "Play it Again: Partner Choice & Learning"

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Abstract:

Often the fuller the reputational record people's actions generate, the greater their incentive to earn a reputation for cooperation. However, inability to "wipe clean" one's past record might trap some agents who initially underappreciate reputation's value in a cycle of bad behaviour, whereas a clean slate could have been followed by their "reforming" themselves. In a laboratory experiment, we investigate what subjects learn from playing a finitely repeated dilemma game with endogenous, symmetric partner choice. We find that with a high cooperation premium and good information, investment in cooperative reputation grows following exogenous restarts, although earlier end-game behaviours are observed.

Keywords: cooperation, reputation, voluntary contribution, public goods, sorting, endogenous grouping, group formation, experiment

JEL classification codes: C92, D74, D83, H41

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Situations in which cooperation is beneficial but individuals are subject to the temptation to free ride are ubiquitous in economic life. A key factor that facilitates cooperation in some of these situations, generically referred to as social dilemmas (Ostrom, 1998; Schulz *et al.*, 2011), is the potential to choose with whom one deals and the resulting competition for trustworthy partners. When individuals have multiple potential partners, incentives to earn a reputation for trustworthiness or cooperation may be strong.

Laboratory experiments in which subjects play finitely repeated dilemma games have confirmed that the ability to choose their partners in such interactions can be a powerful force encouraging more cooperative choices (see e.g. Page *et al*. 2005, and other papers discussed below). But these studies also raise at least two questions that remain understudied. First, in a given finitely repeated interaction among individuals in which beliefs about one another's true types and beliefs need not initially be accurate, each may only gradually learn the benefit of investing in a cooperative reputation. If her full history of past play is public knowledge, it may be too late (or too costly) for an individual who initially underestimated the value of a cooperative reputation to rise into the ranks of sought-after co-operators. Are there conditions under which the learning attained in earlier finitely-repeated interactions could lead to more investment in cooperative reputations if one's slate were to be wiped clean?

Second, in a series of interactions with known last period, as when a group of people cooperate on a time-limited project, individuals might cooperate in early periods, but in the last interaction all but those with both (a) a true taste for cooperating conditional on others doing so and (b) a strong belief that their counterparts will cooperate, will free ride. If observing such end-game free riding leads to a downward re-evaluation of beliefs regarding the proportion of cooperators in the population, would any tendency to cooperate more in later finitely repeated games, thanks to learning reputation's benefits, be offset by such end-game learning?

Whether "learning to cooperate" (learning the value of reputation) or "learning to free ride" (mastering backward induction from end-game effects) dominate may be important to know for a variety of reasons. Consider the question of whether people should be allowed to hide their past behaviours, for instance by changing their names, moving from city to city, or deleting electronic records (on which recent legal rulings on the so-called "right to be forgotten"—Streitfeld, 2014—are pertinent). At first blush, it appears that anything that allows individuals to escape the reputational consequences of their past actions in matters of trustworthiness and cooperation will weaken incentives to behave well. Studies that reference the design of online markets such as eBay have generally supported designers' belief that making establishment of fresh identities difficult has favourable effects on overall efficiency (Friedman and Resnick 2001; Kamei 2015). But the idea that clean breaks are unhelpful in every setting relies on an implicit assumption that when agents enter the world of social interaction, they immediately and accurately size up the potential costs and benefits of cooperating. Social learning may instead require experience, and in societies with strong social norms of trustworthiness and cooperation (Herrmann *et al.*, 2008), initial underestimates of the benefits of cooperating are possible. Creating junctures at which slates are wiped clean may therefore, at least in some conditions, lead to greater rather than to less cooperation, on average.

If more reputational information were always better than less, societies of immobile individuals whose reputations accumulated indefinitely among the same circle of neighbours would be better at inducing trustworthy behaviours. Yet researchers find higher levels of trust and cooperation in relatively mobile and urbanized societies than in relatively immobile ones in which small communities are the norm (Cardenas and Carpenter, 2008; Henrich *et al*., 2001). In the former, people often move from job to job or from location to location with little carry-over of reputation. What lessons do they take from past interactions regarding the value of a reputation for cooperation? And in the longer term, with what lessons from experience might parents advise their children—ones supporting a culture of trust, or ones favouring suspicion of and opportunism towards non-kin (Tabellini, 2008)?

We conduct a laboratory decision-making experiment to obtain detailed data on partner preferences, levels of cooperation, and individual and social histories, controlling and varying across treatments the possibility of reputation formation and the potential gain from cooperation. The distinctive feature of our design is that we combine endogenous partner selection, examined previously by a few studies, with the successive playing of multiple finitely repeated super-games between which there is no continuity of individual reputation, a novel feature. In contrast with the concern of studies such as Friedman and Resnick (2001), the slate-cleaning we study comes at the exogenous breaks between super-games, not at the discretion of individual agents. Like many past studies including Bolton *et al.* (2004), we find considerable evidence of subject investment in reputation and of preference for more cooperative partners, and we also replicate the finding of sharp end-game decline of cooperation as series of interactions end. However, we provide the first explicit demonstration we are aware of that when there are sufficient gains from cooperation and the informational conditions are good enough, the detrimental impact of observing end-game effects fails to dominate the tendency of individuals to invest more, not less, in cooperative reputation in later finitely repeated games with endogenous matching.[1] Our data thus suggest that

[1] A more qualified statement would be that the earlier arrival of end-game effects fails to outweigh the strengthening of cooperation in the sequence of four super-games observed by us. We do not attempt to project outcomes beyond this "medium-run" type horizon. See below.

the beneficial effects of competition for partners can survive in a world in which people learn about others' types and beliefs as they transition from job to job, place to place, or among different spheres of interaction.

Of course, the benefits of clean breaks may be specific to the context. We make no claim that our findings are applicable when the slate-wiping is at the discretion of the actor, who may choose to hide her identity for strictly opportunistic reasons. Our findings may thus have little application to the design of e-commerce platforms, but more relevance to situations in which new identity formation coincides with transitions not chosen by the actor, or at least not chosen with reputation cleansing as a major motive—for instance career changes which occur due to exogenous economic shocks, or relocation to a new region due to the needs of a spouse or parent. Our conclusions may hint at why modern societies in which people are sometimes forced to "reinvent themselves" don't necessarily cultivate individuals more inclined towards opportunism and less able to cooperate than did traditional ones marked by lower mobility.

The remainder of our paper proceeds as follows. Section 1 provides a discussion of past literature which sets the stage for our study. In Section 2, we spell out our experimental design and discuss theoretical predictions. Section 3 presents our results and analysis. Section 4 concludes the paper.

1. Literature

Consequences of current decisions that operate through reputation are central to inducing trustworthiness in a wide variety of transactions, from the selling of non-prescription drugs and toothpaste (Erdem and Swait, 1998) to the provision of services like plumbing (McDevitt, 2011) and management (Fama, 1980). In all of these situations, at least one party to a transaction is unable to instantaneously ascertain quality or quantity at the moment of payment and counts on the supplier's incentive to maintain reputation as assurance of aligned incentives (MacLeod, 2007). Agents entering into a partnership or engaging in other forms of collective action face the same problem albeit symmetrically: investments are made simultaneously without certainty that others are pulling their weight. If informational conditions permit and group membership is sufficiently easy to rearrange, they too can rely on transmission of *ex post* observation (reputation) as a way to deter opportunism, for instance by threat of excluding unreliable group members.

With potentially infinitely lived entities such as firms, or in indefinitely ongoing interactions with sufficiently low termination probabilities and patient agents, cooperation can be an equilibrium with standard agents. Some economic and social situations are better captured, however, by models of finite repetition. Examples include a team working some months on a one-time project, or a customer navigating a relationship with a service provider (perhaps a painter, or a baby-sitter) despite some known end-point (the customer is preparing his house for sale, the baby-sitter will soon leave for college). Consider, for example, individuals who must restart a career in a new field, as happened for some following the recent "great recession." Cooperation dilemmas in situations of finite repetition hold special theoretical interest because non-standard or social preferences and beliefs regarding their distribution may be requirements of cooperation, because participants can invest in reputation over time, and because problems of backward unravelling threaten to undermine the potential for cooperation among selfish agents with common knowledge. Preferences that might support cooperation include altruism, reciprocity, inequality aversion, and warm glow.

The cooperation problem most widely used in experimental studies has been the voluntary contribution mechanism (VCM, also called public goods game). In each iteration or period, group members allocate tokens between a public and private accounts (Ledyard, 1995). In this environment, “conditional co-operators” (Fischbacher *et al*., 2001; Fischbacher and Gächter, 2010) can play a similar role in facilitating cooperation as do tit-for-tat players in the prisoners’ dilemma interactions studied by Kreps *et al*. (1982). A conditional co-operator is an agent who prefers contributing as much to the public good as do his counterparts,[2] and a rational selfish agent playing a finitely repeated VCM with such an individual may find it payoff maximizing to contribute the maximum amount in all periods but the last, then contribute zero.

One source of evidence for conditional cooperation is VCM studies in which experimenters assign subjects to groups based on their initially observed contribution propensities. Whereas in finitely repeated VCM experiments without sorting cooperation decays over time, contributions by high contributors assigned to interact together are relatively sustained (Gunnthorsdottir *et al*., 2007; Gächter and Thöni, 2005). This suggests that high contributors tend to reduce their contributions in the unsorted experiments not because they are learning to play the game, in a general sense, but because they find that their contributions are not adequately reciprocated.

Groups of similarly behaving subjects can also emerge in the lab through self-sorting. Subjects in Page *et al*. (2005)’s endogenous regrouping treatment first played three periods of a standard VCM game in randomly formed partner groups of four, then were shown the average contribution thus far by every participant in their session of sixteen and could assign preference rankings based on which new groups were formed. As in Gunnthorsdottir *et al*. (2007), but in this

[2] The preference function of the conditional co-operator may be thought of as causing the material payoffs of a prisoners’ dilemma to be associated with “assurance game” (Sen, 1967) or stag hunt game payoffs in utility (or psychological) terms. Alternatively, in our appendix we note that conditionally cooperative behaviours can also be rationalised by inequity (or inequality)-averse preferences along the lines of Fehr and Schmidt (1999). While Fischbacher and Gächter (2010) find that the average conditional co-operator less-than-fully matches her counterparts’ contributions, we simplify discussion in the remainder of our paper by ignoring variation in the degree of completeness of reciprocity.

case through endogenous group formation, contributors of similar amounts interacted together and the typical decay of contributions was absent.

Differences of design yield differences of outcome in the lab. Groups may be of fixed size (four in Page *et al*. [2005], two in Coricelli *et al.* [2004], Bayer [2011] and the present paper) or of variable size (Ehrhart and Keser [1999], Ahn *et al*. [2008, 2009], Charness and Yang [2010]). Both sides of each match can have a say about playing together (Page *et al*. [2005], Bayer [2011], this paper, some treatments in Coricelli *et al*. [2004] and Ahn *et al*. [2008, 2009]) or individuals can join others' groups at will (Ehrhart and Keser [1999], some treatments in Ahn *et al*. [2008, 2009]). Details of the matching process also differ—for instance, a second price auction is used in Coricelli *et al*. (2004), a Gale-Shapley stable marriage mechanism in Bayer, majority or plurality voting in Ahn *et al*. (2008, 2009) and Charness and Yang (2010), and a simple ranking and group assignment mechanism shared by Page *et al*. (2005) and the present paper.[3]

Our focus on reputation and partner choice make the nature of the information subjects receive critical. While subjects in all of the above experiments learn of at least the most recent decisions of prospective partners, the persistence of reputation differs, from learning of contributions in the most recent periods only, in Ahn *et al*. (2008, 2009), Bayer (2011), and Charness and Yang (2010), to seeing others' entire past average contributions, in Page *et al*. (2005) and Coricelli *et al*. (2004).

The evidence discussed so far suggests that choice of interaction partners can promote cooperation in finitely repeated social dilemmas because there are cooperatively-inclined individuals thus enabled to sort and play with one another and because selfish but sophisticated

[3] Related papers include Gürerk *et al.* (2006) and Lazear *et al*. (2012) and Aimone *et al*. (2013).

types mimic co-operators. However, extant studies leave open the twin questions posed in our introduction: (i) might some individuals invest more rather than less in cooperation after their slates are cleaned, due to past learning, and (ii) how is the potentially positive impact of learning altered by observing end-game choices? An initial return of cooperation to earlier levels has been found in voluntary contribution experiments without partner choice (Andreoni, 1988), but type-sorting and investment in reputation play a central role in explaining the higher cooperation levels in the environments we're discussing, and the impact of observed end-game behaviours has not been studied in them.[4] In a world without partner choice, being able to wipe one's slate clean or hide one's identity has been proven to be harmful to communities if such acts are cost-free and are made endogenously by agents. For example, Friedman and Resnick (2001) theoretically show that in an infinitely-repeated environment where a fraction of players constantly enter and at the same time exit, an option to change one's identity at no cost reduces efficiency, and mutual cooperation cannot hold as an equilibrium. Wibral (forthcoming) studies the impact of individuals' identity changes using finitely-repeated trust games with a rating system, where new players enter interaction units and the group size becomes large as the experiment proceeds. His experiment finds that being able to erase one's history via identity change significantly decreases both trust and trustworthiness, compared to the situation in which this option is unavailable. Kamei (2015) shows that even if both entry and exit are not allowed and players are assigned unique identification numbers with which they can send a credible signal and build reputation, having the option to hide these identifiers at no cost is harmful for their communities, as some players decide to hide their identifiers. His experiments further indicate that fixed identity or cost for hiding may be necessary to prevent such opportunistic behaviour. These negative effects of endogenously

[4] Charness and Yang (2010)'s paper provides a partial exception in that their subjects play two sequential finitely-repeated games of 15 periods each without reputational carry-over. However, analysing the effects of the restart is not a focus of their paper, and they apply shorter memory within games. We return to their results in footnote 20, below.

changing identities or hiding them, however, may not carry over to our context because we consider only exogenous restarts for reputation.

Andreoni and Miller (1993) study much the same race between ‘learning to invest in cooperative reputation’ and ‘learning backward unravelling’ as addressed by us, but in prisoners’ dilemma games with exogenously assigned partners. In their core treatment (see also Selten and Stoecker, 1986; Hauk and Nagel, 2001; and for a meta-analysis, Embrey et al., 2014), each period of a given ten-period game is played with the same randomly chosen partner, which permits each member of the pair to build a reputation as a cooperator even if his intention is to defect before his counterpart does. The subsequent ten-period game is played with a new randomly-assigned partner, so reputation cannot carry over. Andreoni and Miller (1993) find that in their setting investment in reputation-building grows across super-games. While end-game defections initially become earlier on average, Andreoni and Miller (1993) find that they settle into a relatively unchanging pattern after the first few finitely-repeated games. It is unclear *a priori* how the play of multiple finitely-repeated dilemma games with partner choice will compare to play by subjects who cannot select their partners. On the one hand, competition for the most cooperative partners might lead to still greater reputation-building efforts; on the other hand, the possibility of switching to other partners mid-way through a super-game might invite earlier defection. The greater menu of options in the VCM than the PD might also affect play. Thus, while Andreoni and Miller (1993) provide a clear reference case for play of multiple finitely-repeated social dilemma games without partner choice, investigating the parallel problem in the context of partner choice—a setting known in its own right to enhance cooperation—is worthy of new research.

2. Experimental Design and Predictions

2.1 Experimental Design

In our experiment, subjects belonging to sets of ten anonymous and randomly selected participants who remain together throughout their session, play four distinct 10-period sequences of VCM stage games, called phases, with no carry-over of reputation from one to the next. The stage game group size is two, with potentially new partners assigned each period based on submission of rankings and pairing by mutual preference. Subject *i*'s earnings in period *t* are given by:

$$E - C_{it} + mpcr \cdot \sum_{j=1}^{2} C_{jt}, \qquad (1)$$

where *E* is the uniform per-period endowment, which we set at 10 points, C_{it} is the contribution of subject *i* in period *t*, and *mpcr*, the marginal per capita return from allocations to a pair's joint account, can also be represented as *F*/*n*, with *F* being the factor by which returns under full cooperation exceed those under full free-riding and *n* being the group size, here 2. We study three low gain treatments (*LG*) in which *F* = 1.3 and *mpcr* = 0.65, and three high gain treatments (*HG*) in which *F* = 1.7 and *mpcr* = 0.85. At the end of each period, a subject is informed of her partner's contribution decision and her own earnings.[5] Under each *F* and *mpcr*, we vary the degree to which reputation stays with a subject during a phase, as explained presently.

2.1.1 Ranking procedure and information conditions

Each period, subjects are given the opportunity to choose their partners through ranking. We adopt a simple procedure in which each subject is offered a subset of five of the ten set members as prospective partners each period thanks to a fresh random division of the set into two

[5] One point exchanged for $0.045 (4.5 cents) at the end of the experiment. Hence, universal non-contribution for all 40 periods would yield earnings of 40*10*$0.045 = $18, universal full contributions earnings of $23.40 (in *LG* treatments) or $30.60 (in *HG* treatments) plus $5 show-up fee. In the event, overall earnings averaged $22.87 (or with show-up fee $27.87), slightly past the mid-way point between average expected earnings with no and those with full cooperation.

sub-sets of five.[6] Each subject first sees the Subject IDs (fixed for the 10 period phase) of her 5 potential partners, and in four of the treatments, also information on their allocations to their joint accounts in past periods of the phase, then gives each a rank of 1, 2, …, or 5, with 1 indicating most and 5 least preferred counterpart. As explained to the subjects, the computer searches among possible pairs for the match-up with the lowest sum of ranks, breaking ties randomly, then searches for a next pairing of the remaining 8 subjects, etc., assigning each set member to one of 5 pairs.[7]

We vary across treatments the reputational information subjects have access to when ranking prospective partners and upon partner assignment. In high information (*HI*) treatments, subjects at each ranking stage see each of their prospective counterparts' average allocation in all periods of the phase thus far. In medium information (*MI*) treatments, they see the average allocation in past periods of which each is randomly selected with probability 0.5, and are also shown how many past periods entered the averaging calculation. In low information (*LI*) treatments, they are shown no information on past allocations, but as in other treatments subject IDs (fixed within a phase) are shown, so recollection of own recent interactions can inform ranking. The crossing of the two gain levels (*LG* and *HG*) with the three information conditions (*LI*, *MI* and *HI*) yields six treatments, which we refer to as the *LI-LG* treatment, the *MI-HG* treatment, etc., as displayed in Table 1.

[6] These divisions into sub-sets were adopted partly to speed ranking, since complete rankings could be decided on more quickly for five than for nine others. They also have the benefit of raising reputation's potential importance by making establishing a partnership with a single counterpart largely infeasible.

[7] The algorithm translating ranks into partner assignments is identical to that in Page *et al*. (2005). The simple mutual ranking procedure facilitates subject's easy recognition of the desirability of playing with higher-contributing partners. Mutual ranking solves the problem of "fleeing from free riders" reported by Ehrhart and Keser (1999), while our mechanism is easier to explain to subjects than the Gale-Shapley algorithm used by Bayer (2011), is arguably easier for subjects to understand than the auction device used by Coricelli *et al*. (2004), and is more symmetric and requires fewer steps than alternatives used by, for instance, Ahn *et al*. (2008) and Charness and Yang (2010). We simplify our design relative to Page *et al*. (2005)'s in two minor respects: we eliminate choice over how many to give ranks to, and costliness of ranking. These elements appear to have had little impact in their experiment, although models assuming uniformly selfish rational type imply that subjects would never elect to submit ranks if doing so is costly.

2.2 Predictions

If all participants maximizing own payoffs and have common knowledge of this, the prediction is the same for all six treatments: universal non-contribution to the joint accounts. With no reason to favour one prospective partner over another, ranks will be assigned randomly, and presence of ranking and pair assignment procedures will have no impact on play.

However, decades of experimental studies, including both Andreoni and Miller (1993) and past partner choice studies, indicate that the assumptions just applied are unlikely to yield good predictions. These studies suggest behaviours more consistent with models like Kreps *et al*. (1982) in which the decision-makers attach positive probability to the presence of some actors who prefer cooperative actions. While attempts at cooperation are observed even with random partner assignment, the potential to switch partners gives any individual wishing to encourage cooperation from her counterpart an additional source of leverage, since she can now implicitly threaten not simply to reduce her contributions if the partner is not sufficiently reciprocating, but to exit the relationship and to enter into one with a better partner. The possibility provides reason to continue to make large contributions so as to increase or maintain one's attractiveness in the market for partnerships.

In our Appendix, we provide a partial equilibrium model which shows that if all agents belong to one of two types—selfish payoff-maximisers, and conditional cooperators—then in any given phase (finitely-repeated super-game), there is a finite number of periods, k, over which the selfish players find it rational to contribute to their joint accounts at the same level as a conditional cooperator, after which they switch to full free riding. For the *HI* condition, we show k to be increasing in the proportion p of conditional cooperators and in the *mpcr*. For our finitely repeated super-games of 10 periods, it is self-evident that for any $0 < p < 1$ and any *mpcr* < 1, $k \leq 9$. If all players have identical beliefs and degrees of strategic sophistication, then all payoff-maximisers interacting at given *mpcr* and information condition will adopt identical strategies, and their behaviours and those of the conditional cooperators will be indistinguishable up to period k, providing no basis for choosing one partner over another.[8] In practice, however, individuals' contributions are likely to differ from one another, due *inter alia* to different beliefs about p and different levels of strategic sophistication. This differentiation will lead to meaningful partner preferences and to a significant impact of the partner assignment mechanism, including the tendency for individuals having closely similar contribution profiles to be paired.[9]

Both a selfishly rational individual and a conditional cooperator, who also gets positive utility from own earnings, will prefer to interact with more cooperative partners. We thus expect to see rankings consistent with a preference for more cooperative partners, and we expect the workings of our ranking mechanism to cause higher contributors to be matched with one another.[10] Since subjects in the *MI* and *HI* treatments see a sample of others' average contributions thus far in the ranking stage, beginning with a phase's second period, and since those subjects are also shown in the contribution stages the past average contribution of the partner who gets assigned to them, they can infer whether they are lately playing with relatively high contributors, relatively low ones,

[8] In period $k + 1$, the payoff-maximisers would at last distinguish themselves from the conditional cooperators, after which conditional cooperators will be able to favour one another as partners in period $k + 2$ and beyond (assuming additional periods remain, i.e. assuming $k \leq 8$).

[9] The basic version of our model considers a selfish player who calculates the optimal number of periods to mimic cooperation under the assumption that only actual conditional cooperators reciprocate their contributions. The alternative assumption that all rational selfish players will mimic cooperation for so long as this is profitable would predict a somewhat higher k. Probably neither approach is fully realistic, because individuals differ in their degrees of strategic sophistication, causing the degree to which cooperation is mimicked to vary not only with own but also with beliefs regarding others' degrees of sophistication. Our model's qualitative conclusions should hold for a range of such adjustments.

[10] To be sure, our ranking and grouping procedure can give rise to strategic issues, because once subjects have differentiated themselves with respect to contributions, an individual who is only the second or third highest contributor in his sub-set of five has reason not to give his most preferred rank to the highest contributor in the complementary sub-set. In Section 3, we nonetheless report both a highly significant correlation between rank assignment and past average contribution of the subject being ranked, and we find that the mechanism is quite effective in pairing partners of similar contribution.

or ones in between. Most subjects are accordingly likely to infer, by the end of the first phase, that contributing more increases one's chance of interacting with a high-contributing partner. If the expected impact of the extra point one contributes to the joint account on the contribution of the future partners whose identity is influenced by this decision is high enough, it is profitable to contribute more, despite an *mpcr* < 1. Simplifying by considering only that return from this period's investment in reputation which is realised in the period immediately following, we see that to compensate for each extra point contributed, a subject would need to anticipate an extra contribution ∂C_j by the next partner per additional point of own contribution such that $mpcr \cdot \partial C_j \geq (1 - mpcr)$. For *mpcr* = 0.85 (*HG* treatments), the requirement is $\partial C_{j,t+1}/\partial C_{i,t} \geq (1 - .85)/.85 \approx .176$, while for *mpcr* = 0.65 (*LG* treatments), it is $\partial C_{j,t+1}/\partial C_{i,t} \geq (1 - .65)/.65 \approx .538$. The much higher hurdle for the *LG* treatments provides intuition for the prediction above that contributions are less sustainable with the lower *mpcr*.

