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Pledges of commitment and cooperation in partnerships

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Pledges of Commitment and Cooperation in Partnerships

Lachlan Deer and Ralph-C. Bayer

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Pledges of Commitment and Cooperation in Partnerships*

Lachlan Deer† University of Zürich
Ralph-C. Bayer‡ University of Adelaide

July 22, 2015

Abstract

We use experimental methods to investigate whether pledges of commitment can improve cooperation in endogenously formed partnerships facing a social dilemma. Treatments vary in terms of the individual's (a) opportunity to commit to their partner, (b) the cost of dissolving committed partnerships, and (c) the distribution of these dissolution costs between partners. Our findings show that pledges of commitment increase cooperation in committed partnerships when costs to dissolve them are shared equally among partners. In contrast, when costs to dissolve committed partnerships fall solely on the individual choosing to break up, pledges of commitment fail to improve cooperation and instead decrease cooperation.

■JEL Classification Codes: C92, D03, D83, H41

■Keywords: Commitment, Cooperation, Endogenous Group Formation, Experiment

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†Corresponding Author. Email: lachlan.deer@econ.uzh.ch. Postal Address: Lachlan Deer, Department of Economics, University of Zurich, Schönberggasse 1, Zurich CH 8001.

‡Email: ralph.bayer@adelaide.edu.au Postal Address: Ralph-C Bayer, School of Economics, University of Adelaide, Adelaide, South Australia SA 5005.

1. Introduction

Many economic transactions involve choosing the people we interact with to forge cooperative relationships. A key feature of these cooperative relationships is that opportunistic behaviour is attractive to an individual, but is collectively inefficient. In such social dilemma situations cooperative behaviour within a partnership can be supported through formal legal institutions or relational contracts. Although enforceable contracts ensure cooperative behaviour can be sustained, often they are costly to write and difficult to enforce. Instead, partners may utilise relational contracting such as mutual pledges of commitment to limit opportunistic behaviour and sustain long-term cooperation. A pertinent feature of these pledges is that cooperation is not explicitly contractable, so upon committing the incentive to engage in short term opportunism remains. When pledges of commitment are unsuccessful in sustaining cooperation individuals may incur costs to dissolve the partnership before forming a new cooperative alliance.

We construct an experimental environment to investigate how pledges of commitment influence cooperation within endogenously formed partnerships. The environment implemented is a variation of the linear voluntary contribution mechanism (VCM). The VCM provides a simple framework that allows for a straightforward measurement of self-interested versus partnership-orientated behaviour. We augment the standard design by periodically introducing commitment and regrouping phases. In commitment phases, subjects in uncommitted partnerships simultaneously choose whether to pledge commitment to their partner. When both partners choose to commit, a committed partnerships forms. Both subjects remain in a committed partnership until the end of the game, or until one (or both) choose to dissolve the partnership during a regrouping phase. In regrouping phases, subjects choose whether to stay in their current partnership or to dissolve the partnership and be rematched to a new partner. Subjects whose partnership has been dissolved are rematched to new partners according to their preferences using the stable marriage mechanism.

The objectives of the study are two fold. The first objective is general: to investigate whether pledges of commitment can increase and sustain cooperation when partnership formation is endogenous. The second more focussed objective, is to investigate how cooperation is influenced by the presence and distribution of dissolution costs attached to dissolving committed partnerships. Six treatments were designed to disentangle these effects. In one treatment subjects have the opportunity to commit to partnerships with no cost to dissolve it in future regrouping phases. Three additional treatments introduce costs of dissolving committed partnerships. Along the cost dimension, treatments vary the size and distribution of the dissolution costs between partners. The design is complemented by two control treatments which remove commitment opportunities.

This paper is the first to investigate the effectiveness of pledges of commitment when partnership formation is endogenous. Hence partnership formation mirrors real-life more accurately compared to the standard exogenously determined protocols commonly used in social dilemma experiments. It is a natural question to investigate if cooperation is influenced by pledges of commitment when subjects choose who they interact with. A pledge of commitment in this experiment refers to committing to remain with a specific partner, and possibly incurring costs to dissolve a committed partnership. Furthermore, the study is the first to investigate how cooperation levels are influenced by costly dissolution of partnerships together with pledges of commitment.

The experimental design employs many procedures developed and implemented in previous experiments conducted by other authors. Subjects interact using a linear VCM (Isaac et al. (1985)) and are regrouped using the stable marriage mechanism (Bayer (2011)). Subject's preferences over new partners play an important part of the regrouping procedure as in Bayer (2011) and Page et al. (2005). We extend these designs by adding a commitment phase to the standard VCM design used in endogenous group formation experiments.

Early experimental work on behaviour in social dilemmas has shown individuals can work together to overcome free riding incentives under certain circumstances. In finitely repeated social dilemmas individuals begin by cooperating to a modest extent, but cooperation typically erodes over time (Ledyard (1995)). The pattern of declining cooperation has been attributed to the co-existence of conditional cooperators, imitators and self-interested subjects (Fischbacher et al. (2001) and Fischbacher and Gachter (2010)). A number of modifications to the standard social dilemma framework have shown to considerably increase cooperation levels and prevent the decline in cooperation over time (Chaudhuri (2011) provides a rigorous summary of institutions shown to sustain cooperation). Providing individuals the opportunity to reduce the earnings of the least cooperative group members is highly effective in raising group contributions in a number of settings (Ostrom et al. (1992); Fehr and Gachter (2000); Carpenter (2007); Masclet et al. (2003)).

Although the introduction of sanctions and punishment has been found to increase average contribution levels, it has mixed effects on welfare (Tan (2008)). Furthermore, Guala and Mittone (2005) highlight historical and ethnographic evidence that costly punishment is rarely used outside laboratory environments. The ability to choose with whom to interact and cooperate is a simple institution to adopt outside the experimental laboratory. Existing literature on endogenous group formation generally finds positive effects on cooperation in social dilemmas.[1] Unilateral regrouping with constant group size (Coricelli et al. (2003)),

[1] See Hauk and Nagel (2001) for an exception.

restricted entry (Ahn et al. (2008)) and congested public goods (Ahn et al. (2009)) has been shown to increase cooperation. Preference based regrouping has also been shown to increase cooperation when regrouping is compulsory (Page et al. (2005)) and when voluntary (Bayer (2011)).

Our study also relates to the literature on communication in social dilemmas (see Balliet (2010) for an extensive review). Dawes et al. (1977) identifies three competing explanations to account for the cooperation enhancing role of communication: identification, discussion and commitment. Previous studies have ruled out both identification and discussion as the *primary* cause of the communication effect. Bohnet and Frey (1999) and Brosig et al. (2003) show identification alone fails to sustain high levels of cooperation. Further, Bouas and Komorita (1996) find that discussion concerning character and motives of partners fails to deliver high levels of cooperation. When Bouas and Komorita allow public announcements of intentions (a form of commitment) cooperation rose significantly.

The results from our experiment show that the introduction of pledges of commitment increase cooperation levels within committed partnerships when the cost of dissolving them is symmetrically shared by both partners. We find increases in cooperation among committed partnerships when there is no cost to dissolve, and when the cost is equally shared under low- and high cost structures. Cooperation levels among committed partnerships are highest when the cost to dissolve a committed partnership is equally split and relatively high. When dissolution is costless, or costs are low and equally shared cooperation increases, but to a lesser extent. The increase in cooperation under costless pledges of commitment suggests that pledges which serve to signal or reassure a partner of cooperative intentions are effective when partnership formation is endogenous. The introduction of equally split dissolution costs, serves to either sustain the rise in cooperation under the low cost structure or provide additional gains in cooperation under the high cost structure.

Furthermore, we find that when costs to dissolve committed partnerships fall completely on the instigator of the dissolution these pledges fail to increase cooperation. Our results show that under this asymmetric cost structure cooperation in committed partnerships is lower than a benchmark where pledges of commitment are removed. We find that upon committing, subjects begin to free-ride on each other decreasing their cooperativeness correctly anticipating that their partner will not dissolve the partnership. The reluctance to dissolve the committed partnership stems from a perception that instigating the breakup and bearing the full monetary cost of dissolution whilst their partner pays nothing is unfair. Instead, we find uncommitted partnerships out-perform the committed partnerships using the threat of costless breakup to maintain high levels of cooperation. In total, our results suggests pledges of commitment are successful in increasing cooperation when the threat of dissolution is credible and the cost is equally split

among partners.