The Appendix provides a more complete accounting, also considering benefits from potentially higher contributions by partners in periods beyond $t + 1$. Using this more comprehensive approach, we confirm that the number of periods of cooperation k that optimises earnings in *HG* treatments (*mpcr* 0.85) is higher than that in *LG* treatments (*mpcr* 0.65) assuming the same known proportion p of conditional cooperators. If p is independent of *mpcr*, this leads to:

PREDICTION 1. *Contributions will be more sustained in the HI-HG than in the HI-LG treatment.*

The predictions in our Appendix are most directly applicable to our high information treatments. What of the other information conditions? Consider first those on the opposite end of the information spectrum. In all of our treatments, subjects maintain fixed IDs during a phase, but in the *LI* treatments only their counterpart of a given period learns their action, and there is no way for reputations to spread within the set. A subject might still attempt to build a within-phase reputation for cooperativeness with specific individuals, as do counterparts in Andreoni and Miller (1993), who found considerable, indeed growing, cooperation during the early periods of their finitely-repeated games. Such reputation building would be complicated for our subjects by the random selection of the potential partner sub-set each period, which makes a single pairing unlikely to be sustainable without interruptions. For this reason, we may see at least some subjects attempting to build cooperative relationships with more than one other in a given phase. And despite the difficulty of maintaining ongoing relationships in all treatments, it seems likely that given pairs of subjects will play more periods of a phase with one another in the *LI* than in the *MI* and *HI* treatments, since in the former prior play with an individual is the only way to ascertain cooperativeness.

While sparseness of information will cause more rank numbers to be assigned randomly in the *LI* treatments, subjects will still preferentially rank whatever past partner had been most cooperative, and the converse for those who free rode, so the ranking and partner assignment mechanism can still be used to similar qualitative effect. But with reputation so much more difficult to build, we conjecture that cooperation will be greater on average with high information, even with low return to cooperation, than with low information, even with high return.

PREDICTION 2. *Contributions will be higher in the HI-LG treatment than in the LI-HG treatment (completeness of information will trump size of potential cooperative gain).*

In *MI* treatments, a given contribution choice has only half the chance of preserving or improving one's reputation, if high, and harming it, if low, as compared to *HI* treatments. The impression of a "mid-way" position between the other two information conditions seems likely to be misleading, however. Since there's no way to know in advance which choices will affect one's reputation with others besides the current partner, and since those choices that *are* recorded and reported will have about twice the weight on reputation as choices in the *HI* treatments, investment in reputation is likely to be more similar to that in the *HI* than that in the *LI* treatments. The effects of the differences in *mcpr* remain the same, and potentially strong enough that we cannot confidently predict the relationship between contributions in the *HI-LG* and those in the *MI-HG* treatment. Letting *C* stand for average contribution, what can be predicted is:

PREDICTION 3. *C(HI-HG) > C(MI-HG) > C(LI-HG); C(HI-LG) > C(MI-LG) > C(LI-LG) (i.e., for given return from cooperation, contributions are ordered according to the completeness of within-phase reputational information).*

The reasoning discussed also supports the generalization of Prediction 1 as:

PREDICTION 4. *C(HI-HG) > C(HI-LG); C(MI-HG) > C(MI-LG); and C(LI-HG) > C(LI-LG) (i.e., for given completeness of reputational information, contributions will be higher the higher is the return from cooperation).*

Between-phase dynamics

Thus far, we've considered change over time within a single phase only. By assuming a mixed population of conditional cooperators and payoff-maximisers, where $0 < p < 1$, our simple model in which payoff-maximisers contribute at the same level as conditional cooperators from periods 1 to *k*, thereafter contributing 0, implies that there will be a drop in average contribution in the final period or periods of the phase. Even if there is a well-known value of *p* for the universe of individuals from whom the subject set is drawn, *p* can vary between randomly drawn sets of subjects, so it is likely that play of the second phase will differ from that of the first due to updated beliefs about *p* leading to new optimal *k*. Given the details of our design, subjects will be better informed of p after a phase of play the smaller is k and the higher the information condition (*HI* > *MI* > *LI*).[11]

Actual subjects are likely to differ in their degree of strategic sophistication, as well as in their guesses regarding the degrees of such sophistication among fellow subjects, which means that there is scope for learning from earlier experience additional to revising estimates of p. As mentioned earlier, some subjects may not have appreciated the potential benefits of establishing cooperative reputations at the outset, and since they are able to wipe their reputational slates clean only when one phase ends and another begins, a rise in their appraisal of those benefits may have a larger impact on their play at the outset of the next phase than in the remainder of the first one. Under conditions which make benefits of cooperation small, however, some subjects may lower their appraisals of cooperation's benefits and contribute less when the next phase begins. While unable to make exact predictions, an increase in cooperation across phases appears less likely the poorer is information and the lower the potential cooperative gain, since the benefits of behaving cooperatively will be smaller under those conditions.

With regard to end-game learning, it is worth pointing out first that if subjects were all strategically sophisticated and either of conditional cooperator or payoff-maximiser type, with $0 < p < 1$, then there would be no theoretical reason to predict that observing the decline in contributions toward the end of the first phase would lead to earlier rather than to later unravelling of cooperation. Those payoff-maximisers whose expectations had proven over-optimistic might reduce their k's, but just as many might have been overly pessimistic and thus have reason to

[11] If end-game behaviour appears in period 10 only, subjects' exposure to it is quite limited. Note also that a shift to non-contribution is not an unambiguous indicator that past cooperation was feigned, since even a conditional cooperator will refrain from contributing if convinced that her counterpart will not contribute.

revise those estimates of p and therefore their calculation of k upwards.[12] Once subjects achieve stable estimates of p, k should also remain fixed, paralleling the "settling into a stable pattern" dynamics found by Andreoni and Miller (1993).

The presence of less sophisticated subjects whose understanding of the game improves with experience, however, might lead to a tendency for cooperation to unravel earlier with each phase. These subjects might not be able to solve for an optimal behaviour assuming a distribution of types; rather, they might look for an "appropriate" behaviour that seems not too far from the norm, while at the same time seeking to avoid being taken advantage of. Their first experience of end-game behaviours may come as a "wake up call," and their impulse afterwards may be to try to defect one period ahead of others, in the future.

We end by noting that increases in reputation-building behaviours in early periods, and earlier end-game declines, are not mutually incompatible. Given some initially unsophisticated subjects having an ability to learn from experience, it is possible that both some learning that it can pay to establish a cooperative reputation, and a tendency to try to stay a step ahead of others' end-game behaviours, may be present when the conditions for reputation building are sufficiently favourable.

3. Results

12 experiment sessions, two for each treatment, each with 20 subjects, were conducted at a computer classroom at Brown University from October 2012 through March 2013. Adding one

[12] The Appendix, which simplifies by assuming that p is common knowledge, shows that the privately optimal k of a payoff-maximiser remains fixed over a range of p values because k is confined to the integers, so not all changes in p are associated with changes in k.

under-populated session of 10 subjects, this makes for a total of 250 subjects.[13] The experiment was programmed using z-tree (Fischbacher 2007). Participants were undergraduates drawn from all subject areas, recruited through the BUSSEL (Brown University Social Science Experiment Lab) registration site.[14] All lacked prior experience in VCM experiments. Sessions lasted between ninety minutes and two hours. Instructions were neutrally framed and were read aloud by one of the experimenters as subjects read along.[15] Subjects then answered comprehension questions and were invited to ask questions which were answered by a member of the experiment team before the start of decision-making.

A first view of the impacts of our treatments on contribution trends is provided by Figure 1. We see that in all treatments, average contributions in each phase are positive but ultimately decreasing within each phase, as in conventional finitely repeated VCM experiments. Between information levels, average contributions tend to be highest in *HI*, lowest in *LI*, and intermediate (although usually closer to *HI* than to *LI*) in *MI* condition, consistent with Prediction 3. At a given information level, average contributions appear to be higher in the high (*HG*) than in the corresponding low gain (*LG*) treatment, consistent with Prediction 4. Our Prediction 2 conjecture that information would trump returns ($C(HI\text{-}LG) > C(LI\text{-}HG)$) holds true in the early periods of later phases, but not overall.

[Figure 1]

[13] By "under-populated," we refer to one session of the *MI-HG* treatment that had insufficient turnout and thus proceeded with only 10 subjects (one set). An extra session with two subject sets was therefore added for that treatment. Because the data from the under-populated session show no systematic differences from the others of its treatment, we keep all 5 set-level observations of it (Table 1).

[14] The university offers a wide range of science, engineering and mathematics, social science and humanities majors. Slightly under 17% of participants reported economics as their major or one of their major fields, almost identical to its representation among Brown undergraduates at the time. 56% of subjects were female, slightly above the 53% share of female undergraduates at the university.

[15] Full instructions are available online on the journal website.

In conditions with medium or high information, within-phase downward trends are noticeably more attenuated in the first six to eight periods of a phase in high gains treatments (*MI-HG* and *HI-HG*) than in the corresponding low gain treatments (*MI-LG* and *HI-LG*), supporting Prediction 1. The rapid decay of contributions in the latter treatments causes our Prediction 2 conjecture that information would trump returns ($C(HI\text{-}LG) > C(LI\text{-}HG)$), which hold in some early periods of phases, to fail overall (Table 1). As for between-phase changes, the initial contribution of a phase tends to rise from phase to phase in at least one *MI* and in both *HI* treatments, as detailed below. These results suggest that incentives to invest in a reputation for cooperativeness became stronger with repetition in all treatments with an adequate basis for reputation formation, but their effectiveness within each phase decayed more rapidly for the smaller *mpcr*, as predicted by our theoretical analysis. Finally, there are visual indications that end-game "unravelling" began earlier in late than in early phases, a matter to which we return shortly.

3.1 Change across Phases: Increasing Investments in Reputation, Earlier Unraveling of Cooperation

The main innovation of our design is that it allows us to study what happens to the impact of potential competition for partners when more than one finitely repeated game is played. We speculated that subjects might on average learn to try even harder to invest in cooperative reputations in early periods of later phases, but that their experience of end game effects in early phases might lead to earlier "unraveling" of cooperation. Figure 1 suggests that both effects were present to some degree in at least some treatments with substantial possibility of investing in reputation. Although contributions in the low gain treatments decay rapidly with repetition within phase, the average contribution in periods 11, 21 and 31 appear to be slightly higher than the average in period 1 for the *MI-LG* treatment, and the average appears to rise substantially from period 1 to period 11 and from period 11 to periods 21 and 31 (with the latter not much different from each other) in the *HI-LG* treatment. Despite their different within-phase trends, something similar applies to the initial periods of phases in both the *MI-HG* and the *HI-HG* treatments. Non-parametric tests looking at the first period of phase only find some of these differences to be statistically significant.[16]

To consider more than first periods only, we look for differences in the contribution level at which the trends of different phases begin by estimating for each treatment a multivariate regression using set-level observations. These regressions, which assume that contributions vary if at all with a linear trend of common slope for the first seven periods of any phase, and with a possibly different linear trend for the last three periods of the phase, are shown in Table 2. Significant differences in the phase dummy variables indicate whether contributions were significantly higher or lower in later phases. The estimates indicate that contributions are significantly lower in the second than in the first phase in the two *LI* treatments, and in the third than in the second phase in one of those two (the *LI-HG* treatment), with little difference between third and fourth phase. The *MI-LG* treatment shows almost no trends in contributions across the phases. Contrastingly, the *HI-LG* and *MI-HG* treatments show contributions to be increasing significantly from phase one to two and two to three, with a further increase phase 4 in *HI-LG*. Thus, the visual impression that the contribution trends begin at higher levels in later than in earlier phases is supported statistically by the estimated intercepts of the linear regression trends for two of our treatments. In a third treatment, *HI-HG*, the visual impression in Figure 1 that contributions

[16] Using as observations only their set-level averages, and thus having only four or five pairs of observations for each test, we find that the average contribution is higher in period 31 than in period 1, significant at the 10% level, in the *MI-LG* and *HI-LG* treatments according to Wilcoxon signed ranks tests. The corresponding differences are significant at the 5% level in the *MI-HG* treatment. Detailed results are found in Panel (2) of Appendix Table B1.

rise in phases 2, 3 and 4 is supported by the point estimates of the phase dummy coefficients in Table 2, but those coefficients fall short of statistical significance, in part because contributions are already so high in phase 1. A simpler specification using set level observations of average contribution in periods 1 – 7 of each phase and including only a trend variable for phase number, attains a positive coefficient significant at the 5% level (see Appendix Table B3), so a statistically significant upward trend is confirmed at the subject set level. These findings for treatments *HI-LG*, *MI-HG* and *HI-HG* suggest that at least some subjects took from their early experiences the idea that they could do better by investing more in the early periods of a phase than they had initially done. These findings are consistent with the predictions discussed in Section 2.2.[17]

Result 1: The average contribution was significantly lower in phases 2, 3 and 4 than in Phase 1 in the two LI treatments. By contrast, it was significantly higher in the later than in the earlier phases in the two HI treatments and in the MI-HG treatment. With good information and high return from cooperation, subjects decide to invest in more cooperative reputations after their slates are exogenously wiped clean, despite end-game observations.

As mentioned, Figure 1 also gives the impression of earlier end-game unravelling of contributions in later than in earlier phases in the two treatments (*MI-HG* and *HI-HG*) in which contributions are relatively sustained in the early periods of each phase. We use two approaches to investigate whether subjects were deciding to "free ride" significantly earlier as the experiment progressed.

[17] The value of average contribution by treatment and phase is reported in Appendix Table B1, which also reports Wilcoxon tests for significance of differences at the set and individual levels. Average contribution over ten periods rises from 2.92 (Phase 1) to 3.63 (Phase 2) to 4.19 (Phase 3) to 4.68 (Phase 4) in *HI-LG* treatment, for example. For that treatment, most phase-to-phase differences are statistically significant at the 5% level or better in individual level tests. The regressions in Appendix Table B3 also provide support for the finding of rising contributions in treatments *HI-LG* and *MI-HG*.

First, for each subject in each treatment and phase, we identify the last period of the phase in which he or she chose $C_i > 0$. Table 3 shows both the mean and the median across subjects within each treatment of this last period of phase in which a positive contribution is made, phase by phase. For each treatment, the average and median period of last positive contribution becomes earlier as one moves from phase to phase, with the only exception occurring between phases 2 and 3 in the *MI-HG* treatment.[18]

Result 2: Median and especially average periods of last positive contribution are found to have come earlier as sets of subjects moved from phase to phase in all six treatments.

Second, we look at the number of subjects making positive contributions in the final period of each phase. Barring confusion, only true conditional cooperators or possessors of other non-standard preferences should contribute anything in these periods, and the number contributing can be taken as a lower bound on the number with such preferences (recall that a true conditional cooperator will contribute 0 if believing her counterpart will do the same). As discussed in Section 2, the existence of conditional cooperators, and subjects' first- and higher-order beliefs about their representation in the subject pool, may be critical to giving selfish subjects an incentive to invest in cooperative reputations. Figure 2 graphs the percentage of subjects contributing $C_i > 0$ in a phase's last period by treatment (each of six lettered sub-figures) and phase (bars within sub-figures). We see that within each treatment, the proportion making a positive contribution in the last period steadily declines from phase to phase, a trend that may be readily explained by decreasing optimism about others' last period contributions based on experience both within the current phase and in previous ones. Between treatments, the main difference is that the share contributing a

[18] Interestingly, positive contributions were the norm in the 9th periods of all but the fourth phase in the *LI-HG* and *MI-HG* treatments, and in the 9th period of all phases in the *HI-HG* treatment. There are slightly earlier switches to complete free-riding in the *MI-LG* and *HI-LG* treatments and a much earlier switch—after period 4—in the *LI-LG* treatment.

positive amount in the initial period 10 is somewhat higher in each *HG* than in each *LG* treatment and that, among *HG* treatments, the share appears higher in the *MI-HG* than the *LI-HG* and higher in the *HI-HG* than in the *MI-HG* treatment. In each case, higher last period contributions are consistent with higher estimates of the likelihood that counterparts are true conditional cooperators, in turn consistent with more evidence of cooperation within the initial phase.[19,20]

3.2 Ranking, Payoff to Reputation, and Partnerships

The desire to obtain cooperative partners can potentially explain high positive contributions in the early periods of a phase in our experiment. In this subsection, we look more closely at how the ranking and partner assignment mechanisms worked, then calculate the actual payoffs from cooperation in each treatment. To check that subjects expressed a preference for higher-contributing partners, we estimated individual random effects Tobit regressions in which the rank number assigned by each subject to each potential partner is predicted by the latter's past average contribution in the phase (*HI* treatments) or by the selected past average and the share of available past periods randomly selected for inclusion (*MI* treatments). We obtain highly significant negative coefficients on all variables, indicating that subjects, as expected, tended to give better (lower) rank numbers to those thus far reported to have contributed more on average to their joint accounts, and that in the *MI* treatments subjects also showed a preference for counterparts

[19] Hypothetically, one could form inferences about *p* from Figure 2 and use them to compute optimal *k* for a payoff-maximiser as indicated by Appendix Table A.1. There is some rough alignment of behaviours with the resulting predictions. Recall, however, that the impact of behaviour in the very last period of a phase is probably much smaller than it would be with fuller information, because each subject in our treatments saw feedback of his or her own partner's behaviour in that period only.

[20] As mentioned earlier, Charness and Yang (2010)'s experiment also includes a complete restart of a finitely repeated super-game with endogenous group formation, so comparing what they find with regard to changes in reputational investment and end-game behaviour is of interest. Their Figure 1 suggests that as in our *MI-HG* and *HI-HG* treatments, subjects in their two endogenous grouping treatments contributed more in the earlier periods of their second than those of their first super-game and that the end-game effect in the second super-game was more pronounced than that in the first.

information about whom was more complete.[21] For the *LI* treatments, in which subjects could know the past contributions of others only for those periods of the phase in which they had been paired together, we separately estimated regressions that show that there, too, subjects gave significantly better ranks to others based on their information about their contribution tendencies, in the *LI-HG* treatment also showing a preference for individuals with whom they had interacted for more previous periods, other things being equal.[22]

Result 3: In the MI and HI treatments, subjects were more likely to give better rank numbers to those who were reported to have contributed more in the past. In the LI treatments, subjects were more likely to give better rank numbers to those perceived to be higher contributors based on direct past interactions. In the MI treatments (the LI-HG treatment), subjects preferred to be matched with others whose history information was more complete (whose behaviour was better known to the rank-giver by virtue of more interaction).

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[21] The regressions are shown in Appendix Table B7. In additional analysis, not shown, we confirm that there was significant variation in the proportion of periods randomly selected for display in the two *MI* treatments; about two-thirds of subjects had 4, 5 or 6 of the previous 9 periods' decisions displayed as of the tenth period of a phase, leaving considerable numbers who had fewer or more periods selected. Because strategic concern about inability to compete for highest-contributing counterparts might have influenced ranks given, we also estimated Probit regressions in which *not* giving one's best rank to the highest past contributor among available prospective counterparts is explained by one's own relative contribution standing and phase dummies. Lower relative standing does indeed significantly raise the likelihood of not giving the highest contributor one's best rank (see Appendix Table B8). However, such strategic voting is clearly of second-order importance, because for example we are unable to pick up its presence by adding controls to regression formats resembling that of Appendix Table B7.

[22] For the regressions for the *LI* treatments, shown in Appendix Table B9, we created a "perceived previous average contribution" variable that takes the value of each group member's average past contribution during interactions with oneself, if the two have interacted in the phase, or else the median value among those one has thus far interacted with, if the assessor has not played with the assessed individual. This "perceived previous average contribution" variable obtains negative coefficients significant at the 1% level. For the regressions of both tables B.7 and B.9, we also checked whether qualitatively different results obtain if, rather than past average contribution of the subjects being ranked, we use that subject's own past contribution relative to the average past contribution of others in the prospective partner sub-set. These robustness tests yield qualitatively identical results. The minor exception is that the variable reflecting a preference to play again with counterparts one has interacted with more in past periods of the phase becomes statistically significant in the regression for the *LI-LG* treatment corresponding to column (1) of Table B9.

To be effective in generating incentives to contribute, the partner assignment mechanism should also reliably assign high contributing subjects to interact with one another, preventing low contributors from accessing these preferred partners. The more highly correlated are the contribution levels of those paired together, then, the more effectively is the mechanism aiding incentive generation. To check for this, we identified for each subject and period (except the first period of each phase, for which no information on past play was available) (a) the rank of each individual within their five-person matching subset based on their full contribution history in the phase thus far, and (b) in the *LI* and *MI* treatments, "perceived ranks" within matching subsets based on recorded history (*MI*) or own interaction history (*LI*) only. We then calculated Pearson's bivariate correlation coefficients for each period and treatment based on both the objective history and the perceived history approaches. In the high information treatments, for which the perceived and objective approaches are the same, correlations are positive and in every period significant at least at the 5% and usually at the 1% level. In the medium information treatments, correlations using either approach are almost always positive and are significant in 82% of periods, mostly at the 1% level. In the low information treatments, there is some successful matching, with at least marginally significantly positive correlations using objective history (method (a)) in a little under half (44.4%) of testable periods. Results are shown in Appendix Tables B.10 and B.11.

As a further check on the mechanism's success in pairing like contributors, we also estimated two regressions for each treatment, with individual random effects, in which the average past contribution of each subject i in each period t is dependent variable and the average past contribution of i's period t partner is the only explanatory variable. All coefficients are positive and significant at the 1% level, indicating that on average like was paired with like in all six treatments, although there are differences in the magnitudes of the coefficients suggesting differences in accuracy of pairings. Overall, the tightest correlations between own and partner's past contributions, with coefficients around 0.5, are achieved when there is fuller information on which ranking can be based, with greater incentive to carefully rank perhaps contributing to the tighter correlation in the *MI-HG* than in the *MI-LG* treatment.[23]

Result 4: The ranking procedure sorted subjects and paired those with cooperative history with similarly cooperative subjects, those with less cooperative history with similarly less cooperative subjects. Its functioning was most effective in the HI treatments and least effective in the LI treatments.

Ultimately, what matters to the mechanism's success at encouraging cooperation is not the past behaviours of those you are matched with but how they behave when you interact with them. We use our data to estimate the impact of own contribution on the contribution of future partners, partners whose identities (not only their contributions) might well be influenced by what one decides to contribute now. In Table 4, we report individual fixed effect regression estimates of the marginal impact of own period t contribution on counterpart's period $t + 1$ contribution, controlling (when possible) for own average contribution (in *MI* treatments, reported average contribution) in earlier periods (1 to $t - 1$) of the phase. The regressions are reported only for the *MI* and *HI* treatments, in which a reputation with third parties can be built via reporting to a set of potential counterparts. We report separately estimates for period 1 of a phase, for which there are no prior recorded contributions, and for periods 2 through 7, in which the prior contribution average can be controlled for, leaving out effects on the final two periods $t + 1$, in which end-game effects are

[23] There is also some indication that stronger incentives to pay attention to partner quality leads to tighter correlations, e.g. in the *MI-HG* than in the *MI-LG* treatment. See Appendix Table B12 parts I(a) and I(b), which report regressions and tests for significance of coefficient differences when all past contributions are considered. Alternative specifications in which only the information the prospective partners could take into account about one another are considered are shown in later parts of Table B12 and show significant and in some cases somewhat higher correlations.

important, since we are especially interested in the incentive to invest in reputation in early periods.[24]

All estimated coefficients suggest that contributing an additional point this period raises one's (possibly new) counterpart's contribution next period, significant at the 1% or 5% levels, with the exception of the regression for period 1 of the *HI-LG* treatment. Point estimates are higher for period 1, but the significance of the estimates for the later periods is perhaps more impressive, since, in view of the control, these are truly marginal impacts of contributing in period *t*, taking already-established reputation as given. Recall that it would be selfishly rational to contribute an additional point now at a sacrifice of (1 – *mpcr*) points if the impact on the next counterpart's contribution (remembering that the identity of the counterpart is itself not yet determined) is an increase of at least ((1 – *mpcr*)/*mpcr*) points. This implies that the value of $\partial C_{j,t+1}/\partial C_{i,t}$, estimated by the first coefficient in Table 4, must be at least (1 – 0.85)/0.85 ≈ 0.176 in the *HG* treatments and at least (1 – 0.65)/0.65 ≈ 0.538 in the *LG* treatments in order to spur a contribution from a strictly self-interested subject who myopically considers the next period only. The estimated coefficients in the regressions for the *LG* treatments are not dramatically different from those for the *HG* treatments, but since most are not far above the first cut-off value (.176), the required threshold for privately recuperating one's cost of contributing in a single period is clearly met by the *HG* treatments (columns (5) – (9)) only.