The remainder of the paper is organised as follows: Section 2 presents the research questions our experiment is designed to address and explains the design of treatments to identify the effects of commitment. Section 3 details the experimental design. Results from the experiment are contained in Section 4. Section 5 contains final remarks and concludes.

2. Research Questions

Committing to a partnership comprises of two interrelated pieces: a pledge of commitment, and (possible) costs of dissolving the partnership if it proves unsuccessful. Our experimental set-up is designed to investigate how these two pieces interact to influence the cooperation of committed partnerships compared to an uncommitted counterpart. A pledge of commitment by itself could serve to increase cooperation through signalling cooperative intentions or through serving a reassuring role. These two channels suggest a pledge of commitment alone can be associated with an increase in cooperation (Crawford (1998)). However, previous studies have shown costless, structured pledges of commitment are unsuccessful in increasing cooperation under exogenous regrouping protocols (Camera et al. (2010)). Our design introduces endogenous partnership formation, so we are in a position to investigate whether this null result carries over when subjects can choose their partners.

Research Question 1. *Do pledges of commitment increase cooperation in endogenously formed partnerships?*

The formation of a committed partnership rarely involves only costless, mutual pledges of commitment. Entering into a such a relationship is typically associated with accepting costs in the event the partnership fails and needs to be dissolved in the future. Therefore pledging commitment indicates a willingness to bear a cost if the partnership is unsuccessful an dissolves. This potentially strengthens the credibility of a pledge of commitment, leading partners to coordinate on higher cooperation levels. In addition to this causal argument, costly pledges of commitment may also lead to a segregation of individuals. Subjects in high cooperating partnerships may make pledges of commitment to 'lock in' their partner, making it payoff reducing to dissolve the partnership. Both arguments suggest committed partnerships when dissolution is costly feature higher cooperation.

Research Question 2. *Does the presence of dissolution costs increase the efficiency of committed partnerships?*

If the introduction of costs to dissolve committed partnerships is an important determinant of cooperation, we also want to understand the role of the size and distribution of dissolution costs that are shared among partners. Holding the distribution of costs between partners fixed, the effect of increasing in total cost of dissolution on cooperation is ambiguous. A rise in the total cost of dissolving a committed partnership means that being broken up with by a partner is more costly. This suggests an increase in cooperation by both partners to avoid being broken up with. On the other hand, choosing to dissolve a partnership is more costly, making a subject less likely to choose to dissolve; providing their partner with an incentive to cooperate less. Our treatments (described below) are designed to investigate which of these effects dominates.

Research Question 3. *How important is the total size of the cost to dissolve a committed partnership in influencing cooperation?*

The distribution of costs between individuals when a committed partnership dissolves should also play a role in determining cooperation levels among committed partners. When the dissolution costs are distributed asymmetrically with the larger share falling on the partner choosing to dissolve there is scope for opportunistic behaviour. To see this, consider the difference in costs that would result from dissolving a committed partnership: The partner choosing to dissolve bears the larger proportion of monetary costs plus uncertainty over forming a new cooperative alliance. In contrast, the partner being broken up with bears a relatively lower monetary cost and the same uncertainty over forming a new partnership. When the cost burden falls more asymmetrically on the partner choosing to instigate a dissolution, individuals may be less likely to dissolve the partnership - perceiving the cost of dissolution too high, or the distribution unfair. Anticipating the reluctance to dissolve a partnership, their partner behaves opportunistically decreasing his level of cooperation. If we view partnership dissolution as an inkind punishment on the other partner for opportunistic, self-interested behaviour the existing literature suggests punishment is most successful when relative cost effectiveness is high (Nikiforakis and Normann (2008)). We then expect to see cooperation levels of committed partners decline when the cost burden falls more heavily on partners instigating dissolution.

Research Question 4. *Is the distribution of dissolution costs between partners important for maintaining successful committed partnerships?*

2.1 Treatments

We designed six treatments to investigate the research questions posed above. Table 1 summarises the treatments, highlighting the differences between them.

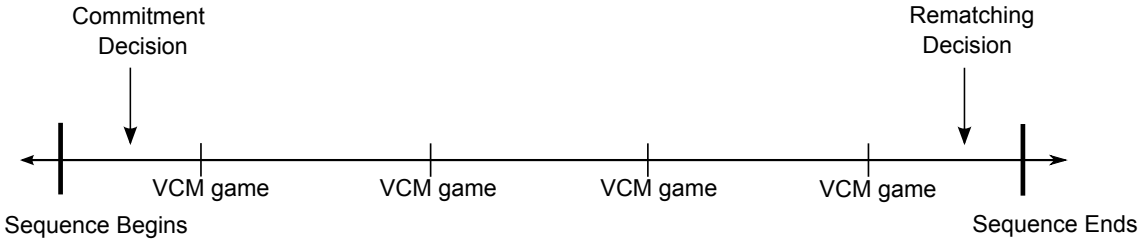
Table 1: Summary of Differences Between Treatments

Treatment	Endogenous Regrouping	Option to Commit	Cost to Dissolve Committed Partnership	Cost paid by each partner	
				Unilateral Dissolution	Bilateral Dissolution
Random Matching	No	No	-	-	-
No Commitment	Yes	No	-	-	-
Cheap Talk	Yes	Yes	0	-	-
One Sided Cost	Yes	Yes	400	Dissolver pays \$400 Other pays \$0	Both pay \$200
Shared Cost	Yes	Yes	400	Both pay \$200	Both pay \$200
High Cost	Yes	Yes	800	Both pay \$400	Both pay \$400

In the *Random Matching* treatment, we remove endogenous group formation and commitment opportunities. The *No Commitment* treatment augments the Random Matching treatment by introducing endogenous group formation periodically. These two treatments serve as control treatments. Four experimental treatments have an additional decision stage where subjects choose whether to pledge commitment to their current partner. Subjects in existing uncommitted partnerships or those entering into new partnerships face a commitment decision at regular intervals. The experimental treatments differ from each other in terms of the cost structure when dissolving a committed partnership.

Differences in behaviour between Random Matching and No Commitment can be attributed to different regrouping procedures, identifying the cooperation enhancing role of endogenous partnership choice. The *Cheap Talk* treatment extends the No Commitment treatment by introducing a 'commitment stage' where subjects can choose to pledge commitment to their partner. These pledges are costless - committed partners do not pay costs to dissolve their partnership. Any difference in contribution behaviour between No Commitment and Cheap Talk captures the effect costless pledges of commitment have on cooperation. The remaining three treatments introduce costs to dissolve committed partnerships. By comparing contributions in Cheap Talk to those in *One Sided Cost*, *Shared Cost* or *High Cost* we can disentangle the potential effects of (1) the cooperation enhancing role of a pledge of commitment and (2) the (additional) effect of dissolution costs to end committed partnerships. Comparison of contribution behaviour between One Sided Cost and Shared Cost highlights the importance of the sharing dissolution costs between subjects whose partnership dissolves. Differences in behaviour between Shared Cost and High Cost isolate the total size effect of dissolution costs, holding the distribution between partners constant.

Figure 1: Timeline of a Typical Sequence in the Game



3. Experiment Design

In each session there are 32 periods of interaction, divided into eight *sequences* of four periods. Each sequence proceeds under identical rules. In each sequence all partnerships play four identical linear VCM games. At the conclusion of each sequence subjects decided whether to dissolve their current partnership or remain together for the subsequent sequence. Subjects whose partnership dissolved faced a preference input and regrouping phase. Those in partnerships which did not dissolve entered directly into the next sequence. In experimental treatments, subjects in existing uncommitted or new partnerships faced a commitment decision at the beginning of a sequence, prior to the VCM stages. As discussed above, the No Commitment treatment removes the commitment decision. In the Random Matching treatment, without endogenous group formation, all subjects were regrouped randomly and there was no commitment stage. Figure 1 graphically illustrates the order of play in a typical sequence.

We now explain the three decision stages subjects face in each sequence, starting with the VCM.

3.1 The Voluntary Contribution Mechanism

The parametric structure of the VCM component of the experiment draws heavily on that of Bayer (2011) and Coricelli et al. (2003). At the beginning of each period in all treatments subjects are endowed with 100 units of experimental currency. A subject chooses how to allocate the endowment between a private account, which is theirs to keep, and a partnership account, which yields profit for both partners. In what follows we refer to the amount allocated to the partnership account as the subject's *contribution*. Each unit contributed to the group account, $c_i \in [0, 100]$ generates 0.8 units of profit for each partner. The profit arising to each individual from the partnership's contributions is $0.8(c_i + c_j)$. Payoffs

are symmetric across partners and allocation decisions are made simultaneously. At the end of a VCM stage, each individual's profits are equal to

$$\Pi_i(c_i, c_j) := 100 - c_i + 0.8(c_i + c_j),\ i, j \in \{1, 2\}, i \neq j.$$

After the contribution decisions have been made, they are revealed to both partners and the game continues. Each partner is informed about the total contribution to the partnership account, the individual contributions of themselves and their partner, and their own profit from that period.