Properly speaking, a non-myopic payoff-maximiser in *LG* condition should ask whether foregoing 0.35 points now can be made up by the expected additional contributions of future partners that total more than 0.538 points over all remaining periods of the phase. To the estimate

[24] Note that we include own contribution in period 7 and next counterpart's contribution in period 8 of each phase; thus, our way of excluding the most pronounced end-game behaviours causes us to drop only two of the periods of potential effects that could have been included.

of the impact in period $t + 1$ given above, the far-sighted decision-maker would add impacts by way of the averaging of the period t contribution into the displayed past average contribution in periods $t + 2$, $t + 3$, etc., multiplied by the impact of each point of average contribution on later partners' contributions measured by the second coefficient of the columns (2) or (6) estimate in Table 4. By such a calculation, contributing one's full endowment in period 1 is clearly profitable, since it returns 1.18 points, in the *MI-LG* treatment.[25] However, the estimated total additional contributions by future partners diminish as the phase proceeds: to 0.70 per point contributed in period 2, and to less than the 0.538 threshold, or specifically 0.51 per point contributed in period 3, 0.38 in period 4, and 0.29, in period 5. Parallel calculations using the corresponding Table 4 regression coefficients show contributing to be selfishly rational with considerably larger margins of gain and for a larger share of the phase's periods, in the *HI* treatments. Since subjects could not have perfectly estimated the impacts of their decisions, a combination of myopia, uncertainty, and risk aversion would be sufficient to explain why contributions fall off rapidly in each period of the phase following the first, in the *LG* treatments, whereas the much higher "profit margins" for early period contributions in *HG* treatments support more sustained contributions within each phase.

Result 5: The benefit of contributing in terms of future partners' contributions exceeded the cost within a single period in the HG but not in the LG treatments. The total benefits of contributing, considering all remaining periods, exceeded the cost in the earlier but not the later periods of the LG treatments.

[25] The calculation considers that if $t = 1$, each point contributed in t affects past average contribution (in expectation, for *MI* treatments) by ½ in period 3, by 1/3 in period 4, by ¼ in period 5, and so on. Using only the coefficients in Table 4's estimates and assuming no further benefits in periods 9 and 10, the gain per point contributed in period 1 of the *MI-LG* treatment is thus **0.25** + **0.38** * (1) + **0.38** * (1/2) + **0.38** * (1/3) + **0.38** * (1/4) + **0.38** * (1/5) + **0.38** * (1/6) ≈ 1.18, where the two numbers (i.e., values) shown in bold typeface are those from our regression estimates.

It is interesting, finally, to see whether partners successfully built reputations with one another in the *LI* treatments, where there is no way to build a reputation with set members one has not interacted with. In these treatments, Figure 1 shows the average rates of decline of contributions to be relatively mild in both periods 1 – 7 and periods 8 – 10 of each phase, due in part to the fact that the average contributions in earlier periods were already low. A close look at the data, however, shows that a few subjects were able to form successful partnerships with specific others for as many as 5 and in the limit up to 9 periods within a phase. Strikingly, the average earnings of pairs, shown in Panel (1) of Appendix Table B14, increase as the duration of pairing in a phase lengthens. Distinguishing between subjects' longest and shortest partnerships and performing Wilcoxon matched pair tests, we find that subjects earned significantly more on average during their longer than during their shorter partnerships in phases 2 to 4 in the *LI-LG* treatment and in all four phases in the *LI-HG* treatment.[26]

Result 6: Some subject pairs managed to build successful partnerships in the LI treatments, despite the random interruptions built into the design. LI treatment subjects' long-duration partnerships were significantly more profitable than their partnerships having short durations.

3.3 Contributions and Trends within Phases

The average contribution patterns in the initial phase reconfirm three of the most standard findings of the literature: (1) average contributions begin at around half of the endowment (with considerable variation among individuals), (2) the average contribution tends to decline with

[26] See Appendix Table B14 and our working paper, for details. Note that causality may run in both directions; that is, subjects would have given better ranks to partners who had been more cooperative, which helps lengthen duration, and subjects would have had reason to be more cooperative towards partners with whom they had hopes of playing for more future periods.

repetition, and (3) contributions are larger at a higher than at a lower *mpcr*.[27] Initial contributions cluster between 37 and 49% of endowment in the *LG* treatments and between 63 and 77% of endowment in the *HG* treatments. The only noteworthy sign that the endogenous partner assignment and reputation dimensions of the experiment might be altering matters qualitatively is that the average contribution graph of the *HI-HG* treatment shows little sign of decline in contributions between periods 1 and 9, a pattern that remains for early periods in later phases of that treatment and in some phases of the *MI-HG* treatment as well.

To obtain a more precise sense of the tendency of contributions to change within a phase, we can return to the regressions of Table 2. The coefficients for the period 1 – 7 (of phase) and period 8 – 10 (of phase) trend variables indicate statistically significant downward contribution trends in every treatment and in both early and late periods of phases. As suspected, however, the rate of decline tends to be considerably greater in periods 8 – 10 than in periods 1 – 7 in the *MI-HG* and *HI-HG* treatments, with a slope almost twice and three times, respectively, steeper for the later than for the earlier periods in the latter treatment, and with the slope differences between early and later periods being statistically significant for both treatments. Rates of decline also show significant between-treatment differences for periods 1 – 7 when comparing the *MI-LG* to the *MI-HG* treatment, and when comparing the *HI-LG* to the *HI-HG* treatment, supporting Prediction 1.[28]

Result 7: The average contribution followed a declining trend within phases in each of the six treatments. The rate of decline was significantly milder in periods 1 – 7 than in periods 8 – 10 in the high gain treatments with medium and high information. Also, the rate of decline in periods 1 –

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[27] These three themes are already present, for example, in Davis and Holt's (1993) survey of the early literature. See also Ledyard (1995) and Zelmer (2003).

[28] See the two-side F tests in Appendix Table B2.

7 was significantly milder with high than with low gain in both the medium and high information treatment pairs.

3.4 Prevalence of Conditional Cooperation

It is relevant to ask, finally, how consistent our data are with previous indications of the prevalence of conditional cooperation. To answer, we must first decide what inferences our data themselves support. Some may argue that subjects are initially naïve about the benefit of last period free-riding, learn that it is beneficial in the course of play, and that the 10 to 20% shares observed in period 40 are thus better indicators of true conditional cooperation than the observations from other periods. An opposite view is that the greater part of the drop-off in final contributing should be attributed to declining optimism about others' actions. After all, our instructions were clear and included tables showing own and partner's earnings for all possible contribution pairs, subjects had to answer control questions, and individuals of above-average intelligence are over-represented in our subject pool. In the treatment and phase in which subjects had most reason to be optimistic about counterparts' contributions, phase 1 of the *HI-HG* treatment, about 58% of subjects contributed a positive amount in the phase's last period.[29] This does not differ markedly from estimates of the share of conditionally cooperative individuals in the subject pools of Fischbacher *et al.* (2001), Keser and van Winden (2006), Herrmann and Thöni (2009), Kocher *et al.* (2010) and Kamei (2011). It also closely resembles the estimated share of cooperators based on the endogenous grouping treatment in Page *et al*. (2005), 59%.

4. Conclusions

[29] Since subjects are randomly drawn from the same subject pool, it is unlikely that the true p differs much between the subjects in different treatments and likely that the better part of the differences apparent in Figure 2 are attributable to differences in treatment parameters, not in p.

The desire to be a reputable partner in a world in which people get to decide who they interact with is a probable cause of much observed cooperation. Relevant real life situations are sometimes better captured by infinite repetition, sometimes by finite repetition models. Games of finite repetition are of particular interest to experimentalists and theorists because evidence of social preferences is in principal clearer in them. Even in interactions involving finite repetition, however, people may get to start over, for instance when they move or change careers. To see how experience of a finitely repeated social dilemma with partner choice might affect play in subsequent interactions of the same kind, we studied experimentally how subjects' experiences would impact play in later finitely-repeated games.

We found that when the benefit of mutually cooperating is high relative to the earnings foregone by not free riding, and when the informational conditions for acquiring a reputation within a population of potential partners are favourable, relatively high levels of cooperation were sustained during most periods. With respect to learning across super-games, we found that cooperation became stronger in later games. This suggests that subjects updated their beliefs about the returns to cooperating—a return from attracting more cooperative partners which we showed to be large and significant—in the direction of increased optimism.

Although early-in-phase cooperation grew over time especially in the high gain treatments with good information, end-game associated declines began earlier in each phase than in the previous one, raising the possibility that with enough repetition, "learning the benefits of cooperation" might eventually be overwhelmed by "backward unravelling." Our 40 period, four (finitely repeated) super-game experiment may be too short to draw definite conclusions on this, however.

While reconfirming that competition for partners can be a spur to cooperation, our paper's main contribution lies in demonstrating for the first time that learning that cooperating pays and learning to anticipate end-game behaviours can both be present when a finitely repeated social dilemma game with partner choice is exogenously restarted. Insofar as the first factor dominates, these results suggest that when designing real world institutions, it may in some instances be desirable that occasions exist on which the reputational slates of individuals are cleaned, so that past learning about the benefits of a good reputation can translate more effectively into future cooperation. While making reputation cleaning too easy for individuals to implement at their own discretion may be fraught with dangers, as other studies have shown, the more favourable outcomes illustrated in our experiment with exogenous restarts of reputation accumulation suggest a partial explanation of how cultures of cooperation have been sustained or even strengthened in some societies despite the increasing mobility of modern life. As people transition through increasing numbers of careers and locations in the face of today's lengthening life-spans, the potential to sustain cooperation despite breaks in accumulated reputation will be worthy of continuing attention by researchers.

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Table 1. *Summary of Treatments, and Average Contributions*

Treatment	*mpcr*	The probability that contribution is recorded	Total # of sessions	Total number of sets	Total # of subjects	Average contributions
(a) Treatments with Low Gains from Cooperation (F = 1.3)						
LI-LG	.65	0%	2	4	40	1.66
MI-LG	.65	50%	2	4	40	3.57
HI-LG	.65	100%	2	4	40	3.85
(b) Treatments with High Gains from Cooperation (F = 1.7)						
LI-HG	.85	0%	2	4	40	4.59
MI-HG	.85	50%	3	5	50	6.62
HI-HG	.85	100%	2	4	40	7.38
Experiment as a whole			13	21	210	

Notes: Subject sets consist of ten randomly selected participants who remain together for all four phases, totaling forty periods. Each session (with one exception) had two anonymously matched subject sets. *LI*, *MI* and *HI* refer to low, medium, and high information conditions. In all conditions, subjects know the ID of their counterpart and get feedback of the counterpart's action, with ID's fixed within each 10-period phase. In *MI* and *HI* conditions, subjects have additional information about set members' past contributions in that the average contribution thus far in a randomly chosen 50% of past periods of the phase (*MI*) or in 100% of past periods of the phase (*HI*) are shown at the stage of partner selection and when deciding on contribution after pairing.

Figure 1. *Average Contribution Period by Period*

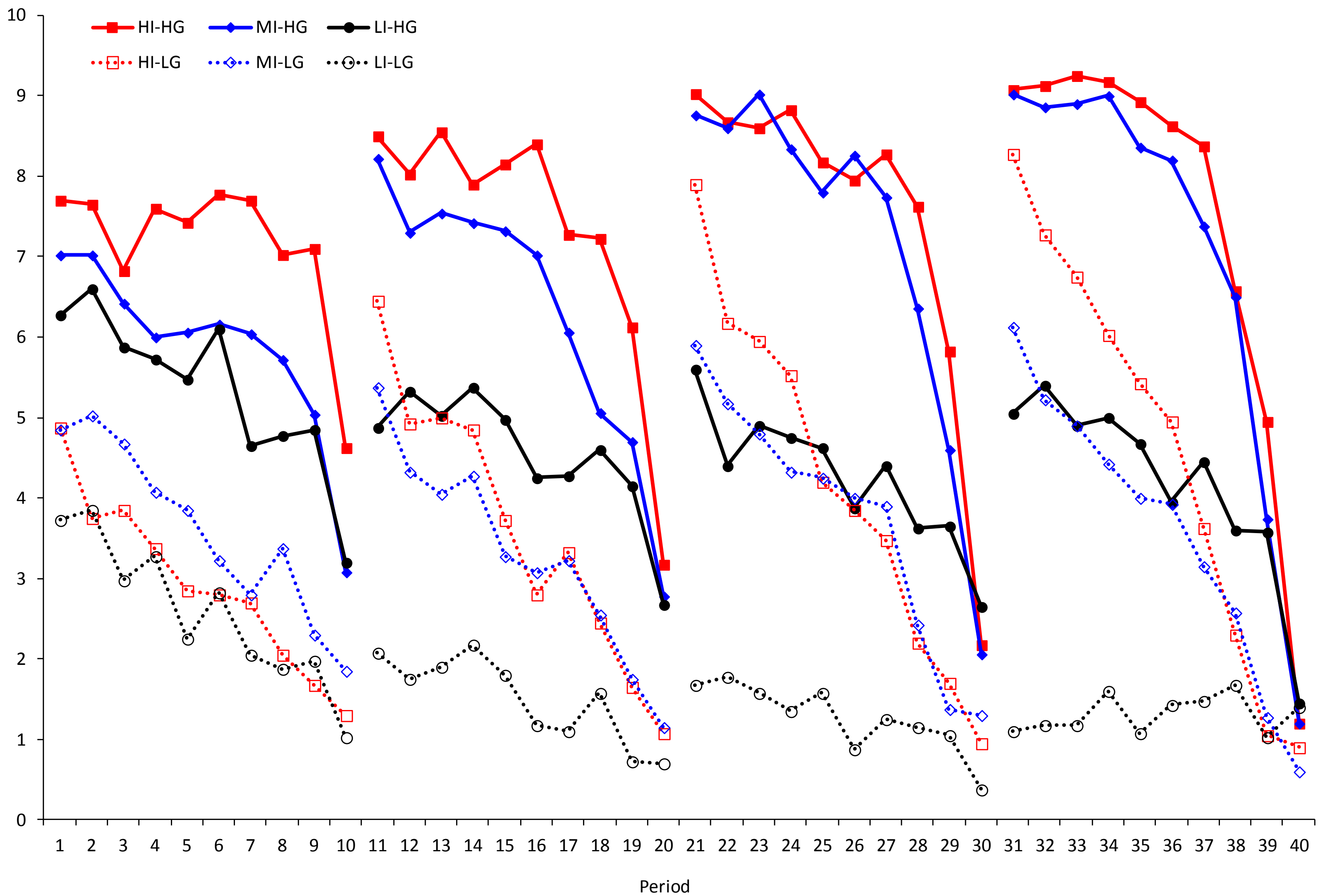


Table 2. *Trends of Average Contributions by Treatment: Regression Analyses*

Dependent variable: Set average contributions per period.

Independent Variable	Treatment					
	Low Gains (F = 1.3)			High Gains (F = 1.7)		
	LI-LG (1)	*MI-LG* (2)	*HI-LG* (3)	*LI-HG* (4)	*MI-HG* (5)	*HI-HG* (6)
(a) Phase2 dummy {1 if Phase 2; 0 otherwise}	-1.09*** (0.17)	-0.30 (0.23)	0.70*** (0.24)	-.80*** (0.24)	0.49* (0.27)	0.19 (0.33)
(b) Phase3 dummy {1 if Phase 3; 0 otherwise}	-1.32*** (0.17)	.14 (0.23)	1.27*** (0.24)	-1.11*** (0.24)	1.30*** (0.27)	0.37 (0.33)
(c) Phase4 dummy {1 if Phase 3; 0 otherwise}	-1.28*** (0.17)	.018 (0.23)	1.74*** (0.24)	-1.15*** (0.24)	1.26*** (0.27)	0.39 (0.33)
(d) Period within phase1 {= 1, 2, …, 7}[#1]	-0.13*** (0.036)	-0.38*** (0.048)	-0.57*** (0.050)	-0.20*** (0.050)	-0.26*** (0.057)	-0.14** (0.069)
(e) Period within phase2 {= 8, 9, 10}[#2]	-0.13*** (0.022)	-0.45*** (0.029)	-0.61*** (0.030)	-0.26*** (0.030)	-0.51*** (0.034)	-0.41*** (0.041)
Constant	3.29*** (0.19)	5.86*** (0.25)	6.16*** (0.26)	6.60*** (0.27)	7.94*** (0.30)	8.67*** (0.37)
# of Observations	160	160	160	160	200	160
F	23.45	53.57	102.14	22.81	69.34	32.67
Prob > F	.0000	.0000	.0000	.0000	.0000	.0000
R-Squared	.3695	.3339	.5430	.1580	.5445	.3583
F test results						
(a) = (b)						
F	1.84	3.74	5.78**	1.62***	9.03***	0.31
p-value (two-sided)	.1774	.0549*	.0174	.2057	.0030	.5794
(a) = (c)						
F	1.16	1.92	19.14***	2.10	8.21***	0.35
p-value (two-sided)	.2826	.1681	.0000	.1497	.0046	.5537
(b) = (c)						
F	0.08	0.30	3.88*	.03	0.02	0.00
p-value (two-sided)	.7823	.5834	.0506	.8597	.8883	.9697
(d) = (e)						
F	0.02	3.31*	1.27	2.88*	40.90***	31.93***
p-value (two-sided)	.8927	.0708	.2608	.0918	.0000	.0000

Notes: Set fixed effects linear regressions. The dependent variables are per-period set average contribution.
[#1] The Period within phase 1 variable equals 0 if it is in period 8, 9 or 10. [#2] The Period within phase 2 variable equals 0 if it is in period 1, 2, ..., 6, or 7. Test results for the equality of the coefficient of each of variables (a) to variable (e) across treatments are found in Appendix Table B2.
*, **, and *** indicate significance at the .10 level, at the 0.05 level and at the .01 level, respectively.

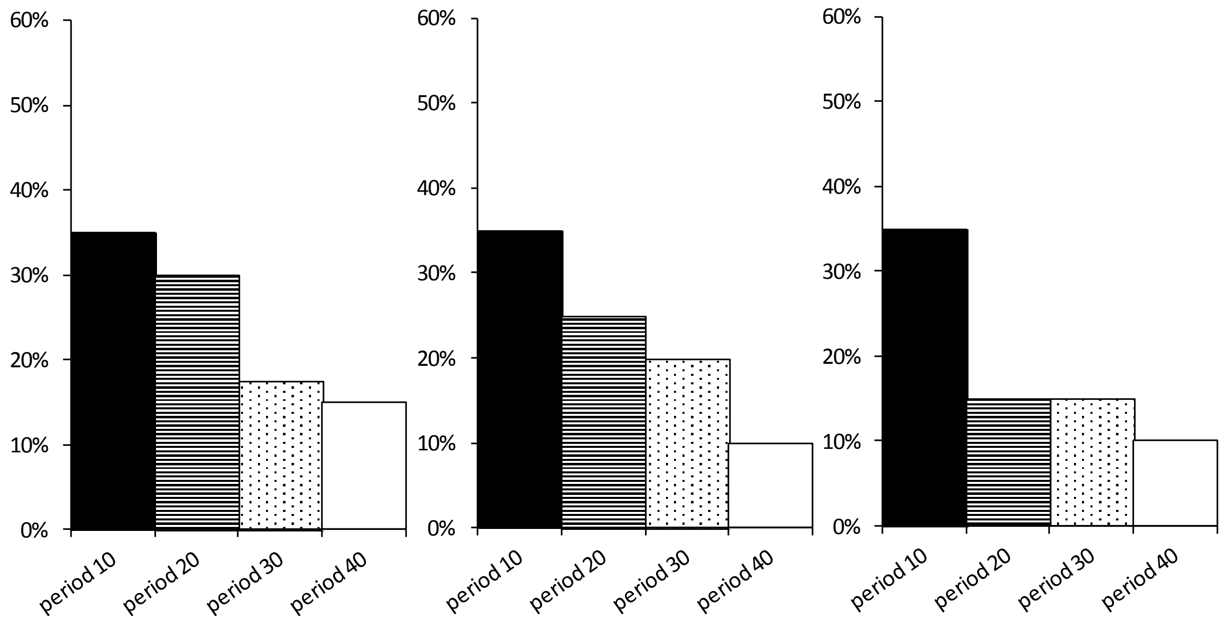
Table 3. *End-effects Behaviour by Phase and Treatment: The Last Period in which a Subject Contributed a Positive Amount*

		Average				Median			
		Phase 1	Phase 2	Phase 3	Phase 4	Phase 1	Phase 2	Phase 3	Phase 4
Treatment	I. Low Gains (F = 1.3)								
	LI-LG	7.05 (3.46)	5.55 (4.37)	4.50 (4.36)	4.15 (4.21)	8	8	4	4
	MI-LG	7.75 (3.12)	7.33 (2.81)	6.18 (3.47)	5.88 (3.15)	9	8	7	7
	HI-LG	7.63 (3.12)	7.53 (1.91)	6.83 (2.77)	6.60 (2.55)	9	8	8	7
	II. High Gains (F = 1.7)								
	LI-HG	7.38 (3.61)	6.83 (4.04)	6.63 (4.00)	5.88 (3.96)	9	9	9	7
	MI-HG	8.82 (1.77)	8.14 (2.46)	8.52 (1.36)	8.00 (1.67)	9	9	9	8
	HI-HG	9.35 (1.10)	8.85 (1.78)	8.83 (1.11)	8.48 (1.15)	10	9	9	9

Notes. Numbers in parenthesis are standard deviations. We use 0 for a subject's last period if the subject contributed nothing during the entire phase. Test results in comparing the average last periods between treatments are found in Appendix Table B4. Parallel to this analysis, we also calculated the percentage of subjects that contributed nothing to their joint account by period and by treatment. The results are similar, and are omitted to conserve space.

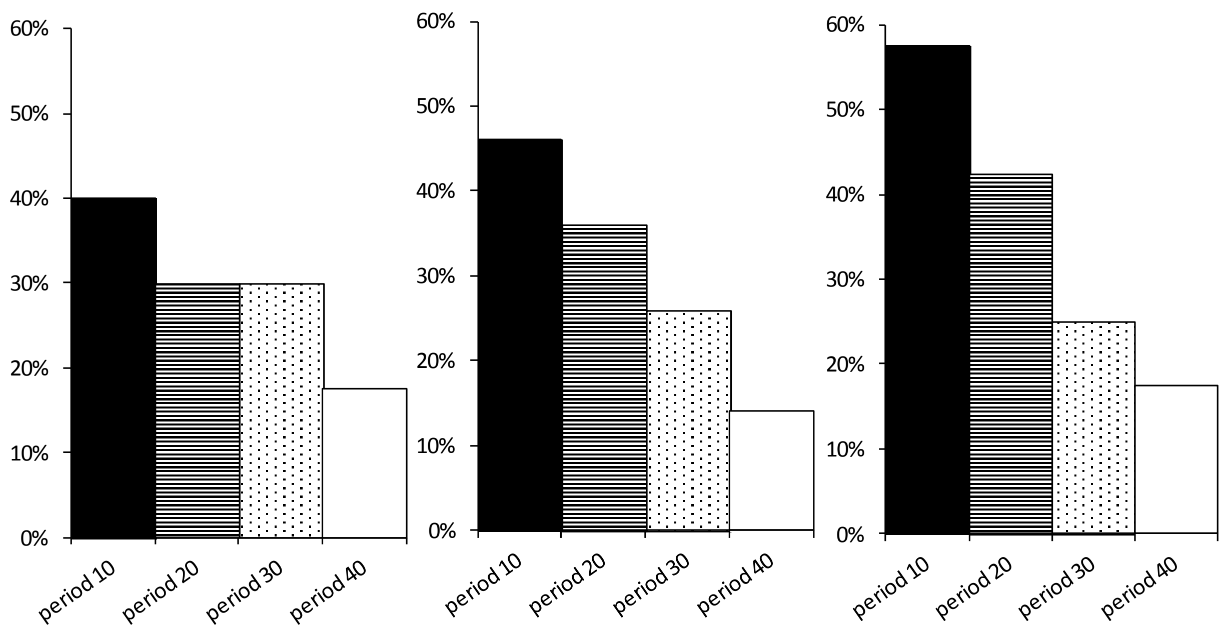
Figure 2. *The Percentage of Subjects that Contributed Positive Amounts in the Tenth Period of Each Phase, by Treatment*

(a) Low Gain Treatments (Factor = 1.3)



(a1) *LI-LG* (a2) *MI-LG* (a3) *HI-LG*

(b) High Gain Treatments (F = 1.7)



(b1) *LI-HG* (b2) *MI-HG* (b3) *HI-HG*

Table 4. *Period t Contribution versus Period t + 1 Partner's Contribution*

Dependent variable: Period $t + 1$ partner's contribution.

Independent Variable	*MI-LG* $t=1$ (1)	*MI-LG* $t>1$ & $t \le 7$ (2)	*HI-LG* $t=1$ (3)	*HI-LG* $t>1$ & $t \le 7$ (4)	*MI-HG* $t=1$ (5)	*MI-HG* $t>1$ & $t \le 7$ (6)	*HI-HG* $t=1$ (7)	*HI-HG* $t>1$ & $t \le 7$ (8)
Own contribution in period t	0.25** (0.066)	0.15** (0.044)	0.43 (0.20)	0.24*** (0.025)	0.37*** (0.08)	0.21** (0.060)	0.61*** (0.071)	0.24** (0.045)
Own (recorded) past average contribution up to $t-1$[1]	----	0.38** (0.10)	----	0.45*** (0.046)	----	0.29** (0.081)	----	0.54*** (0.047)
Periods within phase ($\in \{2, 3, \ldots, 7\}$)	----	-0.17** (0.040)	----	-0.33*** (0.057)	----	-0.28** (0.086)	----	-0.17* (0.054)
Phase 2 dummy {=1 if phase =2}	-0.83* (0.31)	-0.29 (0.14)	0.49 (0.71)	-0.052 (0.14)	-0.17 (0.55)	-0.012 (0.30)	-0.11 (0.41)	-0.027 (0.27)
Phase 3 dummy {=1 if phase =3}	-0.12 (0.45)	-0.021 (0.48)	1.11 (0.93)	-0.26 (0.18)	0.93* (0.42)	0.62 (0.39)	0.22 (0.76)	-0.038 (0.22)
Phase 4 dummy {=1 if phase =4}	-0.13 (0.71)	-0.29 (0.28)	2.05** (0.63)	-0.12 (0.30)	1.09** (0.26)	0.74 (0.53)	0.64 (0.57)	-0.089 (0.25)
Constant	3.79*** (0.66)	2.02** (0.47)	1.64 (0.94)	1.80*** (0.20)	4.39*** (0.49)	4.17** (0.92)	2.98** (0.62)	2.32** (0.42)
# of Observations	160	955[2]	160	960	200	1200	160	960
R-Squared	.1320	.3806	.3093	.4952	.1459	.2420	.2320	.3696

Notes: Individual fixed effects regression with robust standard errors clustered by set id. Only observations whose t is less than or equal to 7, and greater than 1 are used in columns (2), (4), (6) and (8).

[1] If a subject's contribution decisions have not been recorded yet, then the median of other group members whose contribution decisions have been recorded at least once is used.

[2] In one group, no contributions had yet been recorded as of period 22 in the *MI-LG* treatment; and thus the five observations of that group are excluded in this regression.

*, **, and *** indicate significance at the .10 level, at the 0.05 level and at the .01 level, respectively.

Supplementary Online Appendix for Kamei and Putterman, 2015,

"Play it Again: Partner Choice, Reputation Building

and Learning from Finitely-Repeated Dilemma Games"

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Appendix A. Theoretical Predictions in the high information treatments.

In this appendix, we discuss some key theoretical predictions for our experimental design using a simple partial equilibrium model, in which all subjects are assumed to be either conditional cooperators or maximisers of own money payoff—hereafter, payoff-maximisers. Specifically, we examine how strong the reputation building motives are for payoff-maximisers in the *HI* treatments. Our prediction is that cooperation is more likely to be sustained in the *HI-HG* treatment than in the *HI-LG* treatment, and the larger is the proportion of conditional cooperators, due to higher incentives to build a good reputation through which they can pair with subjects of that type. For simplicity, we suppose that there are only three types of subjects in the population: sophisticated selfish payoff maximisers, unsophisticated selfish agents who always contribute 0, and conditional cooperators. We focus on the behaviour of a sophisticated payoff maximiser who requires an expectation of material reward to motivate her cooperation, whereas conditional cooperators will contribute to their joint account whenever they expect the same from their counterpart, and unsophisticated selfish agents will always contribute 0.

Suppose that each subject believes that the percentage of conditional cooperators is p, and that of payoff maximisers is $1 - p$. Suppose also that these beliefs are correct: the percentage of conditional cooperators in the population is p in actuality. We now must make our assumptions about the choices conditional cooperators make more explicit. In a flexible definition (see, for instance, Fischbacher and Gächter, 2010), a conditional cooperator is any individual whose preferred contribution rises as the expected contributions of others rise. This leaves it possible that conditional cooperators are a class of agents, not a single homogeneous type. For simplicity, we assume a uniform degree of reciprocity of our homogeneous conditional cooperator type. We also need an assumption about conditional cooperators' expectations. We assume that if a conditional cooperator meets with a subject having average past contribution, A_{it}, to the joint account, then, the conditional cooperator contributes $x \cdot A_{it}$, where $x \in (0, 1]$. We focus on the *HI* treatments since subjects' previous average contributions are fully conveyed in them. For period 1, as there is no average past contribution available, we refer to the amounts that conditional cooperators contribute in period 1 as A_0.[1]

[1] A_0 can be exogenously set in a model, dependent on an assumption. One example is to set A_0 equal to the expected proportion of conditional cooperators in the population.

ASSUMPTION 1. *A conditional cooperator contributes* $x \cdot A_{jt}$ *in periods 2 to 10, where* A_{jt} *is his or her counterpart's average contribution to the joint account up to but not including period t.*

In our analysis, we assume $x = 1$ for simplicity, although the implication that we obtain below would not change even if we assume $x < 1$, if x is not too small. Also, Assumption 1 implies very unsophisticated forecasting on the part of conditional cooperators, who expect each partner met to contribute her past average contribution even when there is evidence that contributions may be declining within the population. Both the assumption that $x = 1$ and the naïve forecasting assumption may bias our model towards somewhat too optimistic predictions, but the flavor of its predictions should nonetheless stand.

Our next assumption has an offsetting pessimistic bias: we assume that a selfish payoff maximiser i believes that all other selfish players contribute zero to the joint project, if they are matched as a pair. We assume, also, that this is indeed the case: all selfish players except i do contribute 0. Under these assumptions, we study how a strategically selfish payoff maximiser i has an incentive to build a good reputation as a mimicker of cooperation. The assumption on other selfish players' behaviour is extreme, but it is fine as a benchmark for a lower bound of the selfish player i's reputation building motive.

ASSUMPTION 2. *Selfish players other than i contribute zero in all periods.*

Furthermore, we restrict a selfish payoff maximiser i's possible domain of contributions from 0 to A_0 (the contribution level of conditional cooperators in period 1); as it would be realistic to assume that if i is sufficiently sophisticated, he or she would want to avoid standing out from conditional cooperators. In other words, under conditions that make contributing rational for the payoff-maximiser, contributing the entire endowment will generate the largest payoff, but we will assume that she foregoes the potential short-term gain since she is eliciting contributions by mimicking conditional cooperators, and it would be odd were our model to have mimickers contributing more than conditional cooperators yet assumed to be indistinguishable from them.

Finally, we further simplify in a pessimistic direction by assuming that despite the mutual ranking mechanism, a selfish payoff maximiser i is randomly paired with a subject: that is, he or she is paired with a conditional cooperator with probability *p* (1 − *p* for the case of being paired with a selfish payoff maximiser). We find that even in this circumstance, a payoff maximiser *i* has a substantial incentive to cooperate: a selfish player *i* contributes A_0 to her joint account in all initial periods, but in a round *k* + 1 determined by *p* and mpcr, he or she changes to fully free-riding, as in Proposition 1. There is, then, even more incentive to cooperate when one adds to the account that this increases the likelihood of attracting a cooperating partner.

Condition (A.1) in Proposition 1 summarises the duration of the cooperation by payoff maximiser *i* and it is very intuitive. $-1 + mpcr + \frac{1}{t}\left(1 + \sum_{s=1}^{9-t} \frac{t}{t+s} 1_{t\leq 8}\right) \cdot mpcr \cdot p$, which is included in Condition (A.1), indicates *i*'s net gain from contributing one more unit to his joint account in period *t*.[2] For example, when *t* = 5, it is:

$$-1 + mpcr + \frac{1}{5} \cdot \left(1 + \sum_{s=1}^{4} \frac{5}{5+s}\right) \cdot mpcr \cdot p.$$

$$= -1 + mpcr + \frac{1}{5} \cdot \left(1 + \frac{5}{5+1} + \frac{5}{5+2} + \frac{5}{5+3} + \frac{5}{5+4}\right) \cdot mpcr \cdot p$$

$$= -1 + \underbrace{mpcr}_{\substack{\text{Period 5 earnings} \\ \text{from joint account}}} + \underbrace{\frac{1}{5} \cdot mpcr \cdot p + \frac{1}{6} \cdot mpcr \cdot p + \frac{1}{7} \cdot mpcr \cdot p + \frac{1}{8} \cdot mpcr \cdot p + \frac{1}{9} \cdot mpcr \cdot p}_{\text{Total gains from the rises in his reputation in period 6 to 10}} \quad \text{(A.0)}$$

When a selfish payoff maximiser *i* contributes one point to the joint account in period 5, *i* loses the opportunity to gain one point from his or her private account (this is "−1" in expression (A.0)), but instead, *i* gets mpcr from the joint account in that period. In addition, *i* enjoys gains resulting from an increase in his or her average past contributions in the subsequent periods, periods 6 through 10. For instance, in period 8, his average past contribution rises by $\frac{1}{7}$ when *i* contributes one point in period 5, as the average contribution in period 8 is calculated by the average of *i*'s seven past contributions. Since the probability that *i* meets with a conditional cooperator in period 8 is *p*, and since we assume that the conditional cooperator matches *i*'s average past contribution, *i*'s marginal gain in period 8 is $\frac{1}{7} \cdot mpcr \cdot p$.

[2] Note that *t* in this and the following expressions always refers to the period in which subject *i* is considering whether to contribute to the joint account, whereas *s* is a counter for remaining periods. *s* takes maximum value 8 (= 9 – *t*) because at most there can be 9 remaining periods of the 10 period phase, in period *t* = 1. Although future benefit may also be anticipated in period 9, the indicator $\mathbf{1}_{t \leq 8}$ takes value 1 up to decision-making period 8 only since the first 1 inside the parenthesis already captures the benefit in the immediately following period, in that case period 10.

If the net benefit, described in expression (A.0), is positive, *i* decides to contribute to his joint account in period 5. Notice that the earlier period it is (the smaller *t* is), the greater the value of expression (A.0) as there remain many future interactions. This means that for all periods *t* such that $-1 + mpcr + \frac{1}{t}\left(1 + \sum_{s=1}^{9-t} \frac{t}{t+s} 1_{t \leq 8}\right) \cdot mpcr \cdot p > 0$, a selfish player *i* invests in his or her joint account; beyond that period, however, *i* stops cooperating and changes to full free-riding in all remaining periods of the finitely-repeated super-game, since the future gains from investing in the joint activity no longer compensates for its current cost (1 – *mpcr*).

PROPOSITION 1. *Suppose that the series of assumptions above, including assumptions 1 and 2, hold. Then, in a given phase, a selfish payoff maximiser i continues to contribute A_0 to her joint account until period k such that*

$$k = max\left\{t \in \{1,2, \dots ,8 ,9\}: -1 + mpcr + \frac{1}{t}\left(1 + \sum_{s=1}^{9-t} \frac{t}{t+s} 1_{t \leq 8}\right) \cdot mpcr \cdot p > 0\right\}, \tag{A.1}$$

where $1_{t \leq 8} = 1$ if $t \leq 8$; = 0, otherwise. Then, he or she contributes 0 in period k + 1 and afterwards, and continues to free-ride until the end of a given phase.

Proof:

This optimization problem can be solved by using the standard optimal control theory (see Sethi and Thompson (2005)).

A selfish payoff maximiser *i* maximises his or her total expected earnings (material payoff) from his or her interactions with partners in the ten interactions of a given phase, with respect to his or her contribution decisions:

$$max_{c_{it \in \{1,2,\dots,10\}}}\{J_i = \sum_{t=1}^{10} 10 - c_{it} + mpcr \cdot (c_{it} + p \cdot A_{it})\},$$

subject to: $\Delta A_{it} = A_{it+1} - A_{it} = -\frac{A_{it}}{t} + \frac{c_{it}}{t}$, $0 \leq c_{it} \leq A_0$. Here, c_{it} is player *i*'s contribution in period *t*, $10 - c_{it}$ is subject *i*'s earnings from the private account in period *t*, and $c_{it} + p \cdot A_{it}$ is the expected total contribution in his joint account in period *t*. $\Delta A_{it} = -\frac{A_{it}}{t+1} + \frac{c_{it}}{t+1}$ is obtained from the following relation:

$$t \cdot A_{it+1} = (t-1) \cdot A_{it} + c_{it} \tag{A.2}$$

This relation holds since A_{it} is subject *i*'s average past contribution up to period $t-1$. Relation (A.2) reduces to:

$$t \cdot A_{it+1} - t \cdot A_{it} = -A_{it} + c_{it}.$$

In other words:

$$A_{it+1} - A_{it} (= \Delta A_{it}) = -\frac{A_{it}}{t} + \frac{c_{it}}{t}.$$

The Hamiltonian H_t, in this problem, is defined as follows:

$$H_t = 10 - c_{it} + mpcr \cdot (c_{it} + p \cdot A_{it}) + \lambda^{t+1} \left(-\frac{A_{it}}{t} + \frac{c_{it}}{t}\right),$$

where λ^{t+1} is the shadow price of a unit of *i*'s average past contribution in period $t + 1$; and thus, the fourth term, $\lambda^{t+1} \Delta A_{it} = \lambda^{t+1} \left(-\frac{A_{it}}{t} + \frac{c_{it}}{t}\right)$ indicates the gain from periods $t + 1$ through period 10 when *i* contributes in period *t*.

Since H_t is linear in c_{it}, $\frac{\partial H_t}{\partial c_{it}} = -1 + mpcr + \frac{\lambda^{t+1}}{t}$ does not depend on c_{it}. This means that $c_{it} = A_0$ if $\frac{\partial H_t}{\partial c_{it}} > 0$, whereas $c_{it} = 0$ if $\frac{\partial H_t}{\partial c_{it}} < 0$ (the selfish player's optimal solution is a "bang-bang solution" (Sethi and Thompson 2005)). The adjoint equation in our optimal control problem is:

$$\Delta\lambda^{t+1} = \lambda^{t+1} - \lambda^t = -\frac{\partial H_t}{\partial A_{it}} = -mpcr \cdot p + \frac{\lambda^{t+1}}{t}. \tag{A.3}$$

$$\lambda^{11} = 0. \tag{A.4}$$

Equations (A.3), by rearranging them, reduces to:

$$\lambda^t = \frac{t-1}{t} \cdot \lambda^{t+1} + mpcr \cdot p, \text{ for each } t. \tag{A.5}$$

In other words,

$$\begin{aligned}
\lambda^t &= \frac{t-1}{t} \cdot \lambda^{t+1} + mpcr \cdot p. \\
&= \frac{t-1}{t} \cdot \left(\frac{t}{t+1} \cdot \lambda^{t+2} + mpcr \cdot p\right) + mpcr \cdot p. \\
&= \frac{t-1}{t+1} \cdot \lambda^{t+2} + \frac{t-1}{t} \cdot mpcr \cdot p + mpcr \cdot p. \\
&= \frac{t-1}{t+1} \cdot \left(\frac{t+1}{t+2} \cdot \lambda^{t+3} + mpcr \cdot p\right) + \frac{t-1}{t} \cdot mpcr \cdot p + mpcr \cdot p. \\
&= \frac{t-1}{t+2} \cdot \lambda^{t+3} + \frac{t-1}{t+1} \cdot mpcr \cdot p + \frac{t-1}{t} \cdot mpcr \cdot p + mpcr \cdot p. \\
&= \cdots \\
&= \frac{t-1}{10} \cdot \lambda^{11} + \cdots + \frac{t-1}{t+2} \cdot mpcr \cdot p + \frac{t-1}{t+1} \cdot mpcr \cdot p + \frac{t-1}{t} \cdot mpcr \cdot p + mpcr \cdot p.
\end{aligned}$$

$$= mpcr \cdot p + \sum_{s=0}^{9-t} \frac{t-1}{t+s} \cdot 1_{t\le 9} \cdot mpcr \cdot p.$$

$$= \left(1 + \sum_{s=0}^{9-t} \frac{t-1}{t+s} \cdot 1_{t\le 9}\right) \cdot mpcr \cdot p,$$

where $1_{t\le 9}$ is an indicator function; and $1_{t\le 9} = 1$ if $t \le 9$, and = 0 otherwise. In other words,

$$\lambda^{t+1} = \left(1 + \sum_{s=0}^{9-(t+1)} \left[\frac{t+1-1}{t+1+s}\right] \cdot 1_{t+1\le 9}\right) \cdot mpcr \cdot p.$$

$$= \left(1 + \sum_{s=0}^{8-t} \left[\frac{t}{t+1+s}\right] \cdot 1_{t\le 8}\right) \cdot mpcr \cdot p.$$

$$= \left(1 + \sum_{s=1}^{9-t} \left[\frac{t}{t+s}\right] \cdot 1_{t\le 8}\right) \cdot mpcr \cdot p.$$

Thus, we obtain the following:

$$\frac{\lambda^{t+1}}{t} = \begin{cases} \frac{1}{t}\left(1 + \sum_{s=1}^{9-t} \frac{t}{t+s} 1_{t\le 8}\right) \cdot mpcr \cdot p, & \text{if } t \le 9. \\ 0, & \text{if } t = 10. \end{cases}$$

$\frac{\partial H_t}{\partial c_{it}} = -1 + mpcr + \frac{1}{t}\left(1 + \sum_{s=1}^{9-t} \frac{t}{t+s} 1_{t\le 8}\right) \cdot mpcr \cdot p$ when $t < 10$. Here, $\frac{1}{t} \cdot mpcr \cdot p$ is a potential gain in period $t + 1$ from contributing marginal amounts in period t, and $\frac{1}{t}\sum_{s=1}^{9-t} \frac{t}{t+s} 1_{t\le 8} \cdot mpcr \cdot p$ is the sum of the potential gains in periods $t + 2$ through 10 from the marginal contribution in period t. We also see that $\frac{\partial H_t}{\partial c_{it}} = -1 + mpcr < 0$ when $t = 10$, as $\frac{\lambda^{t+1}}{t} = 0$ (i.e. there is no gain by building a good reputation). From this, we find that a selfish payoff maximiser *i* contributes nothing in period 10 with certainty, but, in earlier period, *t*, the subject contributes A_0 if $\frac{\partial H_t}{\partial c_{it}} > 0$. The subject keeps contributing A_0 until the period before the period such that $-1 + mpcr + \frac{1}{t}\left(1 + \sum_{s=1}^{9-t} \frac{t}{t+s} 1_{t\le 8}\right) \cdot mpcr \cdot p$ becomes negative for the first time. In other words, the duration of cooperation, *k*, is such that

$$k = max\left\{t \in X\colon -1 + mpcr + \frac{1}{t}\left(1 + \sum_{s=1}^{9-t} \frac{t}{t+s} 1_{t\le 8}\right) \cdot mpcr \cdot p > 0\right\},$$

where X is a set consisting of positive integers up to 9, and then, the subject contributes 0 in period $k + 1$ and afterwards. ■

Condition (A.1) in Proposition 1 gives us the threshold concerning the percentage of conditional cooperators (p) in the population so that a selfish payoff maximiser *i* chooses to cooperate in each periods in the environment. The relationship between *k* and *p* is summarised as follows by mpcr:

Table A1. *k in the above prediction and the percentage of conditional cooperators, p.*

	The duration of cooperation, by a selfish payoff maximiser *i* (*k*)								
mpcr	1	2	3	4	5	6	7	8	9
0.65	19.0% $\leq p <$ 29.4%	29.4% $\leq p <$ 40.5%	40.5% $\leq p <$ 54.1%	54.1% $\leq p <$ 72.2%	72.2% $\leq p <$ 98.7%	98.7% $\leq p \leq$ 100%	n.a.	n.a	n.a
0.85	6.2% $\leq p <$ 9.6%	9.6% $\leq p <$ 13.3%	13.3% $\leq p <$ 17.7%	17.7% $\leq p <$ 23.7%	23.7% $\leq p <$ 32.3%	32.3% $\leq p <$ 46.6%	46.6% $\leq p <$ 74.7%	74.7% $\leq p \leq$ 100%	n.a

Notes: These solutions apply for play of a 10 period finitely-repeated game in which *i* is the only sophisticated selfish player, *p* is the proportion of conditionally cooperative players, and remaining players always contribute 0. All numbers in the ranges of *p* are not exact numbers, but are rounded up to the first decimal points.

For example, if mpcr is 0.65 (the efficiency factor is 1.3) and if p = 25%, then a selfish payoff maximiser *i* decides to cooperate only in period 1, after which she changes to full free-riding. The calculations are for the purpose of providing benchmarks only, but they show that a selfish payoff maximiser *i* holds materially strong reputation building motives only in very early rounds in the *LG* treatment. The incentive to build a good reputation depends heavily on mpcr. We see that if mpcr is 0.85 (the efficiency factor is 1.7) and if p = 25%, a selfish payoff maximiser *i* cooperates in periods 1 through 5, which is a relatively longer duration; after which he or she changes to full free-riding.

Also, Table A1 reveals that the incentive to build reputation is largely dependent on *p*. For example, a selfish payoff maximiser *i*, if p = 50%, instead of p = 25%, chooses to contribute until period 3 and to fully defect in period 4 and afterwards with mpcr of 0.65; but, chooses to cooperate until period 7 and to fully free ride in period 8 and afterwards with mpcr of 0.85. Kamei (2011) calculated the percentage of conditional cooperators at Brown University, Rhode Island, using the strategy method developed by Fischbacher et al. (2001), finding that it is around

50%.[3] The numerical calculation above indicates that in our sample cooperation may sustain for a longer duration in the *HG* treatment, whereas it may be similarly high in very early periods but may quickly collapse in the *LG* treatment.

Note that a selfish payoff maximiser *i* does not have an incentive to cooperate in period 9 with mpcr of 0.65 or 0.85 according to Table A1; if mpcr were, however, extremely high, say, 0.95, though not our experimental parameter, then, the cooperation sustains until period 9 for the community with $p > 47.4\%$.

These considerations using the numerical calculations give us the following additional predictions.

COROLLARY 1. *A selfish payoff maximiser i is more likely to cooperate for a longer duration with mpcr of 0.85 than with mpcr of 0.65.*

Thus far, we've taken as a given that conditional cooperators are individuals who choose to match the expected contribution of their counterpart. One way to rationalise such behaviour is to assume that conditional cooperator *j* can be described by the Fehr-Schmidt (1999) utility function, with inequality averse preferences: $u_j(\pi_j, \pi_m) = \pi_j - \alpha_j \cdot max\{\pi_m - \pi_j, 0\} - \beta_j \cdot max\{\pi_j - \pi_m, 0\}$, where $0 < \beta_j < \alpha_j$. The choice of the Fehr-Schmidt model is due to its tractability; conditional cooperation behaviour can also be explained by other types of social preference models such as reciprocity models. Then, a similar partial equilibrium analysis indicates that if *p* is high enough that $p > \frac{1}{\alpha_j + \beta_j}\{1 + \alpha_j - mpcr\}$, *j* cooperates in the final round.

PROPOSITION 2. *Suppose that all conditional cooperators have the average past contribution of A_{10} in period 10. Also suppose that the percentage of conditional cooperators is large enough*

[3] In the experiment of the present paper, the percentages of subjects that contributed positive amounts in period 10 of phase 1 were 35.0% and 57.5% in the *HI-LG* and *HI-HG* treatments, respectively. As pointed out in our paper, contributing in the last period gives only a lower-bound indication of conditional cooperation, because a conditional cooperator who expects their counterpart to contribute 0 also contributes 0. The smaller share of positive contributors in the *HI-LG* treatment may be largely due to diminished expectations that others will contribute in period 10, thanks to much lower contributions as that period approaches. Placing slightly more weight on the 57.5% share for this reason, these numbers are broadly consistent with the estimate of Kamei (2011).

that $> max_j \frac{1}{\alpha_j+\beta_j}\left\{1+\alpha_j - mpcr\right\}$ *. Finally, suppose that each conditional cooperator treats the probability that her period 10 counterpart is a conditional cooperator as equal to p.*[4] *Then, there exists an equilibrium in which all conditional cooperators choose to contribute* A_{10} *in the last round.*

<u>Proof</u>: In order to derive this prediction, all we have to do is to show that there is no incentive for a conditional cooperator to defect from the mutual cooperation equilibrium.

Assume that all conditional cooperators except *j* contributes the average past contribution amounts of their counterpart (i.e., A_{10}) in Period 10. Then, a conditional cooperator *j*'s utility function is expressed as:

$$u_j(c_{j10}) = 10 - c_{j10} + mpcr \cdot \left(c_{j10} + p \cdot A_{10}\right) - p \cdot \alpha_j \cdot \left(c_{j10} - A_{10}\right)1_{A_{10}<c_{j10}}$$
$$-p \cdot \beta_j \cdot \left(A_{10} - c_{j10}\right)1_{A_{10}>c_{j10}} - (1-p) \cdot \alpha_j \cdot c_{j10}.$$

Here, *j* meets with a selfish free-rider with a probability of $1-p$, and incurs a disutility $\alpha_j \cdot c_{j10}$ due to a disadvantageous disutility, which is the last term in the above utility function, $-(1-p) \cdot \alpha_j \cdot c_{j10}$.