The payoff structure generates a social dilemma because the net return from contributing one unit into the partnership's account is negative (-0.2) whilst the net social return of one unit contributed is positive (0.6). Average contributions are an indicator for how successful a partnership is at overcoming the social dilemma because aggregate partnership welfare (W) increases linearly with the average contribution of each partner,

$$\begin{aligned} W &= 200 + (0.6)(c_i + c_j) \\ &= 200 + 1.2\bar{c}. \end{aligned}$$

3.2 Pledges of Commitment

Subjects in the four experimental treatments face a commitment decision at the beginning of each sequence of four VCM games. Each partner in a surviving uncommitted partnership or newly formed partnership had the opportunity to commit to their current partner. Subjects were asked simultaneously whether they wanted to pledge commitment to their partner. If both partners chose to pledge commitment, a committed partnership formed. Partners were informed of the outcome and remained in a committed partnership until it was dissolved in a regrouping phase or the experiment ended. In all other situations subjects remained in an uncommitted partnership. When one partner wanted to commit and the other did not, the willing partner was informed his counterpart was 'not willing to commit right now.' If both partners decided not to commit, both were informed of the outcome. Subjects then progressed to the next four VCM periods.

3.3 Regrouping

At the conclusion of each sequence all subjects could be regrouped. In the *Random Matching* treatment, subjects were regrouped randomly by the computer and continued onto the next sequence. In all other treatments subjects could choose

to dissolve their current partnership. A partnership was dissolved if one or both partners chose to dissolve. Subject's whose partnership dissolved enter into a pool of 'singles' to be regrouped. There was no cost of dissolving an uncommitted partnership, and no direct reward for partners staying together. The cost of dissolving committed partnerships varied across treatments, as shown in Table 1.

All 'single' subjects were regrouped according to the stable marriage algorithm (Gale and Shapley (1962)). Subjects were shown information about the average contributions from the previous sequence of four VCM games of 'single' subjects to form preferences over potential partners.[2,3] Subjects ranked potential partners in order of desirability.[4] When the ranking process was complete, the matching algorithm used these preferences to produce a stable matching. Subjects were informed that they had been regrouped and entered into the next sequence without information about who they had been matched with. They could only use indirect inference by observing their partner's contributions over the next sequence.

The mechanism underlying group formation is quite complex. For this reason instructions provided to subjects do not fully explain how the algorithm works to avoid confusion and noisy regrouping behaviour.[5] The regrouping procedure is described in the instructions as follows:[6]

'The computer will collect the rankings from every 'single' and rematch all 'singles' according to these rankings. The partner you are matched with is determined by your preferences and the preferences of all other 'singles.' The computer is programmed to give you the best partner available.'

[2]The decision to provide information on the average contributions of subjects over the previous sequence reflects an important compromise. When only contribution history from the previous sequence is used as information in regrouping phases, subjects are able to escape any reputation attained during sequences that occurred earlier. The advantage of the approach implemented is that both accidents and interactions with low contributing partners are removed from a subject's history quickly.

[3]In period 1 of each session, 'types' were randomly determined by a computer along with the initial grouping. Each initial grouping features two partners, each of a different type. In a regrouping phase subjects could only see potential partners who were of a different type from themselves. Only subjects with different types could form a partnership.

[4]Subjects rank potential partners by typing a number into a box next to the information about each of them.

[5]See Bayer (2011) for a discussion of the performance Stable Marriage Mechanism in a linear VCM with endogenous regrouping. He explains the workings of the mechanism to the subjects using almost identical language and finds it performs well in matching high contributing subjects together based on preferences.

[6]Sample instructions from the experiment can be found in the online appendix.

3.4 Implementation

We conducted seventeen sessions, three sessions under six different treatments.[7] Between 16 and 20 subjects participated in each session, for a total of 314 participants. All sessions were conducted at the Adelaide Laboratory for Experimental Economics (AdLab) at the University of Adelaide. The experiment was computerized and scripts were programmed using the z-Tree platform (Fischbacher (2007)). Subjects were mainly undergraduate and graduate students from a variety of majors at the University of Adelaide recruited using the online recruitment system ORSEE (Greiner (2004)). Approximately thirty percent of participants were majoring in Commerce, Economics or Finance. Of the remaining seventy percent most participants were from an Engineering, Law or Science background. Fifty percent of participants were female. No subject participated in more than one session of the experiment. On average sessions lasted 90 minutes, including initial instruction and payment of subjects. Subjects earned an average of $AUD 24.

4. Results

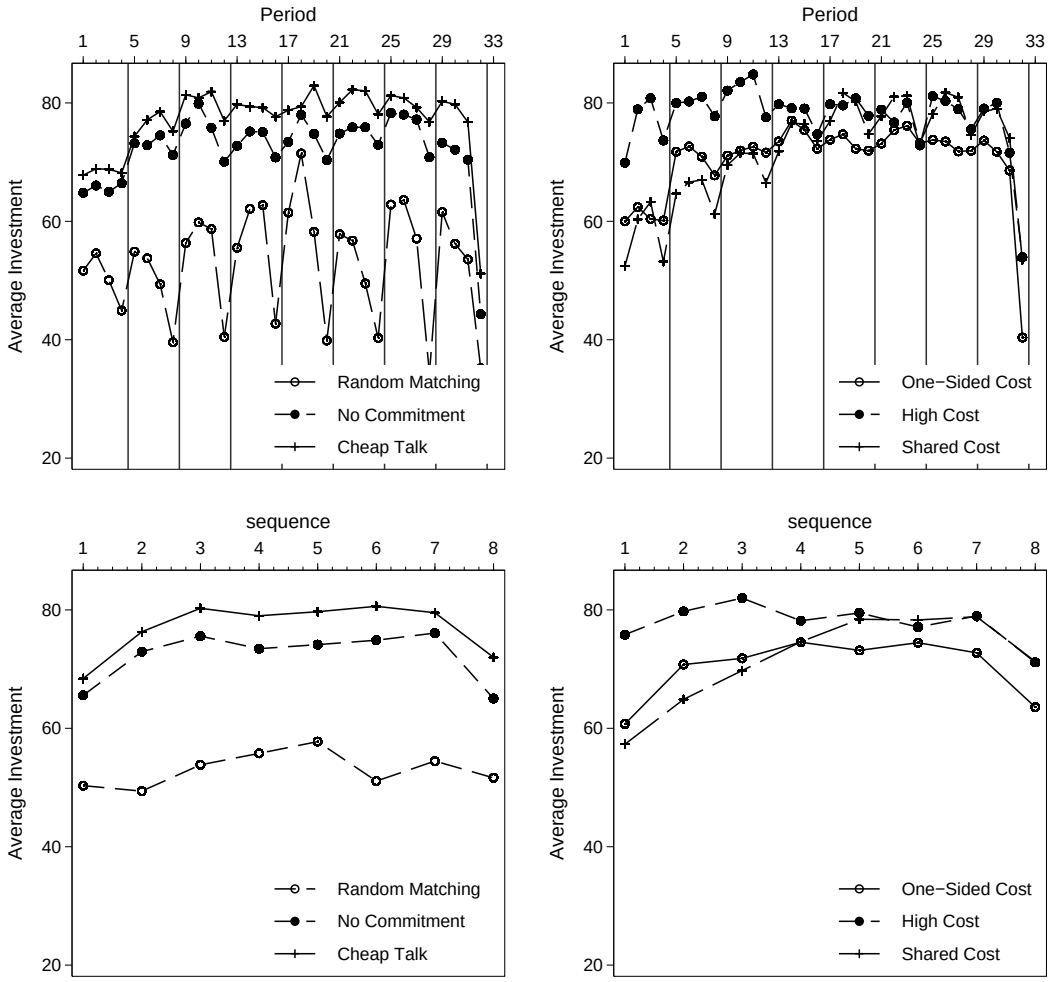
4.1 Overall Efficiency

Figure 2 illustrates the time path of individual contributions averaged across subjects in each of the six treatments. The top panels show average contributions by period. Average contributions per sequence of four periods are shown in the lower panels. The maximum possible individual contribution is 100, corresponding to the partnership optimum. The minimum is zero. Table A in the Appendix shows the corresponding average contributions by sequence for each treatment along with the overall average. Added to this table are the median and the standard deviation of contributions.