The first-order condition reduces to:

$$\frac{\partial u_j}{\partial c_{j10}} = \begin{cases} -1 + mpcr - p \cdot \alpha_j - (1-p) \cdot \alpha_j, & if\ A_{10} < c_{j10} \\ -1 + mpcr + p \cdot \beta_j - (1-p) \cdot \alpha_j, & if\ A_{10} > c_{j10} \end{cases}.$$

From this, we know that $\frac{\partial u_j}{\partial c_{j10}} < 0$ if $A_{10} < c_{jt}$, as *mpcr* < 1 always. Also, since we assume that $p > max_j \frac{1}{\alpha_j+\beta_j}\left\{1+\alpha_j - mpcr\right\}$, $\frac{\partial u_j}{\partial c_{j10}} > 0$ when $A_{10} > c_{j10}$. This means that $c_{j10} = A_{10}$ is *j*'s optimal contribution. ■

Reference

Fehr, E. and Schmidt, K. (1999). 'A theory of fairness, competition, and cooperation', *Quarterly Journal of Economics*, vol. 114(3), pp. 817-868.

[4] This simplifies by disregarding information subjects in the experiment may be able to use to identify the type of their counterpart if *k* < 9.

Fischbacher, U., Gächter, S. and Fehr, E. (2001). ‘Are People Conditionally Cooperative? Evidence from a Public Goods Experiment’, *Economics Letters*, vol. 71(3), pp. 397-404.

Kamei, K. (2011). ‘From Locality to Continent: A Comment on the Generalization of an Experimental Study’, *Journal of Socio-Economics*, vol. 41(2), pp. 207-10.

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Appendix B. Additional Analysis, Tables and Figures.

Table B1. *Average Contribution by Treatment, and Related Non-Parametric Test Results*

(1) Average contribution by phase

Treatment		Phase 1		Phase 2		Phase 3		Phase 4	
		1st period	Average	1st period	Average	1st period	Average	1st period	Average
	I. Factor of 1.3								
	Low info	3.73	2.58	2.08	1.50	1.68	1.27	1.10	1.31
	Medium info	4.85	3.60	5.38	3.31	5.90	3.75	6.13	3.62
	High info	4.88	2.92	6.45	3.63	7.90	4.19	8.28	4.68
	II. Factor of 1.7								
	Low info	6.28	5.35	4.88	4.55	5.60	4.25	5.05	4.21
	Medium info	7.02	5.86	8.22	6.34	8.76	7.15	9.02	7.12
	High info	7.70	7.14	8.50	7.33	9.03	7.52	9.08	7.53

(2) Did contributions rise over the phases?

(2-1) Set-level Wilcoxon signed ranks tests

Treatment		Comparison of the <u>average</u> contribution by phase				Comparison of the <u>first</u> periods within phase			
		Phase 1 vs. 2	Phase 2 vs. 3	Phase 3 vs. 4	Phase 1 vs. 4	Phase 1 vs. 2	Phase 2 vs. 3	Phase 3 vs. 4	Phase 1 vs. 4
	I. Factor of 1.3								
	Low info	.0679*	.1441	.7150	.0679*	.0679*	.1441	.0947*	.0679*
	Medium info	.1441	.4652	.4652	1.000	.4615	.7150	.3573	.0679*
	High info	.1441	.2733	.4652	.0679*	.0679*	.0679*	.2733	.0679*
	II. Factor of 1.7								
	Low info	.1441	.4652	.7150	.2733	.4652	.4652	.0947*	.2733
	Medium info	.1380	.0782*	.6858	.2249	.1380	.0782*	.6858	.0431**
	High info	.5775	.7150	1.0000	.7150	.1441	.1615	.8415	.1441

Notes: Numbers are *p*-value (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Treatment	Comparison of the average contribution during periods 1 – 5 by phase				Comparison of the average contribution during periods 1 – 7 by phase			
	Phase 1 vs. 2	Phase 2 vs. 3	Phase 3 vs. 4	Phase 1 vs. 4	Phase 1 vs. 2	Phase 2 vs. 3	Phase 3 vs. 4	Phase 1 vs. 4
I. Factor of 1.3								
Low info	.7150	.7150	.0679*	.1441	.7150	1.0000	.1441	.1441
Medium info	.0679*	.4652	.7127	.4652	.4652	.2733	1.0000	.7150
High info	.0679*	.2733	.2733	.0679*	.0679*	.2733	.4652	.0679*
II. Factor of 1.7								
Low info	.2733	.4652	.0679*	.4652	.1441	.4652	.4652	.2733
Medium info	.1380	.1380	.0796*	.0431**	.0431**	.0431**	.5002	.0431**
High info	.0679*	.5775	.5775	.0679*	.1441	.5775	.0947*	.0679*

Notes: Numbers are *p*-value (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(2-2) Individual-level Wilcoxon signed ranks tests

Treatment	Comparison of the <u>average</u> contribution by phase				Comparison of the <u>first</u> periods within phase			
	Phase 1 vs. 2	Phase 2 vs. 3	Phase 3 vs. 4	Phase 1 vs. 4	Phase 1 vs. 2	Phase 2 vs. 3	Phase 3 vs. 4	Phase 1 vs. 4
I. Factor of 1.3								
Low info	.0001***	.0739**	.7044	.0005***	.0007***	.0056***	.0028***	.0000***
Medium info	.3054	.1120	.4319	.7983	.1212	.0852*	.3721	.0660*
High info	.0813*	.0222**	.2484	.0000***	.0094***	.0003***	.0041***	.0000***
II. Factor of 1.7								
Low info	.0974*	.1635	.5869	.0016***	.1072	.6050	.2950	.0274**
Medium info	.1269	.0218**	.5172	.0029***	.0147**	.0165**	.0167**	.0002***
High info	.8983	.7707	.3169	.5674	.0741*	.0155**	.2247	.0023***

Notes: Numbers are *p*-value (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

		Comparison of the average contribution during periods 1 – 5 by phase				Comparison of the average contribution during periods 1 – 7 by phase			
		Phase 1 vs. 2	Phase 2 vs. 3	Phase 3 vs. 4	Phase 1 vs. 4	Phase 1 vs. 2	Phase 2 vs. 3	Phase 3 vs. 4	Phase 1 vs. 4
Treatment	I. Factor of 1.3								
	Low info	.0001***	.0435**	.3095	.0001***	.0000***	.0380**	.4026	.0001***
	Medium info	.6518	.0672*	.5725	.2462	.5496	.0612*	.8219	.2447
	High info	.0094***	.0141**	.0268**	.0000***	.0274**	.0180**	.0406**	.0000***
	II. Factor of 1.7								
	Low info	.3318	.1554	.6871	.1073	.1027	.0703*	.5167	.0242**
	Medium info	.0081***	.0056***	.0939*	.0000***	.0147**	.0034***	.5432	.0000***
	High info	.0062***	.0862*	.0546*	.0001***	.0359**	.2227	.0380**	.0001***

Notes: Numbers are *p*-value (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Results:

In the LI-LG treatment, the per-phase average contribution decreased over the phases. Also, the first contributions decreased over the phases (periods 1, 11, 21) in this treatment. The decreasing trends are sometimes significant at the 10% level according to set-level Wilcoxon signed ranks tests, but are significant at the 5% or 1% level according to individual-level Wilcoxon signed ranks tests.

In the HI-LG treatment, by contrast, the first contributions increased over the phases. The increase in the first contribution, based on a comparison between those in phase 1 and phase 4, is significant at the 10% level according to a set-level Wilcoxon signed ranks test, and at the 1% level according to an individual-level Wilcoxon signed ranks test.

In the HG treatments, with the MI or HI condition, the first contributions rose over the phases. The increase in the contribution, based on a comparison between phase 1 and phase4, is significant at the 5% level under the MI condition according to set-level Wilcoxon signed ranks test, and at the 1% level under each condition according to individual-level Wilcoxon signed ranks test.

(3) Did contributions rise or decline within phases?

(3-1) Average Contributions in Periods 1 to 4 and in Periods 5 to 8

		Phase 1		Phase 2		Phase 3		Phase 4	
		Pds 1−4	Pds 5−8	Pds 1−4	Pds 5−8	Pds 1−4	Pds 5−8	Pds 1−4	Pds 5−8
Treatment	I. Factor of 1.3								
	Low info	3.457	2.250	1.975	1.413	1.594	1.213	1.263	1.413
	Medium info	4.656	3.313	4.506	3.303	5.050	3.644	5.169	3.413
	High info	3.963	2.600	5.306	3.075	6.388	3.431	7.081	4.075
	II. Factor of 1.7								
	Low info	6.119	5.25	5.15	4.525	4.913	4.131	5.088	4.169
	Medium info	6.615	5.995	7.62	6.365	8.68	7.54	8.945	7.61
	High info	7.444	7.481	8.244	7.763	8.781	8.006	9.156	8.125

(3-2) Wilcoxon signed ranks tests: Average contributions in Periods 1−4 versus Period 5−8

		Set-level test				Individual-level test			
		Phase 1	Phase 2	Phase 3	Phase 4	Phase 1	Phase 2	Phase 3	Phase 4
Treatment	I. Factor of 1.3								
	Low info	.0679*	.1441	.2733	.4652	.0011***	.0331**	.1731	.4795
	Medium info	.0679*	.0679*	.0679*	.0679*	.0132**	.0007***	.0011***	.0001***
	High info	.0679*	.0679*	.0679*	.0679*	.0000***	.0000***	.0000***	.0000***
	II. Factor of 1.7								
	Low info	.0679*	.1441	.1441	.0679*	.0497**	.3619	.0347**	.0872*
	Medium info	.2249	.0431**	.0431**	.0431**	.2333	.0001***	.0098***	.0001***
	High info	.7150	.0947*	.0679*	.0679*	.4462	.1060	.0142**	.0032***

Notes: Numbers are *p*-value (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Results:

In both LG and HG treatments, regardless of the difference in the information conditions, in most comparisons, the average contributions in periods 5−8 are significantly lower than those in periods 1−4 at the 10% or sometimes at the 5% level, according to set-level Wilcoxon signed ranks tests, and often at the 1% level according to individual-level Wilcoxon signed ranks tests.

(4) The difference in average contribution between the treatments: "Set-level" Mann Whitney test results

(4a) Phase 1

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	.3865	.8845	.0209**	.0143**	.0209**
Medium info	----	----	.5637	.03865**	.05**	.0833*
High info	----	----	----	.0833*	.0275**	.0433**
II. Factor of 1.7						
Low info	----	----	----	----	.4624	.1489
Medium info	----	----	----	----	----	.1416
High info	----	----	----	----	----	----

(4b) Phase 2

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	.1489	.0433**	.0209**	.0143**	.0209**
Medium info	----	----	1.000	.3865	.0275**	.0833*
High info	----	----	----	.3865	.0275**	.0433**
II. Factor of 1.7						
Low info	----	----	----	----	.1416	.0833*
Medium info	----	----	----	----	----	.4624
High info	----	----	----	----	----	----

(4c) Phase 3

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	.0833*	.0833*	.0833*	.0143**	.0209**
Medium info	----	----	1.000	.5637	.0275**	.0433**
High info	----	----	----	.7728	.0275**	.0433*
II. Factor of 1.7						
Low info	----	----	----	----	.500	.0833*
Medium info	----	----	----	----	----	.8065
High info	----	----	----	----	----	----

(4d) Phase 4

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	.1489	.0209**	.1489	.0143**	.0209**
Medium info	----	----	.5637	.5637	.0275**	.0209**
High info	----	----	----	.7728	.0864*	.0833*
II. Factor of 1.7						
Low info	----	----	----	----	.0864*	.0833*
Medium info	----	----	----	----	----	.6242
High info	----	----	----	----	----	----

Notes: Numbers are *p*-value (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

	(4e) Period 1 (First period in Phase 1)						(4f) Period 11 (First period in Phase 2)					
	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)			I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low info	Medium info	High info	Low info	Medium info	High info	Low info	Medium info	High info	Low info	Medium info	High info
I. Factor of 1.3												
Low info	----	.3065	.0421**	.0204**	.0139**	.0202**	----	.0209**	.0202**	.0294**	.0143**	.0209**
Medium info	----	----	1.000	.1102	.0143**	.0591*	----	----	.3836	.7728	.5000	.0833*
High info	----	----	----	.1489	.1430	.1489	----	----	----	.3065	.2129	.1465
II. Factor of 1.7												
Low info	----	----	----	----	.6242	.1489	----	----	----	----	.0500**	.0433**
Medium info	----	----	----	----	----	.2207	----	----	----	----	----	.6242
High info	----	----	----	----	----	----	----	----	----	----	----	----

	(4g) Period 21 (First period in Phase 3)						(4h) Period 31 (First period in Phase 4)					
	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)			I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low info	Medium info	High info	Low info	Medium info	High info	Low info	Medium info	High info	Low info	Medium info	High info
I. Factor of 1.3												
Low info	----	.0194**	.0202**	.0202**	.0135*	.0202**	----	.0209**	.0209**	.0209**	.0143**	.0209**
Medium info	----	----	.0814*	.8839	.0194**	.0202**	----	----	.0433**	.6631	.0143**	.0209**
High info	----	----	----	.3865	.0639*	.0833*	----	----	----	.1489	.1761	.1913
II. Factor of 1.7												
Low info	----	----	----	----	.0491**	.0433**	----	----	----	----	.0500**	.0433**
Medium info	----	----	----	----	----	.5316	----	----	----	----	----	.8065
High info	----	----	----	----	----	----	----	----	----	----	----	----

Notes: Set-level Mann-Whitney test. Numbers are *p*-value (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Results:

The average contribution in the LI-HG treatment is significantly higher than that in the LI-LG treatment in Phases 1 to Phase 3 at the 5% or at the 10% level, but the difference is not significant in Phase 4. The average contributions in the MI-HG treatment and in the HI-HG treatment are significantly higher than those in the MI-LG and HI-LG treatment in each phase, often at the 5% level and sometimes as the 10% level.

In the LG treatments, the average contribution is significantly higher with the HI condition than that with the LI condition at the 5% level in Phases 2 and 4, and at the 10% level in Phase 3.

In the HG treatments, the average contribution is significantly higher with the HI condition than that with the LI condition in Phases 2, 3, and 4 at the 10% level. In Phase 4, the average contribution is also significantly higher with the MI condition than that with the LI condition at the 10% level.

The first contribution is significantly higher in the HI-LG treatment and in the MI-LG treatment than in the LI-LG treatment, at the 5% level in Phases 2, 3 and 4.

The first contribution is significantly higher in the HI-HG treatment and in the MI-HG treatment than in the LI-HG treatment, at the 5% level in Phases 2, 3 and 4.

(5) The difference in average contribution between the treatments: “Individual-level” Mann Whitney test results

	(5a) Phase 1						(5b) Phase 2					
	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)			I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low info	Medium info	High info	Low info	Medium info	High info	Low info	Medium info	High info	Low info	Medium info	High info
I. Factor of 1.3												
Low info	----	.0787*	.4640	.0007***	.0000***	.0000***	----	.0127**	.0004***	.0003***	.0000***	.0000***
Medium info	----	----	.1269	.0298**	.0007***	.0000***	----	----	.3861	.2031	.0000***	.0000***
High info	----	----	----	.0023***	.0000***	.0000***	----	----	----	.3755	.0000***	.0000***
II. Factor of 1.7												
Low info	----	----	----	----	.6315	.0336**	----	----	----	----	.0001***	.0000***
Medium info	----	----	----	----	----	.0271**	----	----	----	----	----	.0898*
High info	----	----	----	----	----	----	----	----	----	----	----	----

	(5c) Phase 3						(5d) Phase 4					
	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)			I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low info	Medium info	High info	Low info	Medium info	High info	Low info	Medium info	High info	Low info	Medium info	High info
I. Factor of 1.3												
Low info	----	.0000***	.0000***	.0002***	.0000***	.0000***	----	.0001***	.0000***	.0004***	.0000***	.0000***
Medium info	----	----	.2831	.6157	.0000***	.0000***	----	----	.0748*	.6292	.0000***	.0000***
High info	----	----	----	.9118	.0000***	.0000***	----	----	----	.4464	.0000***	.0000***
II. Factor of 1.7												
Low info	----	----	----	----	.0001***	.0000***	----	----	----	----	.0002***	.0001***
Medium info	----	----	----	----	----	.2311	----	----	----	----	----	.3341
High info	----	----	----	----	----	----	----	----	----	----	----	----

Notes: Individual-level Mann-Whitney test. Numbers are *p*-value (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(5e) Period 1 (First period in Phase 1)

	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low info	Medium info	High info	Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	.2188	.1356	.0074***	.0000***	.0000***
Medium info	----	----	.9532	.1229	.0123**	.0018***
High info	----	----	----	.1356	.0000***	.0000***
II. Factor of 1.7						
Low info	----	----	----	----	.6135	.2612
Medium info	----	----	----	----	----	.3468
High info	----	----	----	----	----	----

(5f) Period 11 (First period in Phase 2)

	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low info	Medium info	High info	Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	.0004***	.0000***	.0152**	.0000***	.0000***
Medium info	----	----	.2831	.6731	.0004***	.0001***
High info	----	----	----	.1367	.0016***	.0004***
II. Factor of 1.7						
Low info	----	----	----	----	.0004***	.0002***
Medium info	----	----	----	----	----	.3848
High info	----	----	----	----	----	----

(5g) Period 21 (First period in Phase 3)

	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low info	Medium info	High info	Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	.0000***	.0000***	.0001***	.0000***	.0000***
Medium info	----	----	.0437**	.8544	.0000***	.0000***
High info	----	----	----	.0490**	.0019***	.0002***
II. Factor of 1.7						
Low info	----	----	----	----	.0001***	.0000***
Medium info	----	----	----	----	----	.3626
High info	----	----	----	----	----	----

(5h) Period 31 (First period in Phase 4)

	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low info	Medium info	High info	Low info	Medium Info	High info
I. Factor of 1.3						
Low info	----	.0000***	.0000***	.0000***	.0000***	.0000***
Medium info	----	----	.0398**	.2498	.0001***	.0000***
High info	----	----	----	.0008***	.0138**	.0016***
II. Factor of 1.7						
Low info	----	----	----	----	.0000***	.0000***
Medium info	----	----	----	----	----	.3176
High info	----	----	----	----	----	----

Notes: Individual-level Mann-Whitney test. Numbers are *p*-value (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Table B2. *Test Results for the Equality of the Coefficients of Variables (a) through (e) across the treatments in Table 2 (supplementing the regression analysis in Table 2 of "Play it Again")*

(I) For equality of the coefficients of variable (a):

		Treatment					
		LI-LG	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
Treatment	*LI-LG*	----	.0313***	.0000***	.4353	.0000***	.0005***
	MI-LG	----	----	.0063***	.1691	.0239**	.1822
	HI-LG	----	----	----	.0000***	.5321	.1608
	LI-HG	----	----	----	----	.0002***	.0068***
	MI-HG	----	----	----	----	----	.3931

Notes: Two-sided F test. Numbers in the panel are *p*-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively. For this test, we first jointly estimated the coefficients of all variables using a pooled regression, and then performed F tests.

(II) For equality of the coefficients of variable (b):

		Treatment					
		LI-LG	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
Treatment	*LI-LG*	----	.0001***	.0000***	.5607	.0000***	.0000***
	MI-LG	----	----	.0021***	.0007**	.0009***	.5289
	HI-LG	----	----	----	.0000***	.9356	.0142**
	LI-HG	----	----	----	----	.0000***	.0001***
	MI-HG	----	----	----	----	----	.0077***

Notes: Two-sided F test. Numbers in the panel are *p*-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively. For this test, we first jointly estimated the coefficients of all variables using a pooled regression, and then performed F tests.

(III) For equality of the coefficients of variable (c):

Treatment		*LI-LG*	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
Treatment	*LI-LG*	----	.0004***	.0000***	.7373	.0000***	.0000***
	MI-LG	----	----	.0000***	.0015**	.0004***	.3145
	HI-LG	----	----	----	.0000***	.1706	.0002***
	LI-HG	----	----	----	----	.0000***	.0000***
	MI-HG	----	----	----	----	----	.0117**

Notes: Two-sided F test. Numbers in the panel are *p*-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively. For this test, we first jointly estimated the coefficients of all variables using a pooled regression, and then performed F tests.

(IV) For equality of the coefficients of variable (d):

Treatment		*LI-LG*	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
Treatment	*LI-LG*	----	.0010***	.0000***	.3597	.0777*	.8216
	MI-LG	----	----	.0139**	.0167**	.0844*	.0021***
	HI-LG	----	----	----	.0000***	.0000***	.0000***
	LI-HG	----	----	----	----	.4238	.4899
	MI-HG	----	----	----	----	----	.1268

Notes: Two-sided F test. Numbers in the panel are *p*-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively. For this test, we first jointly estimated the coefficients of all variables using a pooled regression, and then performed F tests.

(V) For equality of the coefficients of variable (e):

		Treatment					
		LI-LG	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
Treatment	*LI-LG*	----	.0000***	.0000***	.0061***	.0000***	.0000***
	MI-LG	----	----	.0003***	.0001***	.1334	.5558
	HI-LG	----	----	----	.0000***	.0191**	.0000***
	LI-HG	----	----	----	----	.0000***	.0006***
	MI-HG	----	----	----	----	----	.0340**

Notes: Two-sided F test. Numbers in the panel are *p*-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively. For this test, we first jointly estimated the coefficients of all variables using a pooled regression, and then performed F tests.

Table B3. *Trends of Average Contributions by Treatment: Regression Analyses (supplementing the regression analysis in Table 2 of "Play it Again")*

Case 1: Dependent variable: Set average contributions during periods 1 to 10 of each phase.

	Group account efficiency					
	Factor of 1.3 (*LG*)			Factor of 1.7 (*HG*)		
Independent Variable	Low info (1)	Medium info (2)	High info (3)	Low info (4)	Medium info (5)	High info (6)
Phase variable {= 1, 2, 3, 4}	-0.40*** (0.10)	.049 (0.16)	0.58*** (0.13)	-0.37** (0.15)	0.46*** (0.13)	0.13 (0.15)
Constant	2.68*** (0.27)	3.45*** (0.43)	2.41*** (0.36)	5.53*** (0.42)	5.47*** (0.37)	7.05*** (0.40)
# of Observations	16	16	16	16	20	16
F	16.44	0.10	19.58	5.97	11.86	0.84
Prob > F	.0019	.7577	.0010	.0327	.0040	.3790
R-Squared	.3917	.0011	.1607	.0464	.1773	.0100

Notes: Set fixed effects linear regressions. The dependent variables are set-level average contribution during periods 1 to 7. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Case 2: Dependent variable: Set average contributions during periods 1 to 7 of each phase.

	Group account efficiency					
	Factor of 1.3 (*LG*)			Factor of 1.7 (*HG*)		
Independent Variable	Low info (1)	Medium info (2)	High info (3)	Low info (4)	Medium info (5)	High info (6)
Phase variable {= 1, 2, 3, 4}	-0.54*** (0.11)	0.21 (0.17)	0.86*** (0.16)	-0.33* (0.18)	0.75*** (0.13)	0.46** (0.15)
Constant	3.20 (0.30)	3.78*** (0.47)	2.65*** (0.43)	5.86*** (0.49)	5.76*** (0.35)	7.11*** (0.41)
# of Observations	16	16	16	16	20	16
F	24.03	1.47	29.57	3.45	34.02	9.31
Prob > F	.0005	.2507	.0002	.0902	.0000	.0110
R-Squared	.5223	.0152	.2698	.0315	.3611	.1078

Notes: Set fixed effects linear regressions. The dependent variables are set-level average contribution during periods 1 to 7 of each phase. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Table B4. *Non-parametric Test Results for the difference of average last period that subjects contribute a positive amount, across phases or across treatments (supplementing the analysis in Table 3 of "Play it Again")*

(1) Did the last period that subjects contribute a positive amount become earlier and earlier over the phases? (Test of earlier decay feature)

(1-1) Set-level Wilcoxon-signed ranks tests

		Comparison of the average last period in which a subject contributed a positive amount, by treatment					
		Phase 1 vs. 2	Phase 1 vs. 3	Phase 1 vs. 4	Phase 2 vs. 3	Phase 2 vs. 4	Phase 3 vs. 4
Treatment	I. Factor of 1.3						
	Low info	.1441	.0679*	.0656*	.1441	.1441	.2733
	Medium info	.2733	.0947*	.0679*	.2733	.0656*	.4652
	High info	1.000	.1441	.4652	.7150	.0679*	.7150
	II. Factor of 1.7						
	Low info	.0947*	.0679*	.0679*	.1975	.0679*	.0679*
	Medium info	.0422**	.2249	.0796*	.2249	.5002	.0568*
	High info	.0679*	.0656*	.0588*	1.000	.0947*	.0656*

Notes: Numbers are *p*-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(1-2) Individual-level Wilcoxon-signed ranks tests

		Comparison of the last periods in which a subject selected a positive amount by treatment					
		Phase 1 vs. 2	Phase 1 vs. 3	Phase 1 vs. 4	Phase 2 vs. 3	Phase 2 vs. 4	Phase 3 vs. 4
Treatment	I. Factor of 1.3						
	Low info	.0013***	.0001***	.0004***	.0442**	.0172**	.5937
	Medium info	.0932*	.0015***	.0002***	.0292**	.0112**	.1947
	High info	.3500	.1023	.0206**	.1296	.0205**	.2851
	II. Factor of 1.7						
	Low info	.1951	.0374**	.0001***	.3654	.0016***	.0048***
	Medium info	.0291**	.0314**	.0005***	.3275	.1708	.0085***
	High info	.0509*	.0005***	.0000***	.0726*	.0219**	.0057***

Notes: Numbers are *p*-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Results: In the HG treatments, the average last period in which subjects contributed a positive amount became earlier in Phase 2 compared with Phase 1, and also in Phase 4 compared with Phase 3; the differences are significant at the 10% level (in Phase 2 at the 5% level for the MI-HG treatment) according to set-level Wilcoxon signed ranks tests. Results are similar in Phase 2 but are stronger in Phase 4 when individual-level Wilcoxon signed ranks tests are used.

In the LI-LG treatment and the MI-LG treatment, the average last periods in which subjects contributed a positive amount became earlier in Phase 2 compared with Phase 1, and also in Phase 3 compared with Phase 2; the differences are significant according to individual-level Wilcoxon signed ranks tests. The average last period in which subjects contributed positive amounts in the LI-LG treatment and MI-LG treatment are significantly earlier in Phase 4 compared with Phase 1 at the 10% level according to a set-level Wilcoxon signed ranks test.

(2) Between-treatment difference in the last period in which a subject contributed a positive amount: Set-level Mann Whitney test results

(2a) Phase 1

	I. Factor of 1.3 (*LG*) Low Info	I. Factor of 1.3 (*LG*) Medium info	I. Factor of 1.3 (*LG*) High info	II. Factor of 1.7 (*HG*) Low Info	II. Factor of 1.7 (*HG*) Medium info	II. Factor of 1.7 (*HG*) High info
I. Factor of 1.3						
Low info	----	.2482	.2482	.4678	.0143**	.0202**
Medium info	----	----	1.000	.4678	.3893	.0421*
High info	----	----	----	.4678	.3893	.0759*
II. Factor of 1.7						
Low info	----	----	----	----	.0143**	.0202**
Medium info	----	----	----	----	----	.0639*
High info	----	----	----	----	----	----

(2b) Phase 2

	I. Factor of 1.3 (*LG*) Low Info	I. Factor of 1.3 (*LG*) Medium info	I. Factor of 1.3 (*LG*) High info	II. Factor of 1.7 (*HG*) Low Info	II. Factor of 1.7 (*HG*) Medium info	II. Factor of 1.7 (*HG*) High info
I. Factor of 1.3						
Low info	----	.1102	.0833*	.3094	.0275**	.0209**
Medium info	----	----	.7728	.8845	.1416	.0433**
High info	----	----	----	.5637	.3231	.0591*
II. Factor of 1.7						
Low info	----	----	----	----	.1099	.0433**
Medium info	----	----	----	----	----	.1761
High info	----	----	----	----	----	----

(2c) Phase 3

	I. Factor of 1.3 (*LG*) Low Info	I. Factor of 1.3 (*LG*) Medium info	I. Factor of 1.3 (*LG*) High info	II. Factor of 1.7 (*HG*) Low Info	II. Factor of 1.7 (*HG*) Medium info	II. Factor of 1.7 (*HG*) High info
I. Factor of 1.3						
Low info	----	.2454	.1489	.0833*	.0139**	.0209**
Medium info	----	----	.7715	.7715	.1383	.1465
High info	----	----	----	.7728	.0851*	.0294**
II. Factor of 1.7						
Low info	----	----	----	----	.0139**	.0209**
Medium info	----	----	----	----	----	.1743
High info	----	----	----	----	----	----

(2d) Phase 4

	I. Factor of 1.3 (*LG*) Low Info	I. Factor of 1.3 (*LG*) Medium info	I. Factor of 1.3 (*LG*) High info	II. Factor of 1.7 (*HG*) Low Info	II. Factor of 1.7 (*HG*) Medium info	II. Factor of 1.7 (*HG*) High info
I. Factor of 1.3						
Low info	----	.1102	.0433**	.2482	.0143**	.0209**
Medium info	----	----	.7728	.7728	.0500**	.0209**
High info	----	----	----	.7728	.2683	.1102
II. Factor of 1.7						
Low info	----	----	----	----	.0500**	.0209**
Medium info	----	----	----	----	----	.2683
High info	----	----	----	----	----	----

Notes: Numbers are *p*-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(3) Between-treatment difference in the last period in which a subject contributed a positive amount: Individual-level Mann Whitney test results

(3a) Phase 1

	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low Info	Medium info	High info	Low Info	Medium info	High info
I. Factor of 1.3						
Low info	----	.3867	.5110	.4712	.0192**	.0010***
Medium info	----	----	.8003	.9602	.1469**	.0059***
High info	----	----	----	.8383	.0871*	.0031***
II. Factor of 1.7						
Low info	----	----	----	----	.1881	.0157**
Medium info	----	----	----	----	----	.1187
High info	----	----	----	----	----	----

(3b) Phase 2

	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low Info	Medium info	High info	Low Info	Medium info	High info
I. Factor of 1.3						
Low info	----	.2620	.3177	.2385	.0186**	.0012**
Medium info	----	----	.7474	.5690	.1084	.0027***
High info	----	----	----	.6155	.0248**	.0002***
II. Factor of 1.7						
Low info	----	----	----	----	.1858	.0371**
Medium info	----	----	----	----	----	.1595
High info	----	----	----	----	----	----

(3c) Phase 3

	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low Info	Medium info	High info	Low Info	Medium info	High info
I. Factor of 1.3						
Low info	----	.0152**	.0338**	.0371**	.0002***	.0001***
Medium info	----	----	.5145	.3145	.0016***	.0003***
High info	----	----	----	.4102	.0018***	.0001***
II. Factor of 1.7						
Low info	----	----	----	----	.2367	.1168
Medium info	----	----	----	----	----	.3459
High info	----	----	----	----	----	----

(3d) Phase 4

	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low Info	Medium info	High info	Low Info	Medium info	High info
I. Factor of 1.3						
Low info	----	.0749*	.0165**	.0871*	.0002***	.0001***
Medium info	----	----	.3745	.5732	.0005***	.0000***
High info	----	----	----	.9806	.0037***	.0001***
II. Factor of 1.7						
Low info	----	----	----	----	.0647*	.0142**
Medium info	----	----	----	----	----	.2396
High info	----	----	----	----	----	----

Notes: Numbers are *p*-values (2-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Results:

[Comparison across the different information conditions:]

In the LG treatments, the average last period in which subjects contributed a positive amount is significantly earlier in the LI condition than in the HI condition at the 10% level in Phase 2, and at the 5% level in Phase 4, according to set-level Mann-Whitney tests.

In the HG treatments, the average last period in which subjects contributed a positive amount is significantly earlier in the LI condition than in the MI or in the HI condition in each phase (except the comparison between the LI and MI conditions in Phase 2) according to set-level Mann-Whitney tests.

[Comparison between the different factors, 1.3 (LG) versus 1.7 (HG):]

In the LI condition, the average last period is significantly later with Factor 1.7 than with Factor 1.3 at the 10% level in Phase 3 according to a set-level Mann-Whitney test. In the MI condition, the average last period is significantly later with Factor 1.7 than with Factor 1.3 at the 5% level in Phase 4 according to a set-level Mann-Whitney test. In the HI info condition, the average last period is significantly later with Factor 1.7 than with Factor 1.3, at the 10% level in Phases 1 and 2, and at the 5% level in Phase 3, according to set-level Mann-Whitney tests. Results are more strongly significant if we use individual-level Mann-Whitney tests.

Table B5. *End-effects Behaviour by Phase and Treatment.* In this table, we examine how subject *i* made his or her contribution decision in the tenth period of a given phase if subject *i* has always contributed 10 so far in the phase and subject *j* (*i*'s partner in that period) has also only contributed 10 so far in that phase, inasmuch as subject *i* can know.

This analysis is a supplementary analysis for Tables 3 of "Play it Again" and Table B4 of this Appendix.

Although we found, as indicated by Figure 2 of "Play it Again," that the majority of subjects chose 0 in the tenth period of each phase other than Phase 1 of the *HI-HG* treatment, and that the last periods in which subjects contributed positive amounts to their joint account became earlier over the phases, it is still interesting to see how subject *i* was playing in the last period of a phase under the following circumstance: subject *i* has always contributed 10 so far and *j* (*i*'s partner in the tenth period) has also only contributed 10 so far, at least inasmuch as subject *i* can know.[5]

By studying these cases, we can examine: (a) whether anyone has enough faith in their counterparts to be conditionally cooperative, and is himself conditionally cooperative, in that he contributes even in the last period, and (b) whether or not a "personal" connection between subject *i* and subject *j* (that is, having interacted together for some number of periods during the current phase) influences that faith (or alternatively, simply the desire to avoid being the only one who defects).

We counted eligible cases only in the *MI* and the *HI* treatments, since cooperation collapsed quickly in the *LI* treatments.

It turned out that the eligible cases are relatively few in our sample. We found 36 cases in the *MI* treatments and 3 cases in the *HI* treatments. We see that out of the 36 and the 3 cases, a substantial number of cases (17 cases out of the 39 cases), or subjects (13 out of 23 subjects) also contributed 10 in one of the tenth periods. This suggests that nearly half of high contributors were genuine conditional cooperators in the sense that they did not wish to contribute zero when there seemed to them to be a real chance that their counterpart would contribute a positive amount (in our terms, that their counterpart was a genuine conditional cooperator who would not automatically defect because the last period of the phase had arrived). As argued in the paper, this kind of estimate should be viewed as "lower bound" in nature since some of the remaining 10 subjects may also have been conditional cooperators but had less optimistic beliefs about their counterparts. Detailed results are summarised on the next pages.

[5] In the *MI* treatments, this condition reduces to the conditions that (1) Subject *j* has always contributed 10 when he or she was matched with subject *i* so far; (2) Subject *j*'s recorded average past contribution as of the tenth period of the phase is 10.

(1) *LG* treatments

	Information Condition							
	Medium info				High info			
	Phase 1	Phase 2	Phase 3	Phase 4	Phase 1	Phase 2	Phase 3	Phase 4
# of all eligible cases	0	0	2	1	0	0	0	1
Contribution decision in Period 10								
(a) 10	N/A	N/A	2 (100%)	1 (100%)	N/A	N/A	N/A	1 (100%)
(b) Between 5 and 9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(c) Between 1 and 4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(d) 0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes: Numbers in the table are the numbers of the eligible cases, and numbers in parenthesis are the percentages of those who contributed either 10 (in row (a)), between 5 and 9 (in row (b)), between 1 and 4 (in row (c)) and 0 (in row (d)), out of all of the eligible cases.

(2) *HG* treatments

	Information Condition							
	Medium info				High info			
	Phase 1	Phase 2	Phase 3	Phase 4	Phase 1	Phase 2	Phase 3	Phase 4
# of all eligible cases	0	8	13	12	0	1	0	1
Contribution decision in Period 10								
(a) 10	N/A	5 (62.5%)	4 (30.8%)	3 (25%)	N/A	1 (100%)	N/A	N/A
(b) Between 5 and 9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(c) Between 1 and 4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(d) 0	N/A	3 (37.5%)	9 (69.2%)	9 (75%)	N/A	N/A	N/A	1 (100%)

Notes: Numbers in the table are the numbers of the eligible cases, and numbers in parenthesis are the percentages of those who contributed either 10 (in row (a)), between 5 and 9 (in row (b)), between 1 and 4 (in row (c)) and 0 (in row (d)), out of all of the eligible cases.

Table B6. *Explaining end-of –phase (period 10, 20, etc.) contribution decisions by negative experience with past end-of-phase partners' contribution decisions (supplementing the analysis in Table 3 of "Play it Again," and Tables B4 and B5 in the Appendix)*

Dependent Variable: Subject *i*'s contribution decision in period $t \in \{10, 20, 30, 40\}$

Independent Variable	*MI-HG*	*HI-HG*
Phase 2 dummy {= 1 if Phase =2; 0 otherwise}	-3.41 (4.06)	-4.19 (3.99)
Phase 3 dummy {= 1 if Phase =3; 0 otherwise }	-9.86* (5.32)	-10.4** (4.98)
Phase 4 dummy {= 1 if Phase =4; 0 otherwise }	-15.2** (5.98)	-15.5*** (5.83)
Average recorded past contribution of the counterpart[1]	2.03*** (0.64)	1.35 (0.84)
Maximum deviation of a past counterpart's contribution in period $t \in \{8, 9, 10\}$ from that past counterpart's (recorded) past average contribution[2]	-0.88* (0.53)	-1.86*** (0.69)
Maximum deviation of a past counterpart's contribution in period $t \in \{5, 6, 7\}$ from that past counterpart's (recorded) past average contribution[3]	0.53 (0.55)	1.10 (0.88)
Constant	-14.7*** (5.66)	-5.96 (7.82)
# of Observations	200	160
Log likelihood	-213.7	-170.4
Wald Chi-squared	18.68	19.21
Prob > Wald Chi-squared	.0047	.0038

Notes: Random Effects Tobit regressions. The numbers of left-(right-) censored observations are 139(30) in column (1) and 103(33) in column (2).

[1] See Table B11 as for the method of calculating this variable in the *MI-HG* treatment.

[2] By deviation, we refer to the drop in a counterpart *j*'s contribution in a late period (8, 9 or 10) relative to what a naïve subject *i* would have expected *j* to contribute using *j*'s past average contribution (in *MI* treatments, recorded past average contribution) as the estimate.

[3] Same as previous variable except refers to earlier periods (5, 6 or 7) of a phase.

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

Table B7. *Determinants of Ranking Decisions in the MI and HI treatments*

(A) Regression results

Dependent variable: Rank given to subject *j* in Period *t*.

Independent Variable	Group account efficiency: Factor of 1.3 (*LG*) Medium info (1)	Factor of 1.3 (*LG*) High info (2)	Factor of 1.7 (*HG*) Medium info (3)	Factor of 1.7 (*HG*) High info (4)
(a) subject *j*'s Average Previous Contribution	-0.42*** (0.0078)	-0.43*** (0.0089)	-0.44*** (0.0084)	-0.53*** (0.012)
(b) share of past periods for which information is included	-0.93*** (0.10)	----	-0.82*** (0.093)	----
Constant	5.45*** (0.14)	5.32*** (0.10)	6.82*** (0.10)	7.42*** (0.15)
# of Observations	6345	7200	8210	7200
Log Likelihood	-9508.9	-11452.1	-12886.4	-11587.3
Chi-squared	3235.5	2314.8	2869.4	1896.3
Prob > Chi-squared	0.000	0.000	0.000	0.000

Notes: Individual random effect Tobit regressions. Only observations whose variable (b) is greater than 0 are used. The numbers of left-(right-) censored observations are 1379(1236) in column (1), 1440(1440) in column (2), 1729(1540) in column (3) and 1440(1440) in column (4). Ex-post efficiency of the ranking procedure is measured by calculating the bivariate correlations between matched pairs' their past contribution decisions, whose results are found in Appendix Tables B10 and B11. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(B) Test Results for the Equality of the Coefficients of Variables (a) and (b) across treatments in Panel (A)

(I) For the equality of coefficients on Variable (a) (*j*'s average past contribution)

		Treatment			
		MI-LG	*HI-LG*	*MI-HG*	*HI-HG*
Treatment	*MI-LG*	----	.7132	.2445	.0075***
	HI-LG	----	----	.4448	.0039***
	MI-HG	----	----	----	.0001***

Notes: Two-sided Chi-squared test results. Numbers in the table are *p*-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively. For this test, we first jointly estimated the coefficients of all variables using a pooled regression, and then performed Chi-squared tests.

(II) For the equality of coefficients on Variable (b) (share of past periods for which information is included)

Two-sided Chi-squared test results: *p*-value = .0017***

Notes: *** indicate significance at the .01 level. For this test, we first jointly estimated the coefficients of all variables using a pooled regression, and then performed Chi-squared tests.

Table B8. *A Regression Analysis for Strategic Ranking Behaviour of Those Whose Average Past Contributions are Lower*

(I) Regression Result

Dependent variable: A binary variable which equals 1 if a subject did not give his or her highest rank to the highest contributor in the other subgroup of five; 0 otherwise.

Independent Variable	*HI* treatment Factor of 1.3 (*LG*) (1)	 Factor of 1.7 (*HG*) (2)
$\dfrac{\text{The average past contribution of the person who is going to rank}}{\text{The maximum average past contribution among the five in the other subgroup of five}}$. {This variable is a proxy of the relative contribution standing of the person who is going to rank}	-1.02*** (0.16)	-1.43*** (0.28)
(a) Phase 2 dummy {=1 if Phase 2; 0 otherwise}	0.11 (0.12)	-0.38*** (0.14)
(b) Phase 3 dummy {=1 if Phase 3; 0 otherwise}	0.54*** (0.12)	-0.40*** (0.15)
(c) Phase 4 dummy {=1 if Phase 3; 0 otherwise}	0.43*** (0.13)	-0.80*** (0.17)
Period~~s~~ within phase {= 1, 2, …, 9, 10}	0.089*** (0.017)	0.10*** (0.022)
Constant	-1.11*** (0.22)	-0.77*** (0.30)
# of Observations	1440	1440
Log likelihood	-629.88	-370.66
Wald Chi-squared	86.24	70.56
Prob > Wald Chi-squared	.0000	.0000

Notes: Individual random effect probit regressions. "Highest rank" refers to best rank, namely a rank of 1. All observations but period 1 are used.*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(II) A Test for the equality of the coefficients of the "The ratio of the average past contribution of the person who is going to rank, to the maximum average past contribution among the five in the other subgroup" variable between column (1) and column (2)

Two-sided Chi-squared test results: p-value = .3174

Note: For this test, we first jointly estimated the coefficients of all variables using a pooled regression, then performed Chi-squared tests.

Table B9. *Determinants of Ranking Decisions in the Low Information treatments*

Dependent variable: Rank given to subject *j* in Period *t*

Independent Variable	*LI-LG* (1)	*LI-HG* (2)
(a) Subject *j*'s Perceived Average Previous Contribution	-0.12*** (0.012)	-0.072*** (0.0071)
(b) The Number of Interaction with Subject *j* prior to Period *t*	0.052 (0.035)	-0.37*** (0.032)
Constant	3.17*** (0.040)	3.55*** (0.048)
# of Observations	6495	6385
Log Likelihood	-11302.2	-11041.5
Chi-squared	101.4	231.7
Prob > Chi-squared	0.000	0.000

Notes: Individual random effect Tobit regressions. Only observations whose variable (a) is defined are used. The numbers of left-censored observations are 1299 in column (1), and 1277 in column (2); numbers of right-censored observations are identical, since subjects are required to assign both the minimum and the maximum rank (as well as each of the intervening ranks) in every period..
*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Remark: The subjects' potential partners' perceived average contribution in period *t* are calculated as follows:

(1) If a subject had interacted with a potential partner (which s/he would rank in period *t*) before period *t*, the average of the partner's past contributions during their periods of interaction is used as the potential partner's contribution;

(2) If the subject hadn't interacted with the potential partner, the median of the average contributions made by potential partners with whom he has interacted at least once is used.

Table B10. *Pearson's Bivariate Correlation Coefficients between subjects' own actual standing (relative past average contribution) and partner's*

Calculation Methods:

Step 1: We arrange each subject's five potential period *t* partners' actual average past contributions in a descending order, and then give a number to each of them from 1 to 5; a subject with higher average past contribution decision is ranked with a smaller number. We call the numbers the "standing of subjects" (from 1^{st} to 5^{th}).

Step 2: Likewise, we calculate each subject's own standing (from 1^{st} to 5^{th}) within the group of five amongst whom he is compared by prospective partners in period *t*.

In Step 1 and Step 2, actual average past contribution of subject *i* in period $t \in \{2, 3, ..., 10\}$ is calculated by the average of *i*'s $t - 1$ past contribution decisions.

Step 3: We calculate Pearson's bivariate correlation coefficients between pairs, separately for each treatment.

If the ranking procedure and partner assignment algorithm matched like-minded or at least like-behaving subjects (high contributors with high contributors, low contributors with low contributors) as a pair, then, the bivariate correlation coefficients would be more highly positive and significant.

We calculate the bivariate correlation coefficients for each treatment period by period, using all pairings in a given treatment and period without regard to the subject set or session in which each pair arises.

The bivariate correlation coefficients are not calculated in the first period of each phase since average past contribution information is entirely unavailable in that period so pairings should be effectively random.