We observe substantial differences in contributions between treatments. Average contributions are highest in the High Cost and Cheap Talk treatments (77.81 and 76.98 respectively) followed in turn by the No Commitment (72.21), Shared Cost (71.68), One Sided Cost (70.21) and Random Matching (53.03). Remarkably, the median contribution level is 100 in sequences two through eight in the High Cost treatment. This contribution level is the partnership-optimal cooperation level. Median contributions also reach 100 in sequences three to eight in Cheap Talk and sequences five to eight in One Sided Cost. In the Shared Cost and No Commitment treatments median contributions never reach this level, remaining between 80 and 90. For Random matching, median contributions never rise above 60.

[7] Only two sessions were conducted for the treatment with random regrouping.

Figure 2: Average Individual Contributions by Treatment



The lower panels of Figure 2 averages contributions of subjects across all periods in a sequence and allows a clearer picture of contribution dyanamics across sequences and the level effects between treatments. We can see a general pattern of gradual increases in cooperation over the first three sequences across treatments, and a decline in the last sequence. It also suggests that the average contribution level does not change appreciably across sequences three to seven in all treatments except Shared Cost. In the Shared Cost treatment there is a large increase in average cooperation levels over the first four sequences before levelling out from sequence five. Looking across treatments we see that the level effect discussed above for cooperation averaged across all sequences is quite stable sequence by

sequence. The Cheap Talk and High Cost treatments have the highest cooperation levels across each sequence, while Random Matching has the lowest. No Commitment and One-Sided Cost have similar average contributions across all periods, whilst Shared Cost starts below these treatments but sharply rises over time to a level close to High Cost in the latter half of the experiment.

Mann Whitney pairwise statistical tests comparing the contributions between treatments yield the results shown in Table 2. The unit of observation is the average contribution of individual subjects per sequence.[8] The null hypothesis is that average contributions between treatments are identical. Results are presented for contributions across the entire experiment and broken down into the first- and the last four sequences.

Table 2: Mann Whitney U-test Results - Overall Efficiency

	No Commitment	Cheap Talk	One Sided Cost	Shared Cost	High Cost
All Sequences					
Random Matching	16.935^{***}	21.185^{***}	15.887^{***}	16.891^{***}	21.854^{***}
No Commitment	-	6.113^{***}	0.128	1.524	7.421^{***}
Cheap Talk	-	-	5.800^{***}	8.360^{***}	1.170
One Sided Cost	-	-	-	2.289^{**}	7.097^{***}
Shared Cost	-	-	-	-	10.197^{***}
Sequences 1-4					
Random Matching	12.155^{***}	14.852^{***}	11.150^{***}	9.473^{***}	16.569^{***}
No Commitment	-	3.080^{***}	0.436	4.485^{***}	5.648^{***}
Cheap Talk	-	-	3.473^{***}	8.399^{***}	2.863^{***}
One Sided Cost	-	-	-	4.397^{***}	6.101^{***}
Shared Cost	-	-	-	-	11.341^{***}
Sequences 5-8					
Random Matching	11.799^{***}	15.276^{***}	10.990^{***}	14.441^{***}	14.383^{***}
No Commitment	-	5.515^{***}	0.583	2.576^{***}	4.825^{***}
Cheap Talk	-	-	4.892^{***}	3.799^{***}	0.900
One Sided Cost	-	-	-	1.117	4.182^{***}
Shared Cost	-	-	-	-	3.330^{***}

Notes: Absolute value of the z-statistic reported is for the Mann-Whitney U-test that average individual contributions per sequence (of four periods) are equal between treatments. Significance Levels: $^{*}p < 0.10$, $^{**}p < 0.05$,$^{***}p < 0.01$.

The results confirm the patterns discussed above: The introduction of commitment opportunities has the effect of either increasing contribution levels or leaving them unchanged. Contributions are highest in the Cheap Talk and High Cost treatments. There is no statistical difference in contributions between these two treatments overall, however contributions are larger in High Cost over the first four sequences. Contributions in Shared Cost are below those in No Commitment over the first four sequences, but greater over the last four sequences.

[8] If we use individual contributions and pool them all differences are significant at $p < 0.01$.

This confirms that contributions in Shared Cost increase over the early sequences of experimental sessions, as shown in Figure 2. Despite the rise in cooperation across early sequences, contributions in Shared Cost over the final four sequences remain below those in High Cost and Cheap Talk. There is no difference in contributions between the No Commitment and One Sided Cost treatment. All treatments with endogenous regrouping feature higher contributions than Random Matching across the duration of the experiment. We use the results of these Mann-Whitney U tests to form a ranking of treatments in terms of overall efficiency in Table 3. Treatments where differences in contributions where found not to be statistically significant share the same rank.

Table 3: Treatment Efficiency Ranking

All Sequences		Sequences 1 - 4		Sequences 5 - 8	
Ranking	Treatment	Ranking	Treatment	Ranking	Treatment
1	High Cost	1	High Cost	1	High Cost
1	Cheap Talk	2	Cheap Talk	1	Cheap Talk
3	Shared Cost	3	One-Sided Cost	3	Shared Cost
3	One-Sided Cost	3	No Commitment	3	One-Sided Cost
3	No Commitment	5	Shared Cost	5	No Commitment
6	Random Matching	6	Random Matching	6	Random Matching

Notes: Ranking based on Mann Whitney U-test Results that average individual contributions per sequence (of four periods) are equal between treatments. Results of these tests are presented in Table 1.

Our results for overall efficiency are summarised in the following observation:

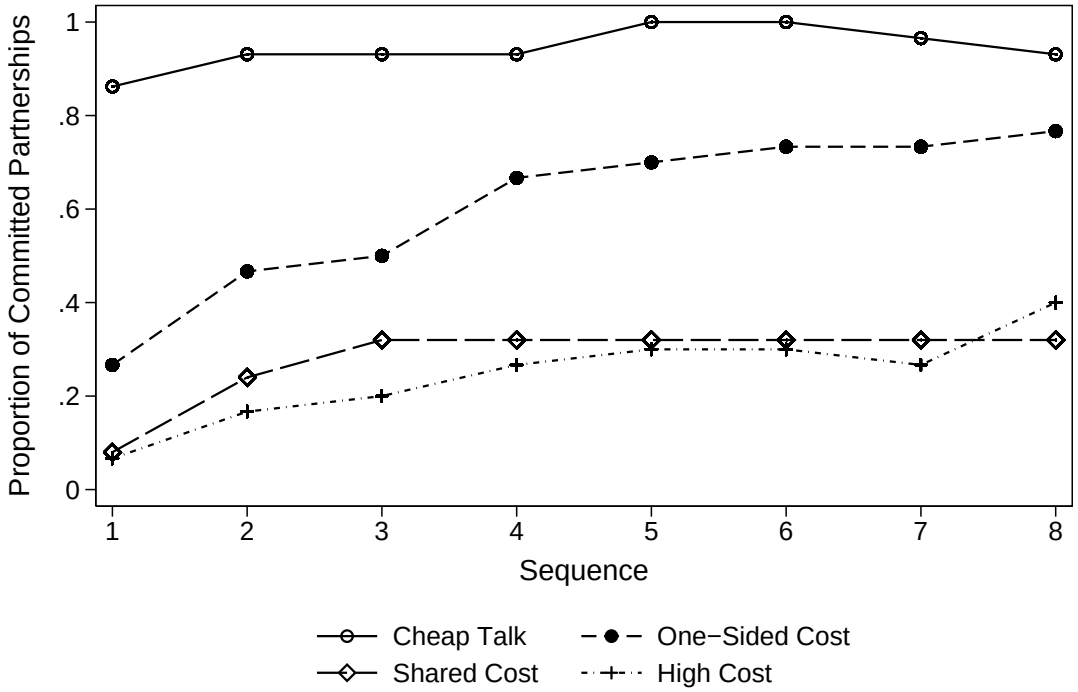
Observation 1. *Overall cooperation is highest in the Cheap Talk and High Cost treatments and lowest under Random Matching. In the One Sided and No Commitment treatments contributions are similar, lying above Random Matching but below the best performing treatments. In the Shared Cost treatment, cooperation gradually increases to a level above One Sided Cost but below both Cheap Talk and High Cost.*

In the remaining subsections we dig deeper into the data to explain how the variation in overall efficiency between treatments is influenced by differences in subject's behaviour.