(1) *LI-LG* treatment

	Pearson's correlation	*p* -value (two-sided)
Period 1	N/A	N/A
Period 2	0.116	0.475
Period 3	0.565***	0.000
Period 4	0.022	0.892
Period 5	0.196	0.224
Period 6	0.634***	0.000
Period 7	-0.095	0.561
Period 8	0.179	0.268
Period 9	-0.006	0.973
Period 10	0.079	0.626
Period 11	N/A	N/A
Period 12	0.639***	0.000
Period 13	-0.244	0.128
Period 14	0.045	0.781
Period 15	0.531***	0.000
Period 16	-0.484***	0.001
Period 17	-0.077	0.636
Period 18	0.375**	0.017
Period 19	0.087	0.595
Period 20	-0.045	0.782
Period 21	N/A	N/A
Period 22	0.256	0.111
Period 23	0.128	0.431
Period 24	0.474***	0.002
Period 25	0.472***	0.002
Period 26	-0.281*	0.078
Period 27	0.41***	0.008
Period 28	0.596***	0.000
Period 29	0.148	0.362
Period 30	0.319**	0.045
Period 31	N/A	N/A
Period 32	0.779***	0.000
Period 33	0.244	0.129
Period 34	0.172	0.288
Period 35	-0.055	0.737
Period 36	0.857***	0.000
Period 37	0.231	0.152
Period 38	0.213	0.187
Period 39	0.659***	0.000
Period 40	0.523***	0.001

Notes: The actual standing variable of a subject in period t is calculated based on the average contributions up to (and including) period t-1 of five subjects in his subgroup: the actual standing variable equals $x \in \{1, 2, \ldots, 5\}$ if his average past contribution is the x^{th} highest among the five subjects. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(2) *MI-LG* treatment

	Pearson correlation	p-value (two-sided)
Period 1	N/A	N/A
Period 2	0.064	0.696
Period 3	-0.003	0.983
Period 4	0.136	0.402
Period 5	0.741***	0.000
Period 6	0.457***	0.003
Period 7	0.732***	0.000
Period 8	0.472***	0.002
Period 9	0.558***	0.000
Period 10	0.498***	0.001
Period 11	N/A	N/A
Period 12	0.412***	0.008
Period 13	0.444***	0.004
Period 14	0.144	0.375
Period 15	0.598***	0.000
Period 16	0.566***	0.000
Period 17	0.59***	0.000
Period 18	0.175	0.279
Period 19	0.562***	0.000
Period 20	0.432***	0.005
Period 21	N/A	N/A
Period 22	0.055	0.735
Period 23	0.512***	0.001
Period 24	0.583***	0.000
Period 25	0.84***	0.000
Period 26	0.653***	0.000
Period 27	0.567***	0.000
Period 28	0.646***	0.000
Period 29	0.63***	0.000
Period 30	0.606***	0.000
Period 31	N/A	N/A
Period 32	0.5***	0.001
Period 33	0.169	0.296
Period 34	0.491***	0.001
Period 35	0.479***	0.002
Period 36	0.298*	0.062
Period 37	0.497***	0.001
Period 38	0.534***	0.000
Period 39	0.466***	0.002
Period 40	0.742***	0.000

Notes: The actual standing variable of a subject in period t is calculated based on the average contributions up to (and including) period t-1 of five subjects in his subgroup: the actual standing variable equals $x \in \{1, 2, \ldots, 5\}$ if his average past contribution is the x^{th} highest among the five subjects. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(3) *HI-LG* treatment

	Pearson's correlation	p -value (two-sided)
Period 1	N/A	N/A
Period 2	0.536***	0.000
Period 3	0.639***	0.000
Period 4	0.882***	0.000
Period 5	0.783***	0.000
Period 6	0.959***	0.000
Period 7	0.837***	0.000
Period 8	0.779***	0.000
Period 9	0.865***	0.000
Period 10	0.763***	0.000
Period 11	N/A	N/A
Period 12	0.657***	0.000
Period 13	0.882***	0.000
Period 14	0.875***	0.000
Period 15	0.632***	0.000
Period 16	0.825***	0.000
Period 17	0.867***	0.000
Period 18	0.911***	0.000
Period 19	0.82***	0.000
Period 20	0.567***	0.000
Period 21	N/A	N/A
Period 22	0.551***	0.000
Period 23	0.606***	0.000
Period 24	0.727***	0.000
Period 25	0.593***	0.000
Period 26	0.69***	0.000
Period 27	0.81***	0.000
Period 28	0.658***	0.000
Period 29	0.582***	0.000
Period 30	0.725***	0.000
Period 31	N/A	N/A
Period 32	0.572***	0.000
Period 33	0.512***	0.001
Period 34	0.656***	0.000
Period 35	0.816***	0.000
Period 36	0.934***	0.000
Period 37	0.808***	0.000
Period 38	0.597***	0.000
Period 39	0.32**	0.044
Period 40	0.675***	0.000

Notes: The actual standing variable of a subject in period t is calculated based on the average contributions up to (and including) period t-1 of five subjects in his subgroup: the actual standing variable equals $x \in \{1, 2, \ldots, 5\}$ if his average past contribution is the x^{th} highest among the five subjects. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(4) *LI-HG* treatment

	Pearson's correlation	*p* -value (two-sided)
Period 1	N/A	N/A
Period 2	0.124	0.446
Period 3	0.265*	0.097
Period 4	-0.009	0.958
Period 5	0.045	0.781
Period 6	-0.010	0.950
Period 7	0.265*	0.097
Period 8	0.382**	0.015
Period 9	0.294*	0.065
Period 10	0.172	0.288
Period 11	N/A	N/A
Period 12	0.243	0.131
Period 13	0.499***	0.001
Period 14	-0.049	0.762
Period 15	0.108	0.508
Period 16	0.211	0.191
Period 17	0.38**	0.015
Period 18	0.542***	0.000
Period 19	0.256	0.111
Period 20	0.276*	0.084
Period 21	N/A	N/A
Period 22	-0.339**	0.032
Period 23	0.371**	0.018
Period 24	0.163	0.316
Period 25	0.426***	0.006
Period 26	0.328**	0.038
Period 27	0.066	0.684
Period 28	0.092	0.573
Period 29	0.31*	0.052
Period 30	0.398**	0.011
Period 31	N/A	N/A
Period 32	0.110	0.501
Period 33	0.116	0.477
Period 34	-0.193	0.233
Period 35	0.286*	0.074
Period 36	0.166	0.307
Period 37	0.363**	0.021
Period 38	0.645***	0.000
Period 39	0.347**	0.028
Period 40	0.49***	0.001

Notes: The actual standing variable of a subject in period t is calculated based on the average contributions up to (and including) period t-1 of five subjects in his subgroup: the actual standing variable equals $x \in \{1, 2, \ldots, 5\}$ if his average past contribution is the x^{th} highest among the five subjects. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(5) *MI-HG* treatment

	Pearson correlation	p -value (two-sided)
Period 1	N/A	N/A
Period 2	0.362**	0.010
Period 3	0.414***	0.003
Period 4	0.371***	0.008
Period 5	0.463***	0.001
Period 6	0.129	0.370
Period 7	0.394***	0.005
Period 8	0.476***	0.000
Period 9	0.641***	0.000
Period 10	0.596***	0.000
Period 11	N/A	N/A
Period 12	0.184	0.200
Period 13	0.148	0.305
Period 14	0.597***	0.000
Period 15	0.506***	0.000
Period 16	0.635***	0.000
Period 17	0.782***	0.000
Period 18	0.734***	0.000
Period 19	0.48***	0.000
Period 20	0.288**	0.042
Period 21	N/A	N/A
Period 22	0.259*	0.069
Period 23	0.514***	0.000
Period 24	0.577***	0.000
Period 25	-0.097	0.504
Period 26	0.586***	0.000
Period 27	0.523***	0.000
Period 28	0.354**	0.011
Period 29	0.599***	0.000
Period 30	0.62***	0.000
Period 31	N/A	N/A
Period 32	0.000	1.000
Period 33	0.071	0.622
Period 34	0.263*	0.065
Period 35	0.54***	0.000
Period 36	0.551***	0.000
Period 37	0.408***	0.003
Period 38	0.463***	0.001
Period 39	0.264*	0.064
Period 40	0.602***	0.000

Notes: The actual standing variable of a subject in period t is calculated based on the average contributions up to (and including) period t-1 of five subjects in his subgroup: the actual standing variable equals $x \in \{1, 2, \ldots, 5\}$ if his average past contribution is the x^{th} highest among the five subjects. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(6) *HI-HG* treatment

	Pearson's correlation	p -value (two-sided)
Period 1	N/A	N/A
Period 2	0.58***	0.000
Period 3	0.584***	0.000
Period 4	0.55***	0.000
Period 5	0.719***	0.000
Period 6	0.556***	0.000
Period 7	0.696***	0.000
Period 8	0.703***	0.000
Period 9	0.469***	0.002
Period 10	0.814***	0.000
Period 11	N/A	N/A
Period 12	0.391**	0.012
Period 13	0.808***	0.000
Period 14	0.333**	0.036
Period 15	0.979***	0.000
Period 16	0.585***	0.000
Period 17	0.79***	0.000
Period 18	0.76***	0.000
Period 19	0.589***	0.000
Period 20	0.614***	0.000
Period 21	N/A	N/A
Period 22	0.497***	0.001
Period 23	0.347**	0.028
Period 24	0.61***	0.000
Period 25	0.716***	0.000
Period 26	0.505***	0.001
Period 27	0.803***	0.000
Period 28	0.529***	0.000
Period 29	0.551***	0.000
Period 30	0.456***	0.003
Period 31	N/A	N/A
Period 32	0.359**	0.023
Period 33	0.581***	0.000
Period 34	0.378**	0.016
Period 35	0.551***	0.000
Period 36	0.675***	0.000
Period 37	0.607***	0.000
Period 38	0.46***	0.003
Period 39	0.52***	0.001
Period 40	0.769***	0.000

Notes: The actual standing variable of a subject in period t is calculated based on the average contributions up to (and including) period t-1 of five subjects in his subgroup: the actual standing variable equals $x \in \{1, 2, \ldots, 5\}$ if his average past contribution is the x^{th} highest among the five subjects. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Table B11. *Pearson's Bivariate Correlation Coefficients between subjects' own recorded/perceived contribution standing and partner's recorded/perceived standing*

This analysis differs from that of Table B10 in that here we check the performance of the ranking procedure and matching algorithm with respect to pairing like individuals in terms only of the information available to the subjects themselves, rather than in terms of their actual full histories of contribution in a given phase.

In the *LI* treatment, in each ranking stage, subjects possessed knowledge of the past contributions of potential partner only if the pair had already interacted during the phase. This knowledge was available thanks to the identification of prospective partners by (within phase) fixed IDs, and the display of feedback on the partner's contribution at the end of each period.

In the *MI* treatment, in each ranking stage, subjects were shown the past contribution of potential partners taking into account only those periods randomly selected (with probability 50%) to be recorded for inclusion in this tally. (Recollection of potential partners' actions in past interactions within the current phase based on ID numbers, as in the *LI* treatment, was also possible.)

We calculate Pearson's bivariate correlation coefficients based only on their interaction experiences in the *LI* treatment, and only on their recorded average past contributions in the *MI* treatment.

Calculation Methods:

[In the *MI* treatment:]

Step 1: We arrange five potential partners' "recorded" average past contribution decisions in an descending order. If no average past contributions of a subject have been recorded, then, the median of the contribution decisions of all others among the five whose contribution decisions have been recorded at least once is assigned to that subject as his or her average past contribution. Based on these average numbers, we assign a standing number to each of them from 1 to 5 so that a subject with a higher average past contribution decision is ranked with a smaller number. We call the number the "recorded/perceived standing of subjects" (from 1st to 5th), as opposed to the actual standing of subjects.

Step 2: Likewise, we calculate each subject's own recorded/perceived standing (from 1st to 5th), based on her recorded/perceived average past contributions, within her own subset of five.

In Step 1 and Step 2, we do not use data for the period and subject set in question if all five individuals in either of the five person subsets have had no contribution decision recorded thus far in the phase.

Step 3: We calculate Pearson's bivariate correlation coefficients between pairs based on the recorded/perceived standing variable by treatment and by period.

If the ranking procedure matched like subjects as pairs, then, the bivariate correlation coefficients be large and significant.

Note that in this analysis, the bivariate correlation coefficients are not calculated in the first period of each phase, since average past contributions are never available in that period.

[In the *LI* treatment:]

Step 1: We calculate each of five potential partners' "perceived" or experienced average past contribution decisions, based on their interaction results so far, and then, arrange them in an descending order. If a subject has not interacted with some potential partners, then, the median of the contribution decisions of all other potential partners with whom the subject has interacted at least once is assigned to that subject. Based on these, we give a number to each of the five potential partners from 1 to 5 so that a subject with higher experienced average contribution decision is ranked with a smaller number. We call the number the "recorded/perceived standing of subjects" (from 1^{st} to 5^{th}) as in the *MI* treatment.[6]

Step 2: Likewise, we calculate each subject's own recorded/perceived standing (from 1^{st} to 5^{th}), based on their experienced average past contributions in his subset of five.

In Step 1 and Step 2, we do not use the data of a pair eventually matched for the period if one or both of the subjects had not yet interacted with any of her five potential partners.

Step 3: We calculate Pearson's bivariate correlation coefficients between pairs based on the recorded/perceived standing variable by treatment and by period.

Note that in these calculations, the bivariate correlation coefficients are not calculated not only in the first but also in the second period of each phase, since subjects will at most have had experience with only one other member of the potential partner sub-group, too few to allow assignment of relative ranks.

[6] In cases of tied contributions, we give all subjects concerned the same standing number, which is the first applicable integer. For example, suppose that five subjects have the average records 10, 5, 4 , 4, and 3, respectively. Then, the subject having 10 has standing rank 1, the subject with a record of 5 has standing rank 2, both subjects with a record of 4 have standing rank 3, and the subject whose past average contribution is 3 has standing rank 5.

(1) *LI-LG* treatment

	Pearson's correlation	*p* -value (two-sided)
Period 1	N/A	N/A
Period 2	N/A	N/A
Period 3	-0.143	0.379
Period 4	0.040	0.806
Period 5	-0.021	0.898
Period 6	0.306*	0.055
Period 7	0.279*	0.081
Period 8	-0.018	0.914
Period 9	-0.310*	0.051
Period 10	0.162	0.317
Period 11	N/A	N/A
Period 12	N/A	N/A
Period 13	0.467***	0.002
Period 14	0.253	0.114
Period 15	0.375**	0.017
Period 16	0.081	0.617
Period 17	0.121	0.457
Period 18	0.000	1.000
Period 19	-0.192	0.235
Period 20	-0.181	0.262
Period 21	N/A	N/A
Period 22	N/A	N/A
Period 23	-0.176	0.276
Period 24	0.200	0.216
Period 25	-0.103	0.528
Period 26	-0.104	0.523
Period 27	-0.015	0.926
Period 28	-0.089	0.585
Period 29	-0.002	0.992
Period 30	0.097	0.552
Period 31	N/A	N/A
Period 32	N/A	N/A
Period 33	-0.026	0.875
Period 34	0.283*	0.076
Period 35	0.000	1.000
Period 36	0.167	0.304
Period 37	0.286*	0.074
Period 38	-0.026	0.875
Period 39	0.201	0.212
Period 40	0.265*	0.098

Notes: The subjects' or their partners' perceived standing equals $x \in \{1, 2, \ldots, 5\}$ if his or her past perceived average contribution is the x^{th} highest among the five subjects in his or her subset. Subjects' potential partners' perceived average contributions in period *t* are calculated as follows: (1) If a subject had interacted with a potential partner (which s/he would rank in period *t*) before period *t*, the average of the partner's past contribution decisions in periods played with the subject is used as the potential partner's contribution; (2) If the subject hadn't interacted with the potential partner, the median of the average contributions made by potential partners with whom he has interacted at least once is used. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(2) *MI-LG* treatment

	Pearson correlation	p-value (two-sided)
Period 1	N/A	N/A
Period 2	0.007	0.966
Period 3	0.202	0.210
Period 4	0.483***	0.002
Period 5	0.599***	0.000
Period 6	0.627***	0.000
Period 7	0.684***	0.000
Period 8	0.756***	0.000
Period 9	0.571***	0.000
Period 10	0.797***	0.000
Period 11	N/A	N/A
Period 12	0.334**	0.035
Period 13	0.329**	0.038
Period 14	0.602***	0.000
Period 15	0.471***	0.002
Period 16	0.572***	0.000
Period 17	0.701***	0.000
Period 18	0.529***	0.000
Period 19	0.536***	0.000
Period 20	0.457***	0.003
Period 21	N/A	N/A
Period 22	0.395**	0.011
Period 23	0.331**	0.037
Period 24	0.544***	0.000
Period 25	0.535***	0.000
Period 26	0.621***	0.000
Period 27	0.573***	0.000
Period 28	0.439***	0.005
Period 29	0.343**	0.030
Period 30	0.726***	0.000
Period 31	N/A	N/A
Period 32	-0.118	0.468
Period 33	0.177	0.273
Period 34	0.644***	0.000
Period 35	0.621***	0.000
Period 36	0.685***	0.000
Period 37	0.723***	0.000
Period 38	0.886***	0.000
Period 39	0.550***	0.000
Period 40	0.691***	0.000

Notes: The recorded standing variable of a subject in period t equals $x \in \{1, 2, \ldots, 5\}$ if his or her past recorded/perceived average contribution is the x^{th} highest among the five potential partners. The standing variable in period t is calculated based on the recorded average contributions up to (and including) period $t-1$ of five subjects in his subgroup. If the subject's contribution has not been recorded by then, the median of other members' recorded average contributions in his subgroup is used. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(3) *LI-HG* treatment

	Pearson's correlation	*p* -value (two-sided)
Period 1	N/A	N/A
Period 2	N/A	N/A
Period 3	-0.143	0.379
Period 4	-0.099	0.544
Period 5	-0.212	0.188
Period 6	0.236	0.143
Period 7	0.032	0.843
Period 8	0.654***	0.000
Period 9	-0.341**	0.031
Period 10	0.380**	0.015
Period 11	N/A	N/A
Period 12	N/A	N/A
Period 13	0.444***	0.004
Period 14	0.063	0.702
Period 15	-0.026	0.875
Period 16	0.16	0.325
Period 17	0.061	0.708
Period 18	0.279*	0.081
Period 19	0.306*	0.055
Period 20	0.241	0.133
Period 21	N/A	N/A
Period 22	N/A	N/A
Period 23	0.314**	0.048
Period 24	0.048	0.770
Period 25	-0.067	0.683
Period 26	0.213	0.187
Period 27	0.16	0.325
Period 28	0.437***	0.005
Period 29	0.061	0.708
Period 30	-0.039	0.811
Period 31	N/A	N/A
Period 32	N/A	N/A
Period 33	0.283*	0.076
Period 34	-0.25	0.119
Period 35	0.121	0.457
Period 36	-0.008	0.959
Period 37	0.424***	0.006
Period 38	0.457***	0.003
Period 39	0.385**	0.014
Period 40	-0.25	0.119

Notes: The subjects' or their partners' perceived standing equals $x \in \{1, 2, \ldots, 5\}$ if his or her past perceived average contribution is the x^{th} highest among the five subjects in his or her subgroup. Subjects' potential partners' perceived average contributions in period t are calculated as follows: (1) If a subject had interacted with a potential partner (which s/he would rank in period t) before period t, the average of the partner's past contribution decisions in periods played with the subject is used as the potential partner's contribution; (2) If the subject hadn't interacted with the potential partner, the median of the average contributions made by potential partners with whom he has interacted at least once is used. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(4) *MI-HG* treatment

	Pearson correlation	*p* -value (two-sided)
Period 1	N/A	N/A
Period 2	0.004	0.978
Period 3	0.055	0.702
Period 4	0.515***	0.000
Period 5	0.738***	0.000
Period 6	0.579***	0.000
Period 7	0.497***	0.000
Period 8	0.642***	0.000
Period 9	0.726***	0.000
Period 10	0.550***	0.000
Period 11	N/A	N/A
Period 12	0.537***	0.000
Period 13	0.072	0.620
Period 14	0.225	0.116
Period 15	0.585***	0.000
Period 16	0.613***	0.000
Period 17	0.655***	0.000
Period 18	0.806***	0.000
Period 19	0.600***	0.000
Period 20	0.608***	0.000
Period 21	N/A	N/A
Period 22	0.047	0.746
Period 23	0.097	0.502
Period 24	0.535***	0.000
Period 25	0.192	0.180
Period 26	0.334**	0.018
Period 27	0.503***	0.000
Period 28	0.466***	0.001
Period 29	0.832***	0.000
Period 30	0.360**	0.010
Period 31	N/A	N/A
Period 32	0.387***	0.005
Period 33	0.545***	0.000
Period 34	0.450***	0.001
Period 35	0.503***	0.000
Period 36	0.560***	0.000
Period 37	0.357**	0.011
Period 38	0.550***	0.000
Period 39	0.329**	0.020
Period 40	0.441***	0.001

Notes: The recorded standing variable of a subject in period t equals $x \in \{1, 2, \ldots, 5\}$ if his or her past recorded/perceived average contribution is the x^{th} highest among the five subjects. The standing variable in period t is calculated based on the recorded average contributions up to (and including) period $t-1$ of five subjects in his subgroup. If the subject's contribution has not been recorded by then, the median of other members' recorded average contributions in his subgroup is used. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Table B12. *The Partial Correlation between Subjects' own and their partners' average past contributions*

(I) Between Subjects' own and their partners' *actual* average past contributions

(Ia) Dependent Variable: Subject's average contribution for all previous periods in Period *t*

Independent Variable	Factor of 1.3 (*LG*) Low info (1)	(2)	Medium info (3)	(4)	High info (5)	(6)	Factor of 1.7 (*HG*) Low info (7)	(8)	Medium info (9)	(10)	High info (11)	(12)
(a) Subject's period *t* partner average past contribution for all past periods	0.22*** (0.027)	0.22*** (0.027)	0.26*** (0.023)	0.25*** (0.022)	0.57*** (0.022)	0.55*** (0.022)	0.13*** (0.027)	0.12*** (0.026)	0.46*** (0.031)	0.42*** (0.030)	0.51*** (0.036)	0.47*** (0.034)
Constant	----	0.28*** (0.57)	----	3.42*** (0.60)	----	2.59*** (0.30)	----	4.07*** (1.13)	----	6.03*** (0.50)	----	6.18*** (0.54)
# of Observations	1440	1440	1440	1440	1440	1440	1440	1400	1800	1800	1440	1440
Log likelihood	-2214.8	-2214.7	-2717.7	-2705.8	-2936.8	-2914.7	-2255.3	-2249.4	-2873.3	-2836.3	-1914.5	-1881.8
F	69.3	67.8	135.4	128.4	656.7	649.6	23.7	21.6	226.4	205.6	202.0	194.5
Prob > F	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

Notes: Individual random effect Tobit regressions. Observations in all periods but period 1 are used. The numbers of left-(right-) censored observations are 567(37) in columns (1) and (2), 200(216) in columns (3) and (4), 58(154) in columns (5) and (6), 331(335) in columns (7) and (8), 39(821) in columns (9) and (10), 25(789) in columns (11) and (12). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(Ib) Tests for the equality of coefficients on variable (a) included in Appendix Table (Ia) (above)

Treatment		Treatment: Column (1)	Column (3)	Column (5)	Column (7)	Column (9)	Column (11)
Treatment	Column (1)	----	.4018	.0000***	.0110**	.0000***	.0000***
	Column (3)	----	----	.0000***	.0001***	.0000***	.0000***
	Column (5)	----	----	----	.0000***	.0004***	.2652
	Column (7)	----	----	----	----	.0000***	.0000***
	Column (9)	----	----	----	----	----	.0465**

Treatment		Treatment: Column (2)	Column (4)	Column (6)	Column (8)	Column (10)	Column (12)
Treatment	Column (2)	----	.2951	.0000***	.0196**	.0000***	.0000***
	Column (4)	----	----	.0000***	.0001***	.0000***	.0000***
	Column (6)	----	----	----	.0000***	.0005***	.2709
	Column (8)	----	----	----	----	.0000***	.0000***
	Column (10)	----	----	----	----	----	.0466**

Note: Two-sided Chi-squared tests. Numbers are *p*-values. For these tests, we first estimated pooled regressions of the relevant pair of columns to obtain the coefficient estimates, then performed then performed Chi-squared tests.
*, ** and *** indicate significance at the 0.10 level, at the .05 level and at the .01 level, respectively.

(II) Dependent Variable: Subject's average contribution for previously *recorded* periods as of period *t* (supplementing the regression analysis in (I) above)

	MI-LG		*MI-HG*	
Independent Variable	(1)	(2)	(3)	(4)
(a) Subject's period *t* partner's average past contribution for past periods for which information is recorded	0.48*** (0.031)	0.46** (0.031)	0.69*** (0.040)	0.63**** (0.038)
Constant	----	2.61*** (0.70)	----	5.15*** (0.58)
# of Observations	1166	1166	1530	1530
Log Likelihood	-2151.8	-2145.9	-2327.9	-2302.0
Chi-squared	234.5	225.0	294.1	275.8
Prob > Chi-squared	.0000	.0000	.0000	.0000

Notes: Individual random effect Tobit regressions. Only observations for which at least one past contribution has been recorded for both self and partner, so that variable (a) can be calculated are used. The numbers of left- (right-) censored observations are 209(224) in columns (1) and (2), 63(780) in columns (3) and (4).
*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(III) Between Subjects' own and their partners' *recorded/perceived* average past contributions (supplementing the analysis in (I)).

(IIIa) Dependent Variable: Subject's recorded/perceived average past contribution in Period *t*

Remark: See the description included in Table B11 concerning the method to calculate the recorded/perceived past average contribution.

Independent Variable	Factor of 1.3 (*LG*) Low info (1)	(2)	Medium info (3)	(4)	High info (5)	(6)	Factor of 1.7 (*HG*) Low info (7)	(8)	Medium info (9)	(10)	High info (11)	(12)
(a) Subject's period *t* partner's recorded/perceived average past contribution	0.23*** (0.046)	0.22*** (0.050)	0.41*** (0.032)	0.39*** (0.031)	0.57*** (0.022)	0.55*** (0.022)	0.32*** (0.056)	0.27*** (0.054)	0.94*** (0.032)	0.87*** (0.030)	0.51*** (0.036)	0.47*** (0.034)
Constant	----	0.055 (0.78)	----	3.20*** (0.61)	----	2.59*** (0.30)	----	3.62*** (0.65)	----	2.77*** (0.41)	----	6.18*** (0.54)
# of Observations	1214	1214	1430	1430	1440	1440	1186	1186	1950	1950	1440	1440
Log likelihood	-2139.7	-2139.7	-2843.2	-2832.5	-2936.8	-2914.7	-2433.0	-2420.5	-3260.1	-3241.9	-1914.5	-1881.8
F	25.2	20.0	163.8	153.4	656.7	649.6	32.9	24.7	873.8	824.8	202.0	194.5
Prob > F	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

Notes: Individual random effect Tobit regressions. The numbers of left- (right-) censored observations is 537 (20) in columns (1) and (2), 241 (280) in columns (3) and (4), 58 (154) in columns (5) and (6), 289 (271) in columns (7) and (8), 77 (913) in columns (9) and (10), 25 (789) in columns (11) and (12). Estimates in columns (5), (6), (11) and (12) are the same as those in Panel (Ia) above. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(IIIb) Tests for the equality of coefficients on variable (a) included in the Table (IIIa)

		Treatment					
		Column (1)	Column (3)	Column (5)	Column (7)	Column (9)	Column (11)
Treatment	Column (1)	----	.4018	.0000***	.0110**	.0000***	.0000***
	Column (3)	----	----	.0000***	.0001***	.0000***	.0000***
	Column (5)	----	----	----	.0000***	.0004***	.2652
	Column (7)	----	----	----	----	.0000***	.0000***
	Column (9)	----	----	----	----	----	.0465**

		Treatment					
		Column (2)	Column (4)	Column (6)	Column (8)	Column (10)	Column (12)
Treatment	Column (2)	----	.0006***	.0000***	.6255	.0000***	.0000***
	Column (4)	----	----	.0000***	.0001***	.0000***	.0000***
	Column (6)	----	----	----	.0000***	.0000***	.0838*
	Column (8)	----	----	----	----	.0000***	.0000***
	Column (10)	----	----	----	----	----	.0008**

Note: Two-sided Chi-squared tests. Numbers are *p*-values. For these tests, For these tests, we first estimated pooled regressions of the relevant pair of columns to obtain the coefficient estimates, then performed then performed Chi-squared tests.
*, ** and *** indicate significance at the 0.10 level, at the .05 level and at the .01 level, respectively.