4.2 Proportion of Committed Partnerships

The proportion of committed partnerships across treatments and sequences are shown in Figure 3. The proportion is highest in the Cheap Talk treatment, staying above eighty percent in all sequences. A test of proportions confirms that the commitment rate is higher in Cheap Talk than any other treatment ($p < 0.00$ for

Figure 3: Proportion of Committed Partnerships by Treatment

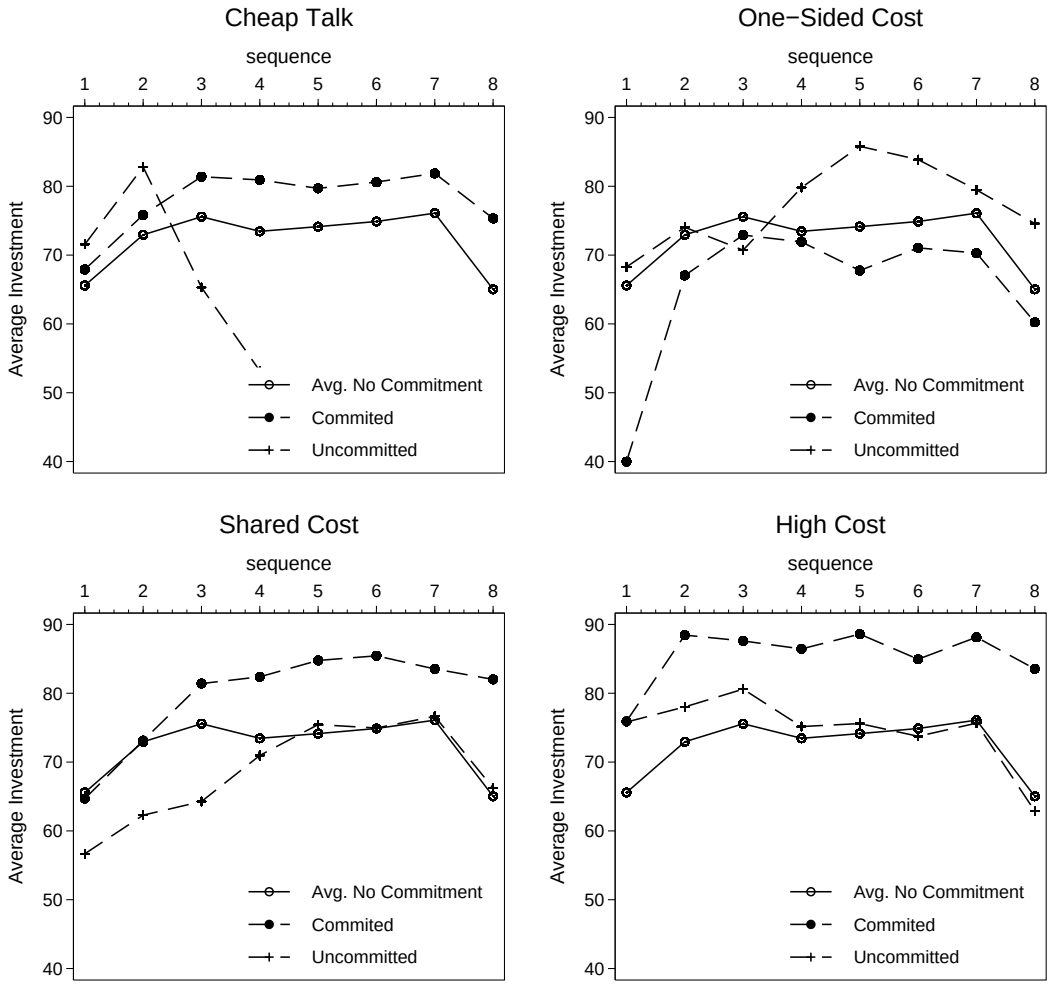


all pairwise comparisons). In sequences five and six every partnership in Cheap Talk is committed.

Variations in the distribution of dissolution costs between partners leads to significantly different proportions of committed partnerships. The proportion is higher in One Sided Cost, where only the partner choosing to dissolve a committed partnership pays a cost, compared to treatments where the dissolution costs are equally shared between partners ($p < 0.00$ for pairwise tests of proportions compared to Shared Cost and High Cost). There is no significant difference between Shared Cost and High Cost, where the distribution of costs remains constant.

Observation 2. *Partnerships are most likely to be committed when there are no cost to dissolving unsuccessful partnerships. The distribution of dissolution costs matter, there are more committed partnerships when costs are borne only by partners who instigate dissolution compared to when costs are equally shared by both partners.*

Figure 4: Average Contributions by Commitment Status and Sequence



4.3 Commitment Status and Contributions

Differences in the proportion of committed partners alone cannot explain differences in the overall efficiency levels documented in Observation 1. When combined with potential differences in contribution behaviour driven by the commitment status of their partnership we can begin to get a clearer picture of mechanisms driving the variation in efficiency across treatments. Figure 4 presents average contributions of both committed and uncommitted subjects in each experimental treatment by sequence. In each panel, the average contribution of subjects in the No Commitment treatment is included as a reference point. Table B in the

Appendix presents the average contributions by treatment and sequence corresponding to Figure 4 along with an average contribution level averaged across all sequences. Standard deviations per sequence are also included.

Figure 4 clearly documents that committed partnerships are associated with higher average contributions than their uncommitted counterparts and to contributions in the No Commitment treatment for all treatments except One Sided Cost. In High Cost average contributions of committed subjects start and stay above those all others, and are the highest of all treatments with an overall efficiency level hovering between 85 and 90 percent. Committed partnerships in Cheap Talk also start and stay above the No Commitment level but are less successful at overcoming the social dilemma compared to those in High Cost with efficiency remaining around 80 percent. In contrast to High Cost and Cheap Talk, average contributions of committed subjects in Shared Cost start at a similar level to No Commitment but then rise over the first three sequences before stabilizing at a level similar to Cheap Talk. Whilst these three treatments show relative success of committed partnerships in increasing contributions, the same is not true in One Sided Cost. This treatment features average contributions of committed subjects remaining at or below the No Commitment benchmark.

Table 4: Mann Whitney U-test Results - Efficiency of Committed Subjects

	One Sided Cost	Shared Cost	High Cost
All Sequences			
Cheap Talk	8.490^{***}	1.011	4.875^{***}
One Sided Cost	-	7.095^{***}	10.313^{***}
Shared Cost	-	-	3.748^{***}
Sequences 1-4			
Cheap Talk	4.7768^{***}	0.099	3.430^{***}
One Sided Cost	-	3.365^{***}	6.050^{***}
Shared Cost	-	-	3.200^{***}
Sequences 5-8			
Cheap Talk	7.496^{***}	1.080	3.147^{***}
One Sided Cost	-	6.533^{***}	8.476^{***}
Shared Cost	-	-	2.007^{***}

Notes: Absolute value of the z-statistic reported is for the Mann-Whitney U-test that average individual contributions per sequence (of four periods) are equal between treatments. Significance Levels: $^{*}p < 0.10$, $^{**}p < 0.05$,$^{***}p < 0.01$.

To tease out the relative effectiveness of commitment in increasing contributions

of committed subjects between treatments we run a series of Mann-Whitney U tests comparing committed subjects average contribution levels per sequence. Table 4 presents the results for all sequences and those disaggregated into the first and last four sequences. The rightmost column of the Table clearly shows that committed subjects in High Cost have the highest average contribution levels confirming what we saw graphically in Figure 4. We can also see that the One Sided Cost treatment is the least successful of all treatments in getting committed subjects to overcome the social dilemma. Cheap Talk and Shared Cost lie in the middle, committed subjects are more successful than in One Sided Cost but less successful than those in High Cost at overcoming the social dilemma. We cannot reject the null hypothesis of equal average contributions of committed subjects in Cheap Talk and Shared Cost.