Table B13. *The Distribution of the Number of Periods for Which Specific Pairing (i, j) was Realised by Phase and Treatment*

(1) Phase 1

# of periods for which specific (i, j) has been paired	*LI-LG*	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
1	38.5%	28.0%	30.5%	29.5%	29.2%	30.0%
2	15.5%	15.0%	13.5%	14.0%	14.8%	11.0%
3	6.5%	5.0%	7.0%	5.5%	6.4%	6.0%
4	2.0%	4.0%	2.5%	2.5%	2.8%	3.5%
5	0.0%	1.0%	1.0%	0.0%	1.2%	0.5%
6	0.5%	1.0%	0.5%	1.5%	0.8%	0.5%
7	0.0%	0.0%	0.5%	1.0%	0.0%	1.5%
8	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
9	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

(2) Phase 2

# of periods for which specific (i, j) has been paired	*LI-LG*	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
1	37.0%	29.5%	28.0%	25.0%	26.8%	29.5%
2	15.0%	13.5%	13.0%	14.0%	13.6%	11.5%
3	5.0%	7.0%	7.0%	5.0%	7.2%	5.5%
4	3.0%	3.5%	3.0%	2.0%	4.4%	2.0%
5	0.5%	1.0%	2.0%	2.0%	0.4%	1.5%
6	0.0%	0.0%	0.5%	1.0%	0.8%	2.0%
7	0.5%	0.5%	0.0%	0.5%	0.0%	0.5%
8	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
9	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%
10	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

(3) Phase 3

# of periods for which specific (i, j) has been paired	*LI-LG*	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
1	36.5%	27.5%	25.5%	30.0%	27.6%	26.0%
2	18.0%	15.0%	18.5%	16.0%	14.4%	15.5%
3	4.5%	8.5%	7.5%	6.5%	8.0%	4.5%
4	2.0%	3.5%	2.5%	2.5%	1.6%	4.5%
5	0.5%	0.0%	1.0%	0.5%	1.2%	1.0%
6	0.0%	0.5%	0.0%	1.0%	1.2%	0.5%
7	0.5%	0.0%	0.0%	0.0%	0.0%	0.5%
8	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
9	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

(4) Phase 4

# of periods for which specific (i, j) has been paired	*LI-LG*	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
1	32.5%	28.5%	25.0%	27.5%	28.0%	30.5%
2	12.0%	17.5%	18.5%	13.0%	12.4%	12.5%
3	6.0%	4.5%	7.0%	6.0%	8.8%	7.5%
4	0.5%	1.5%	3.0%	1.5%	2.4%	1.5%
5	1.5%	1.5%	1.0%	1.0%	0.8%	2.0%
6	1.5%	1.0%	0.0%	1.0%	1.2%	1.0%
7	1.0%	0.5%	0.0%	0.5%	0.0%	0.0%
8	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%
9	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Note. The pairing of a subject i and a subject j is said to endure or be realised for a certain number of periods of a phase regardless of interruptions. For example, if i and j are paired in a phase's periods 1, 2, 5 and 7 only, their pairing was for 4 periods; if they were paired in periods 4, 5, 6 and 7 only, their pairing is also of 4 period duration.

Table B14. *Gains due to a Longer Partnership with a Specific Partner*

(1) Average earnings by # of periods for which specific subject *i* and *j* were matched, by phase and treatment

(a) Phase 1

# of periods for which specific (*i*, *j*) has been paired	*LI-LG*	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
1	10.63	11.09	11.00	13.09	14.29	14.97
2	10.76	10.94	10.82	12.81	13.70	14.32
3	11.04	10.87	10.86	13.37	13.88	15.24
4	11.24	11.17	10.81	15.00	13.54	14.07
5	N/A	11.31	10.03	N/A	14.81	17.00
6	12.65	11.61	13.00	16.32	15.60	16.42
7	N/A	N/A	10.15	15.83	N/A	16.12
8	N/A	N/A	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A	N/A

(b) Phase 2

# of periods for which specific (*i*, *j*) has been paired	*LI-LG*	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
1	10.37	11.01	10.99	12.68	14.01	14.51
2	10.25	10.90	10.93	11.72	14.69	15.58
3	10.34	10.71	11.04	11.40	14.11	15.15
4	11.68	11.20	11.38	14.11	14.58	16.19
5	10.15	11.52	12.19	15.12	11.26	14.48
6	N/A	N/A	10.08	15.98	16.42	16.42
7	11.80	12.79	N/A	17.00	N/A	10.15
8	N/A	N/A	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	17.00	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A	N/A

(c) Phase 3

# of periods for which specific (i, j) has been paired	*LI-LG*	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
1	10.26	10.83	11.19	12.15	14.75	14.70
2	10.18	11.00	11.16	12.25	14.55	15.51
3	10.28	11.27	11.03	13.41	14.65	15.67
4	11.00	11.91	11.77	15.69	15.95	14.32
5	11.77	N/A	11.45	14.34	16.07	16.30
6	N/A	10.45	N/A	15.80	16.71	17.00
7	11.54	N/A	N/A	N/A	N/A	17.00
8	N/A	N/A	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A	N/A

(d) Phase 4

# of periods for which specific (i, j) has been paired	*LI-LG*	*MI-LG*	*HI-LG*	*LI-HG*	*MI-HG*	*HI-HG*
1	10.16	11.06	11.39	11.97	15.15	15.41
2	10.15	11.04	11.28	11.94	14.20	14.79
3	10.17	10.86	11.64	13.12	14.86	15.20
4	12.14	10.78	10.42	14.26	16.64	16.04
5	10.07	12.42	12.16	16.30	16.09	15.01
6	11.66	11.03	N/A	16.21	16.42	15.31
7	11.13	13.00	N/A	15.85	N/A	N/A
8	N/A	N/A	N/A	14.55	N/A	N/A
9	N/A	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A	N/A

(2) Test Results: Is a longer partnership beneficial for subjects?

Procedure – The method of testing the impact of a long partnership on earnings is:

Step 1: In each phase, for each subject, we identify (a) the partner with whom he or she played the most times in a given phase as well as (b) a partner with whom he or she played not more than 2 times and with whom the match was of the shortest duration for that subject in that phase.

Step 2: If the number of periods in (a) above is at least 4, and if a pair in (b) above also exists, we use the subject in this test.

Step 3: We calculate (c) that subject's average earnings in the longest relationship (in the pair (a)), and (d) his or her average earnings in the pairs in (b). If there are more than one pair in (c) (or (d)), we calculate the average of these.

Step 4: By using individual-level Wilcoxon signed ranks tests, we calculate whether the difference between (c) and (d) is significant or not.

	Treatment											
	LI-LG		*MI-LG*		*HI-LG*		*LI-HG*		*MI-HG*		*HI-HG*	
	# of obs.	*p*-value (two-sided)	# of obs.	*p*-value (two-sided)	# of obs.	*p*-value (two-sided)	# of obs.	*p*-value (two-sided)	# of obs.	*p*-value (two-sided)	# of obs.	*p*-value (two-sided)
Phase 1	10	.1394	24	.4237	18	.0741*	18	.0123**	21	.7151	24	.4154
Phase 2	16	.0299**	18	.7439	20	.1850	21	.0008***	24	.0741*	22	1.000
Phase 3	11	.0128**	12	.1167	14	.1981	15	.0782*	18	.1107	23	.6925
Phase 4	18	.0020***	17	.8870	15	.1914	18	.0346**	20	.2459	16	.4531

Notes: Individual-level Wilcoxon signed ranks test. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Results:

In the LI treatments, regardless of which factor, 1.3 (LG) or 1.7 (HG), is used, the average earnings of a pair appear to be larger as the duration of the partnership is longer. According to Wilcoxon signed ranks tests, the efficacy of longer partnership is significant in Phase 2 to 4 of the LI-LG treatment and in all four phases in the LI-HG treatment.

In the MI treatments, it appears that the effects of the longer partnership is weak or that no such effects exist; Wilcoxon signed ranks tests do not detect a significant difference in the average earnings between those with longer partnerships and those who interacted at most twice.

In the HI-HG treatments, the average earnings appear to be larger as the pairs have interacted more times in Phases 1 and 3; but, the increase is not significant, according to Wilcoxon signed ranks tests.

These results are suggestive only, since these are based on individual-level Wilcoxon signed ranks tests with small samples.

However, they suggest that repeated interaction with known partners is a key to more cooperative outcomes when subjects cannot form reputations with those they have not interacted with, whereas it is unimportant when they can do so.

(3) Individual-level Mann-Whitney tests for the differences in average earnings by treatment, for specific numbers of periods for which given (i, j) were paired

(a) Phase 1

	(i) # of periods for which specific (i, j) were paired = 1						(ii) # of periods for which specific (i, j) were paired = 2					
	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)			I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low info	Medium info	High info	Low info	Medium info	High info	Low info	Medium info	High info	Low info	Medium info	High info
I. Factor of 1.3												
Low info	----	.0751*	.0785*	.0004***	.0000***	.0000***	----	.5070	.2669	.0000***	.0000***	.0000***
Medium info	----	----	.7561	.0078***	.0000***	.0000***	----	----	.7677	.0001***	.0000***	.0000***
High info	----	----	----	.0127**	.0000***	.0000***	----	----	----	.0001***	.0000***	.0000**
II. Factor of 1.7												
Low info	----	----	----	----	.0091***	.0004***	----	----	----	----	.1749	.0081***
Medium info	----	----	----	----	----	.1372	----	----	----	----	----	.0895*
High info	----	----	----	----	----	----	----	----	----	----	----	----

	(iii) # of periods for which specific (i, j) were paired = 3						(iv) # of periods for which specific (i, j) were paired = 4					
	I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)			I. Factor of 1.3 (*LG*)			II. Factor of 1.7 (*HG*)		
	Low info	Medium info	High info	Low info	Medium info	High info	Low info	Medium info	High info	Low info	Medium info	High info
I. Factor of 1.3												
Low info	----	1.000	.7817	.0071***	.0000***	.0000***	----	.7132	.7886	.0099***	.0288**	.0137**
Medium info	----	----	.7456	.0191*	.0000***	.0000***	----	----	.2254	.0034***	.0112**	.0014***
High info	----	----	----	.0070***	.0000***	.0000***	----	----	----	.0040***	.0049***	.0005***
II. Factor of 1.7												
Low info	----	----	----	----	.2945	.0497**	----	----	----	----	.2657	.2621
Medium info	----	----	----	----	----	.1008	----	----	----	----	----	.7127
High info	----	----	----	----	----	----	----	----	----	----	----	----

Notes: Each individual pair's data is treated as an independent observation for this test. Numbers are p-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(v) # of periods for which specific (i, j) were paired = 5

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	N/A	N/A	N/A	N/A	N/A
Medium info	----	----	.2454	N/A	.0543*	.0603*
High info	----	----	----	N/A	.0101**	.0565*
II. Factor of 1.7						
Low info	----	----	----	----	N/A	N/A
Medium info	----	----	----	----	----	.1772
High info	----	----	----	----	----	----

(vi) # of periods for which specific (i, j) were paired = 6

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	1.000	1.000	.0442**	.0603*	.1213
Medium info	----	----	1.000	.1697	.2805	.2405
High info	----	----	----	.0429**	.0565*	.1025
II. Factor of 1.7						
Low info	----	----	----	----	.3789	.7343
Medium info	----	----	----	----	----	.3476
High info	----	----	----	----	----	----

(vii) # of periods for which specific (i, j) were paired = 7

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	N/A	N/A	N/A	N/A	N/A
Medium info	----	----	N/A	N/A	N/A	N/A
High info	----	----	----	.0641*	N/A	.0429**
II. Factor of 1.7						
Low info	----	----	----	----	N/A	.3909
Medium info	----	----	----	----	----	N/A
High info	----	----	----	----	----	----

Notes: Each individual pair's data is treated as an independent observation for this test. Numbers are p-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(b) Phase 2

(i) # of periods for which specific (*i*, *j*) were paired = 1 / (ii) # of periods for which specific (*i*, *j*) were paired = 2

	(i) I. Factor of 1.3 (*LG*) Low info	Medium info	High info	(i) II. Factor of 1.7 (*HG*) Low info	Medium info	High info	(ii) I. Factor of 1.3 (*LG*) Low info	Medium info	High info	(ii) II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3												
Low info	----	.0199**	.0172**	.0001***	.0000***	.0000***	----	.1602	.0002***	.0377**	.0000***	.0000***
Medium info	----	----	.9346	.0115*	.0000***	.0000***	----	----	.2740	.2306	.0000***	.0000***
High info	----	----	----	.0161**	.0000***	.0000***	----	----	----	.6820	.0000***	.0000***
II. Factor of 1.7												
Low info	----	----	----	----	.0066***	.0004***	----	----	----	----	.0000***	.0000***
Medium info	----	----	----	----	----	.3482	----	----	----	----	----	.0170*
High info	----	----	----	----	----	----	----	----	----	----	----	----

(iii) # of periods for which specific (*i*, *j*) were paired = 3 / (iv) # of periods for which specific (*i*, *j*) were paired = 4

	(iii) I. Factor of 1.3 (*LG*) Low info	Medium info	High info	(iii) II. Factor of 1.7 (*HG*) Low info	Medium info	High info	(iv) I. Factor of 1.3 (*LG*) Low info	Medium info	High info	(iv) II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3												
Low info	----	.3459	.0627*	.1163	.0000***	.0000***	----	.8773	.5253	.0015***	.0004***	.0005***
Medium info	----	----	.2941	.3463	.0000***	.0000***	----	----	.4251	.0021***	.0003***	.0005***
High info	----	----	----	.7776	.0000***	.0000***	----	----	----	.0025***	.0007***	.0007***
II. Factor of 1.7												
Low info	----	----	----	----	.0004***	.0000***	----	----	----	----	.7048	.4323
Medium info	----	----	----	----	----	.4020	----	----	----	----	----	.2183
High info	----	----	----	----	----	----	----	----	----	----	----	----

Notes: Each individual pair's data is treated as an independent observation for this test. Numbers are *p*-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(v) # of periods for which specific (i, j) has been paired = 5

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	.0641*	.1161	.0361**	1.000	.0442**
Medium info	----	----	.8649	.0107**	.6434	.0325**
High info	----	----	----	.0062***	.6004	.0384**
II. Factor of 1.7						
Low info	----	----	----	----	.0667*	.8961
Medium info	----	----	----	----	----	.1798
High info	----	----	----	----	----	----

(vi) # of periods for which specific (i, j) has been paired = 6

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	N/A	N/A	N/A	N/A	N/A
Medium info	----	----	N/A	N/A	N/A	N/A
High info	----	----	----	.0641*	.0565*	.0345**
II. Factor of 1.7						
Low info	----	----	----	----	.5439	.2996
Medium info	----	----	----	----	----	1.000
High info	----	----	----	----	----	----

(vii) # of periods for which specific (i, j) has been paired = 7

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	.1213	N/A	.1025	N/A	.1213
Medium info	----	----	N/A	.1025	N/A	.1213
High info	----	----	----	N/A	N/A	N/A
II. Factor of 1.7						
Low info	----	----	----	----	N/A	.1025
Medium info	----	----	----	----	----	N/A
High info	----	----	----	----	----	----

Notes: Each individual pair's data is treated as an independent observation for this test. Numbers are p-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(c) Phase 3

(i) # of periods for which specific (i, j) were paired = 1

	I. Factor of 1.3 (*LG*) Low info	I. Factor of 1.3 (*LG*) Medium info	I. Factor of 1.3 (*LG*) High info	II. Factor of 1.7 (*HG*) Low info	II. Factor of 1.7 (*HG*) Medium info	II. Factor of 1.7 (*HG*) High info
I. Factor of 1.3						
Low info	----	.0386**	.0012***	.0200**	.0000***	.0000***
Medium info	----	----	.2941	.3620	.0000***	.0000***
High info	----	----	----	.8608	.0000***	.0000***
II. Factor of 1.7						
Low info	----	----	----	----	.0000***	.0000***
Medium info	----	----	----	----	----	.7403
High info	----	----	----	----	----	----

(ii) # of periods for which specific (i, j) were paired = 2

	I. Factor of 1.3 (*LG*) Low info	I. Factor of 1.3 (*LG*) Medium info	I. Factor of 1.3 (*LG*) High info	II. Factor of 1.7 (*HG*) Low info	II. Factor of 1.7 (*HG*) Medium info	II. Factor of 1.7 (*HG*) High info
I. Factor of 1.3						
Low info	----	.0110**	.0000***	.0001***	.0000***	.0000***
Medium info	----	----	.4874	.0500**	.0000***	.0000***
High info	----	----	----	.0577*	.0000***	.0000***
II. Factor of 1.7						
Low info	----	----	----	----	.0000***	.0000***
Medium info	----	----	----	----	----	.0183**
High info	----	----	----	----	----	----

(iii) # of periods for which specific (i, j) were paired = 3

	I. Factor of 1.3 (*LG*) Low info	I. Factor of 1.3 (*LG*) Medium info	I. Factor of 1.3 (*LG*) High info	II. Factor of 1.7 (*HG*) Low info	II. Factor of 1.7 (*HG*) Medium info	II. Factor of 1.7 (*HG*) High info
I. Factor of 1.3						
Low info	----	.0828*	.0071***	.0021***	.0000***	.0000***
Medium info	----	----	.4511	.0055***	.0000***	.0000***
High info	----	----	----	.0253**	.0000***	.0000***
II. Factor of 1.7						
Low info	----	----	----	----	.0436**	.0124**
Medium info	----	----	----	----	----	.2125
High info	----	----	----	----	----	----

(iv) # of periods for which specific (i, j) were paired = 4

	I. Factor of 1.3 (*LG*) Low info	I. Factor of 1.3 (*LG*) Medium info	I. Factor of 1.3 (*LG*) High info	II. Factor of 1.7 (*HG*) Low info	II. Factor of 1.7 (*HG*) Medium info	II. Factor of 1.7 (*HG*) High info
I. Factor of 1.3						
Low info	----	.0596*	.2478	.0004***	.0010***	.0153**
Medium info	----	----	.8833	.0001***	.0008***	.0148**
High info	----	----	----	.0003***	.0009***	.0323**
II. Factor of 1.7						
Low info	----	----	----	----	.9259	.1076
Medium info	----	----	----	----	----	.1273
High info	----	----	----	----	----	----

Notes: Each individual pair's data is treated as independent observation for this test. Numbers are p-value (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(v) # of periods for which specific (i, j) were paired = 5

	I. Factor of 1.3 (*LG*) Low info	I. Factor of 1.3 (*LG*) Medium info	I. Factor of 1.3 (*LG*) High info	II. Factor of 1.7 (*HG*) Low info	II. Factor of 1.7 (*HG*) Medium info	II. Factor of 1.7 (*HG*) High info
I. Factor of 1.3						
Low info	----	.6434	N/A	.1213	.0331**	.0565*
Medium info	----	----	N/A	N/A	N/A	N/A
High info	----	----	----	.0641*	.0083***	.0194**
II. Factor of 1.7						
Low info	----	----	----	----	.1554	.3404
Medium info	----	----	----	----	----	.6579
High info	----	----	----	----	----	----

(vi) # of periods for which specific (i, j) were paired = 6

	I. Factor of 1.3 (*LG*) Low info	I. Factor of 1.3 (*LG*) Medium info	I. Factor of 1.3 (*LG*) High info	II. Factor of 1.7 (*HG*) Low info	II. Factor of 1.7 (*HG*) Medium info	II. Factor of 1.7 (*HG*) High info
I. Factor of 1.3						
Low info	----	N/A	N/A	N/A	N/A	N/A
Medium info	----	----	N/A	.0641*	.0319	.1025
High info	----	----	----	N/A	N/A	N/A
II. Factor of 1.7						
Low info	----	----	----	----	.3774	.3476
Medium info	----	----	----	----	----	.3778
High info	----	----	----	----	----	----

(vii) # of periods for which specific (i, j) were paired = 7

	I. Factor of 1.3 (*LG*) Low info	I. Factor of 1.3 (*LG*) Medium info	I. Factor of 1.3 (*LG*) High info	II. Factor of 1.7 (*HG*) Low info	II. Factor of 1.7 (*HG*) Medium info	II. Factor of 1.7 (*HG*) High info
I. Factor of 1.3						
Low info	----	N/A	N/A	N/A	N/A	.1025
Medium info	----	----	N/A	N/A	N/A	N/A
High info	----	----	----	N/A	N/A	N/A
II. Factor of 1.7						
Low info	----	----	----	----	N/A	N/A
Medium info	----	----	----	----	----	N/A
High info	----	----	----	----	----	----

Notes: Each individual pair's data is treated as an independent observation for this test. Numbers are p-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(d) Phase 4

(i) # of periods for which specific (i, j) were paired = 1; (ii) # of periods for which specific (i, j) were paired = 2

	(i) I. Factor of 1.3 (*LG*) Low info	Medium info	High info	(i) II. Factor of 1.7 (*HG*) Low info	Medium info	High info	(ii) I. Factor of 1.3 (*LG*) Low info	Medium info	High info	(ii) II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3												
Low info	----	.0143**	.0000***	.0187**	.0000***	.0000***	----	.0431**	.0000***	.0045***	.0000***	.0000***
Medium info	----	----	.0639*	.3393	.0000***	.0000***	----	----	.0189**	.1535	.0000***	.0000***
High info	----	----	----	.8557	.0000***	.0000***	----	----	----	.8816	.0000***	.0000***
II. Factor of 1.7												
Low info	----	----	----	----	.0000***	.0000***	----	----	----	----	.0000***	.0000***
Medium info	----	----	----	----	----	.3164	----	----	----	----	----	.1602
High info	----	----	----	----	----	----	----	----	----	----	----	----

(iii) # of periods for which specific (i, j) were paired = 3; (iv) # of periods for which specific (i, j) were paired = 4

	(iii) I. Factor of 1.3 (*LG*) Low info	Medium info	High info	(iii) II. Factor of 1.7 (*HG*) Low info	Medium info	High info	(iv) I. Factor of 1.3 (*LG*) Low info	Medium info	High info	(iv) II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3												
Low info	----	.0000***	.0110**	.0000***	.0000***	.0000***	----	.1824	.1432	.3173	.0210**	.0429**
Medium info	----	----	.0204**	.1458	.0000***	.0000***	----	----	.8511	.0163**	.0006***	.0038***
High info	----	----	----	.7401	.0000***	.0000***	----	----	----	.0014***	.0000***	.0007***
II. Factor of 1.7												
Low info	----	----	----	----	.0011***	.0002***	----	----	----	----	.0681*	.1481
Medium info	----	----	----	----	----	.2597	----	----	----	----	----	.4237
High info	----	----	----	----	----	----	----	----	----	----	----	----

Notes: Each individual pair's data is treated as an independent observation for this test. Numbers are p-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(v) # of periods for which specific (i, j) were paired = 5

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	.0033***	.0083***	.0079***	.0081***	.0129**
Medium info	----	----	.8302	.0101**	.0103**	.0278**
High info	----	----	----	.0194**	.0202**	.0608*
II. Factor of 1.7						
Low info	----	----	----	----	1.000	.2907
Medium info	----	----	----	----	----	.3865
High info	----	----	----	----	----	----

(vi) # of periods for which specific (i, j) were paired = 6

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	.2864	N/A	.0103**	.0038***	.0103**
Medium info	----	----	N/A	.0202**	.0101**	.0202**
High info	----	----	----	N/A	N/A	N/A
II. Factor of 1.7						
Low info	----	----	----	----	.3774	.5385
Medium info	----	----	----	----	----	.3774
High info	----	----	----	----	----	----

(vii) # of periods for which specific (i, j) were paired = 7

	I. Factor of 1.3 (*LG*) Low info	Medium info	High info	II. Factor of 1.7 (*HG*) Low info	Medium info	High info
I. Factor of 1.3						
Low info	----	.0603*	N/A	.0641*	N/A	N/A
Medium info	----	----	N/A	.1025	N/A	N/A
High info	----	----	----	N/A	N/A	N/A
II. Factor of 1.7						
Low info	----	----	----	----	N/A	N/A
Medium info	----	----	----	----	----	N/A
High info	----	----	----	----	----	----

Notes: Each individual pair's data is treated as an independent observation for this test. Numbers are p-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.