Observation 3. *Contributions of committed partners are highest in the High Cost treatment. Committed subjects in One Sided Cost perform the worst, with contributions lower than subjects in No Commitment. There is no treatment difference for committed subjects between Cheap Talk and Shared Cost who lie in between High Cost and One Sided Cost.*

These results, combined with those concerning the proportion of committed partnerships provide a first glance at mechanisms driving the treatment differences in overall efficiency. Recall from Observation 1 that High Cost and Cheap Talk were the most successful treatments in solving the social dilemma, and we were unable to separate them when we looked across all sequences. It is now evident that their similar levels of success comes through differences in composition. Committed subjects in High Cost are the highest contributors, but there are relatively few committed partnerships in this treatment compared to Cheap Talk. On the other hand, committed subjects in Cheap Talk contribute less on average than their High Cost counterparts but there are relatively more committed partnerships. Combined we cannot see statistical differences in overall efficiency at the treatment level. However, the contribution behaviour of committed subjects alone cannot explain the overall efficiency ranking. The lack of success of committed partnerships in One Sided Cost in overcoming the social dilemma does not decrease the treatment's overall efficiency relative to Shared Cost and No Commitment. We are also not yet able to explain the poor overall efficiency of Shared Cost during early sequences of the experiment.

Additional evidence to explain the differences in overall efficiency can be found by looking at treatment differences in the contribution behaviour of uncommitted subjects. Referring back to Figure 4 we see some surprising patterns. First, we see that average contributions of uncommitted subjects in One Sided Cost start quite low but by the middle of the experiment are higher than committed subjects in the treatment and the No Commitment benchmark. This shows that

uncommitted subjects are more successful at overcoming the social dilemma than their committed counterparts in One Sided Cost. We will return to an interpretation of this result and its effects on overall efficiency in the Discussion. Other interesting features of the data are that in Shared Cost uncommitted subjects average contributions start below No Commitment before rising to an equal level for the latter half of the experiment; whilst in High Cost we see the opposite. We do not display the average contribution behaviour of uncommitted subjects from Cheap Talk in Figure 4 after sequence 4 the because we have less than three partnerships in each subsequent sequence. However, we can see from Table 5 that contributions of these partnerships are substantially lower.

Table 5: Mann Whitney U-test Results - Efficiency of Uncommitted Subjects

	One Sided Cost	Shared Cost	High Cost
All Sequences			
Cheap Talk	5.732^{***}	2.093^{***}	6.055^{***}
One Sided Cost	-	8.860^{***}	0.406
Shared Cost	-	-	9.779^{***}
Sequences 1-4			
Cheap Talk	2.024^{**}	1.605	3.0652^{***}
One Sided Cost	-	7.309^{***}	2.969^{***}
Shared Cost	-	-	11.409^{***}
Sequences 5-8			
Cheap Talk	7.001^{***}	6.714^{***}	7.053^{***}
One Sided Cost	-	6.619^{***}	2.990^{***}
Shared Cost	-	-	2.344^{**}

Notes: Absolute value of the z-statistic reported is for the Mann-Whitney U-test that average individual contributions per sequence (of four periods) are equal between treatments. Significance Levels: $^{*}p < 0.10$, $^{**}p < 0.05$,$^{***}p < 0.01$.

We use a set of Mann-Whitney U tests to look for differences in contribution behaviour of uncommitted subjects across treatments. The unit of observation is again subject average contributions within a sequence. Table 5 presents the results of the tests for three periods of analysis: the entire experiment, the first- and last four sequences. Whilst across all sequences One Sided Cost and High Cost appear to have no treatment differences, this masks a dynamic effect. In the first four sequences, contributions in the High Cost treatment are above One Sided Cost; the opposite is true in final four sequences. The results also make clear that uncommitted subjects in High Cost and One Sided Cost have higher

contributions than their Shared Cost and Cheap Talk equivalents.

Observation 4. *Overall there is no treatment difference in the contribution behaviour of uncommitted subjects in High Cost and One Sided Cost. Dynamically we see uncommitted subjects in High Cost have higher contributions over the first half of the experiment whilst the opposite is true for the latter half. Both One Sided Cost and High Cost feature higher contributions of uncommitted subjects than in Shared Cost.*

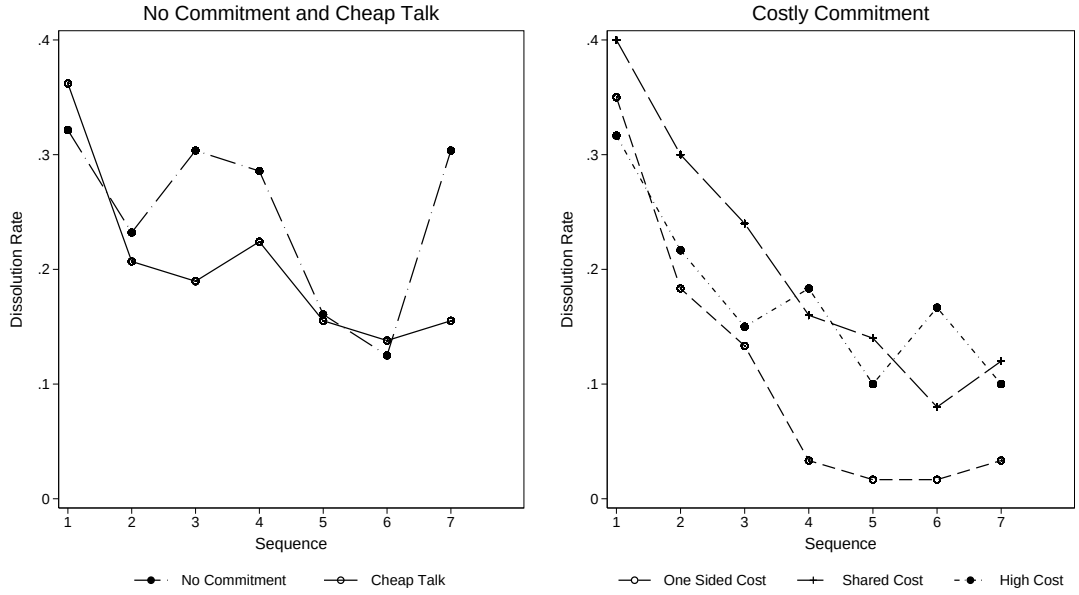
These results allow us to further understand the treatment differences in overall efficiency documented in Observation 1. In particular it clarifies why despite the lack of success that committed partnerships have in overcoming the social dilemma in One Sided Cost, overall efficiency is never shown to be significantly lower than in No Commitment. The relatively higher contributions of uncommitted subjects in most periods mitigate the lower contributions of the committed subjects. Combined, these two effects yield no overall treatment difference compared with No Commitment. We can also see that it is the low contributions of uncommitted subjects in Shared Cost that are damaging to overall efficiency over the first four sequences rendering the treatment second to last. Once the proportion of committed subjects in Shared Cost stabilised, and uncommitted subjects contributions improved to be similar to the No Commitment benchmark we see the positive effect of committed subjects take over and increase treatment level overall efficiency. Our results also suggest that it is the relatively higher contributions of uncommitted subjects in High Cost driving the efficiency difference between it and Cheap Talk in the early sequences of the experiment.

4.4 Partnership Dissolution

We now turn to analyze partnership dissolution decisions. Dissolution rates by treatment and sequence are plotted in Figure 5. The left panel documents the fraction of partnerships that are dissolved in the No Commitment and Cheap Talk treatments. Dissolution rates for treatments where dissolving a committed partnership is costly are shown in the right panel. The aggregate dissolution rate is higher in No Commitment compared to treatments where subjects can commit. Pairwise comparisons between No Commitment and both Cheap Talk and Shared Cost reveal treatment differences at the 10% significance level.[9] Treatment differences are significant at the 1% level between No Commitment and both One Sided Cost and High Cost respectively. Comparing across treatments where subject can choose to commit, the partnership dissolution rate in One Sided Cost is lower than in all other treatments ($p < 0.00$ for all pairwise comparisons). There is no significant difference in overall dissolution rates between the Cheap Talk, Shared Cost and High Cost treatments ($p > 0.1$ for all pairwise comparisons).

[9]Test of proportions, $p < 0.09$ for Shared Cost and $p < 0.08$ for Cheap Talk.

Figure 5: Partnership Dissolution Rates by Treatment and Sequence



The treatment differences in dissolution rates documented by the test of proportions are a combination of two effects: the direct effect of commitment and an indirect effect through changes in contributions. To disentangle the two effects we estimate a Random Effects Linear Probability Model.[10] The dependent variable in the regression is the dissolution decision of each subject in a regrouping phase. Recall that a partnership is dissolved if one or both partners choose to break the partnership. Treatment indicators are included as independent variables, as are interactions between commitment status and the treatment indicator. The reference treatment is No Commitment - where pledges of commitment were not available to subjects. If the treatment indicators are themselves statistically significant, this is evidence that introducing pledges of commitment alters the behaviour of uncommitted subjects. When the sum of the treatment indicator and the 'commitment-treatment' interaction is negative and significant

[10]The decision to use a Linear Probability Model represents a tradeoff. We could have instead estimated a Random Effects Probit or Random Effects Logit model, but recovering the marginal effects of pledges of commitment become more difficult because the effect of interest is an interaction term (Ai and Norton (2003)). Instead, the Linear Probability Model we estimate is an approximation of the Conditional Expectation Function (CEF). The estimated coefficients from the LPM are then linear approximations of the marginal effect of commitment across treatments. Estimated marginal effects from a Random Effect Logit regression do not change the qualitative results and are available from the authors on request.

this means introducing commitment decreases the dissolution rate of committed subjects compared to the No Commitment treatment. We add controls for contribution behaviour to isolate the direct effect of the pledge to commitment. Specification tests revealed that the minimum and maximum contribution of a subject and their partner over a sequence is sufficient. Sequence indicators are added to the regression to to control for time effects. Subject demographics including age, gender and study major are also added as additional controls. The regression coefficients are reported in Table 6.

Across all specifications we see that the addition of sequence and demographic controls do not significantly influence the estimated coefficients. One obvious effect of introducing sequence indicators is to decrease the percentage of predicted probabilities lying inside the unit interval. The regression coefficients accord well with economic intuition. Looking first at the coefficients on treatment indicators we see that only the Cheap Talk coefficient is significantly different from zero. This means in all other treatments, the introduction of commitment opportunities has no effect on the dissolution decisions of uncommitted subjects. The reason uncommitted subjects in Cheap Talk are more likely to dissolve is simple: these (few) uncommitted partnerships were relatively unsuccessful at achieving and sustaining cooperation so subjects were dissolving their partnerships frequently anticipating potential re-matching to a more cooperative partner.

The negative coefficients on the commitment - treatment interactions show that subjects in committed partnerships are always less likely to dissolve their partnership than their uncommitted counterparts in the same treatment. Estimated marginal effects range from 11.6 % for Shared Cost to 25.2 % for One Sided Cost. Compared to the reference treatment, No Commitment, we find subjects in committed partnerships that are costly to dissolve less likely to break up their partnership. The same is not true for Cheap Talk, where committed subjects are as likely to dissolve their partnership compared with subjects in No Commitment. This means that for a given contribution profile, subjects in committed partnerships with a positive dissolution cost are less likely to dissolve their partnership. Across treatments with costly pledges we find the distribution of dissolution costs play an important role in the dissolution decision. For a given contribution profile, committed subjects are 10.7% and 12.1% less likely to dissolve their partnership in One Sided Cost compared to Shared Cost and High Cost respectively. These differences are statistically significant at the 5% significance level. There is no significant difference in dissolution rates between High Cost and Shared Cost where the distribution of costs remains unchanged.

Observation 5. *The introduction of costly pledges of commitment decreases the likelihood that committed partners choose to dissolve their partnership, but have no effect on uncommitted partnerships. Dissolution rates are lowest when the cost burden falls solely on the partner choosing to dissolve, but are no different when we scale up the cost holding*

Table 6: Random Effects Linear Probabilty Model for Partnership Dissolution

	(1)	(2)	(3)
Pr(Dissolve)	RE LPM	RE LPM	RE LPM
Treatment Indicators			
Cheap Talk	0.198***	0.165**	0.169**
	(0.0740)	(0.0738)	(0.0745)
One Sided Cost	-0.000536	-0.0216	-0.0248
	(0.0372)	(0.0374)	(0.0392)
High Cost	-0.00159	-0.00807	-0.00617
	(0.0324)	(0.0324)	(0.0334)
Shared Cost	-0.0292	-0.0320	-0.0347
	(0.0345)	(0.0345)	(0.0354)
Commitment Effects			
Commit $\times$ Cheap Talk	-0.222***	-0.188***	-0.192***
	(0.0710)	(0.0708)	(0.0710)
Commit $\times$ One Sided Cost	-0.252***	-0.216***	-0.205***
	(0.0359)	(0.0365)	(0.0372)
Commit $\times$ High Cost	-0.131***	-0.107**	-0.106**
	(0.0450)	(0.0451)	(0.0457)
Commit $\times$ Shared Cost	-0.116***	-0.101**	-0.0953**
	(0.0447)	(0.0446)	(0.0451)
Contributions controls			
Own Max/10	0.0192***	0.0183***	0.0176***
	(0.00526)	(0.00524)	(0.00530)
Own Min/10	-0.0229***	-0.0212***	-0.0215***
	(0.00354)	(0.00354)	(0.00356)
Partner Max/10	-0.0323***	-0.0334***	-0.0334***
	(0.00510)	(0.00507)	(0.00510)
Partner Min/10	-0.0286***	-0.0270***	-0.0264***
	(0.00347)	(0.00347)	(0.00349)
Constant	0.676***	0.742***	0.716***
	(0.0396)	(0.0426)	(0.0550)
Sequence Dummies		YES	YES
Demographics			YES
% Pred $\in [0,1]$	0.88	0.78	0.78
σ_u	0.121	0.121	0.124
σ_e	0.298	0.296	0.296
R^2	0.323	0.332	0.336
Observations	1,988	1,988	1,988
Number of Subjects	284	284	284

Standard errors in parentheses, clustered at the session level
*** p<0.01, ** p<0.05, * p<0.1

the distribution constant. Costless pledges do have no effect on overall dissolution rates compared to the setting where commitment opportunities are not available.

4.5 Discussion - Pledges of Commitment and Cooperation

With our results in hand, we are in a position to explain the treatment differences in overall efficiency documented in Observation 1. As previously discussed, Cheap Talk and High Cost are the most successful treatments in terms of overall efficiency. Our statistical tests could not definitively separate these two treatments. The efficiency gains in High Cost stem from the higher contributions of a small set, approximately 30% of all partnerships, of committed subjects. Subjects in these committed partnerships featured the highest contributions across all treatments. Committed subjects in High Cost were also found to be less likely to dissolve their partnership, keeping high performing partnerships together. Combined with the fact that uncommitted partnerships in High Cost performed as least as well as the No Commitment treatment, where pledges of commitment were removed, overall efficiency rose.

The route to increased efficiency in Cheap Talk stands in stark contrast to what was observed in High Cost. The Cheap Talk treatment is characterised by many committed partnerships, above 80 percent in all sequences, with contributions that were higher than the No Commitment treatment but lower than committed subjects in High Cost. One slightly disturbing feature of the Cheap Talk treatment is the small fringe of uncommitted partnerships that were unsuccessful in overcoming the social dilemma. These uncommitted partnerships were characterized by low average contributions and frequent dissolution, where subjects were frequently dissolving their partnership looking to be rematched to more cooperative partners. Overall, the large number of committed partnerships outweighed the uncommitted few driving up treatment efficiency to a level parallel to High Cost.

The Shared Cost treatment shares some features that we find in the High Cost and Cheap Talk treatments. In particular, we see that committed partnerships in Shared Cost are as successful in overcoming the social dilemma as committed subjects in Cheap Talk but there are fewer committed partnerships - as in High Cost. The effect of commitment on the decision to dissolve a committed partnership is also similar when compared to High Cost. Combined, we see overall efficiency in this treatment below the top performing treatments. One important difference we see in Shared Cost is a slower, more gradual rise in cooperation levels across all partnerships over early sequences of the experiment. This effect, which is paralleled across committed and uncommitted partnerships makes the treatment the worst performing in the first half of the experiment among all treatments which feature endogenous partnership formation. A potential explanation for this can be seen in from Figures 3 and 5 which plot the commitment and partnership dissolution rates respectively. Shared Cost features a low proportion of committed partnerships and a higher dissolution rate in early sequences, sug-

gesting that a longer sorting process of subjects into partnerships with similar level of cooperativeness. Once this sorting took place, efficiency rises through the formation of high contributing committed partnerships.

The One Sided Cost treatment provides the most suprising results. Committed partnerships in this treatment are the least successful of all committed partnerships in overcoming the social dilemma, and even fair worse on average than subjects in No Commitment. This inefficiency of committed subjects is a result of the uneven distribution of dissolution costs. Recall that in this treatment, only the subject who decides to break the partnership bears the dissolution cost. This 'locks in' subjects, making them the least likely of all to dissolve the partnership. Anticipating that a partner is less likely to dissolve, one committed subject begins to free ride on another which in turn drives down contributions of the higher contributing partner. Surprisingly, the inefficiency of the committed partners is offset by their uncommitted counterparts. Uncommitted subjects in this treatment are found to have higher contributions than the committed subjects. Contributions are also higher than the No Commitment reference level. A potential mechanism that explains this is as follows: Some subjects anticipate the negative effects of commitment on contributions that we document above. Instead of deciding to commit, subjects sort into partnerships with other cooperative uncommitted partners and use the threat of free dissolution & uncertain regrouping outcomes to keep contributions high. Our results suggest that this unlikely combination of unsuccessful committed partnerships and successful uncommitted partners results is an overall efficiency level that is not significantly different than what we see in Shared Cost.

It is important to note that our results cannot establish a wholly causal relationship between pledges of commitment and cooperation. Instead our results speak to a combination of a causal effect where commitment directly influences cooperation *and* a selection effect where potentially highly cooperative partnerships choose to commit and lock in their partner. Some evidence for a causal channel of commitment can be seen by comparing contributions of committed subjects in early periods with their uncommitted counterparts. In early matchings differences in contributions should not be due solely to selection, as it takes time for the group formation mechanism to match high contributing partners together. Furthermore it is unlikely that an 'extra' round of selection through commitment (the first round being regrouping) should trigger the differences in overall efficiency documented in Observation 1. A pure selection argument would suggest, for example, that high contributing partners in High Cost are more likely to commit but it does not suggest that treatment level efficiency increases. Instead, one would expect to see committed partnerships with higher contributions than their uncommitted counterparts but overall efficiency would remain relatively unchanged. It is the credible threat of dissolution with monetary costs of break

up plus regrouping uncertainty driving higher contributions. It is also unlikely that in One Sided Cost low contributing subjects actively *select* into committed partnerships.

5. Conclusion

In this paper we designed an experiment to investigate the impact of pledges of commitment on cooperation levels in endogenously formed partnerships facing a social dilemma. The design of the experiment isolates the cooperation enhancing role played by pledges of commitment and the distribution of costs attached to dissolving committed partnerships. Our results show that the introduction of commitment opportunities can serve to increase the overall efficiency of partnerships. The introduction of commitment leads to higher levels of cooperation within committed partnerships in the Cheap Talk, Shared Cost and High Cost treatments. This increase in cooperation flows through to increase treatment level efficiency in Cheap Talk and High Cost. In Shared Cost, the higher levels of cooperation in committed partnerships does not increase overall efficiency due to the low proportion of committed partnerships combined with more modest increases in cooperation relative to High Cost. In the One Sided Cost treatment we found no change in average welfare at the treatment level despite decreases in efficiency of committed subjects. The decrease was offset by the success of uncommitted subjects in this treatment.

A specific focus of the experiment was to determine how the size and distribution of costs attached to dissolving committed partnerships influence cooperation. The results document the importance of the distribution of dissolution costs in driving increases in cooperation due to a 'commitment effect.' We find that when the costs of breaking up a committed partnership fall solely on the subjects who choose to dissolve the partnership pledges of commitment decrease partnership efficiency. In contrast, we found that when dissolution were zero or when costs fell equally on partners committed partnerships were more efficient. Increases in cooperation when there we no costs to dissolve committed partnerships suggests pledges of commitment themselves can positively influence cooperation through signalling intentions and reassuring partners. This effect can be reinforced by the presence of equally split dissolution costs because subject's respond to the credible threat of their partner dissolving the partnership.

The findings we present suggest avenues for future research. Our results indicate that pledges of commitment with different cost structures lead to similar increases in cooperation and efficiency. Designing an experiment where partners could decide whether to commit and then choose to attach costs to dissolve a committed partnership would be an interesting next step. A post-commitment

stage where partners negotiate over both the size and distribution of the costs attached to dissolving a committed partnership could be added to the design developed in this paper. This approach would provide insight into how individuals perceive dissolution costs interact with pledges of commitment in sustaining cooperation. Another extension is to investigate the success pledges of commitment under different information conditions. Outside the laboratory it is rare for individuals to know the precise history of potential partners. One could construct a set of treatments to investigate the effectiveness of commitment in environments where subjects do not have such detailed information about potential partners past levels of cooperativeness, instead relying on 'soft' reputations. These extensions are left for future work.

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A. Appendix Tables - Contribution Behaviour

Table A: Summary of Contribution Behaviour by Sequence and Treatment

		Sequence								
Treatment		1	2	3	4	5	6	7	8	Total
Random Matching	Mean contr.	50.32	49.39	53.83	55.77	57.76	51.09	54.47	51.63	53.03
	Median contr.	50.00	50.00	50.00	59.50	60.00	50.00	50.00	50.00	50.00
	Std Deviation	33.00	37.96	36.39	34.47	36.69	36.37	36.66	38.86	36.31
No Commitment	Mean contr.	65.58	72.95	75.57	73.46	74.14	74.88	76.09	65.03	72.21
	Median contr.	70.00	85.00	82.00	80.00	80.00	80.00	90.50	72.50	80.00
	Std Deviation	34.69	30.84	28.35	27.56	28.78	28.28	28.87	36.48	30.86
Cheap Talk	Mean contr.	68.41	76.31	80.28	79.01	79.69	80.61	79.53	71.99	76.98
	Median contr.	80.00	90.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
	Std Deviation	33.73	30.57	26.22	29.51	29.94	29.87	31.66	38.40	31.64
One Sided Cost	Mean contr.	60.74	70.77	71.82	74.54	73.18	74.47	72.75	63.59	70.21
	Median contr.	60.00	80.00	87.50	95.00	100.00	100.00	100.00	82.50	90
	Std Deviation	35.53	34.39	34.99	32.87	34.07	34.08	37.54	41.65	35.99
Shared Cost	Mean contr.	57.31	64.89	69.76	74.62	78.43	78.31	78.85	71.28	71.68
	Median contr.	55.00	70.00	80.00	80.00	90.00	90.0	90.00	90.00	80
	Std Deviation	30.10	30.68	30.87	28.35	26.43	26.87	25.62	34.06	30.04
High Cost	Mean contr.	75.83	79.76	82.00	78.17	79.50	77.10	78.99	71.15	77.81
	Median contr.	90.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
	Std Deviation	28.73	30.36	29.58	33.09	30.58	32.84	30.55	38.39	31.98

Table B: Summary of Commited Subject's Contribution Behaviour by Sequence and Treatment

			Sequence								
Treatment			1	2	3	4	5	6	7	8	Total
No Commitment	All Subjects	Mean Contr.	65.58	72.95	75.57	73.46	74.14	74.88	76.09	65.03	72.21
		Std Deviation	34.69	30.85	28.35	27.56	28.76	28.28	28.87	36.48	30.86
Cheap Talk	Commited	Mean Contr.	67.91	75.83	81.39	80.93	79.70	80.61	81.88	75.33	78.10
		Std Deviation	33.80	30.87	25.24	28.43	29.94	29.87	29.54	36.52	30.89
	Uncommitted	Mean Contr.	71.56	82.81	65.31	53.19	-	-	13.75	26.88	58.18
		Std Deviation	33.64	26.01	34.57	32.48	-	-	13.02	35.58	37.81
One Sided Cost	Commited	Mean Contr.	39.98	67.04	72.92	71.91	67.76	71.05	70.30	60.24	66.96
		Std Deviation	34.68	35.52	32.25	34.87	35.81	35.72	38.37	42.16	37.40
	Uncommitted	Mean Contr.	68.28	74.04	70.73	79.81	85.81	83.88	79.48	74.59	75.23
		Std Deviation	32.80	33.16	37.63	27.91	25.71	27.21	34.55	38.24	33.15
Shared Cost	Commited	Mean Contr.	64.69	73.13	81.41	82.39	84.77	85.44	83.53	82.02	81.51
		Std Deviation	23.49	23.56	21.87	22.63	22.01	19.62	20.19	25.25	22.54
	Uncommitted	Mean Contr.	56.67	62.28	64.27	70.96	75.44	74.96	76.65	66.23	67.86
		Std Deviation	30.57	32.25	32.98	30.06	27.85	29.14	27.61	36.50	31.68
High Cost	Commited	Mean Contr.	75.94	88.45	87.60	86.44	88.60	84.94	88.14	83.54	86.11
		Std Deviation	21.23	18.04	17.83	23.03	18.98	24.39	21.50	33.59	24.18
	Uncommitted	Mean Contr.	75.82	78.03	80.60	75.16	75.60	73.75	75.66	62.88	75.10
		Std Deviation	29.23	32.01	31.73	35.64	33.68	35.39	32.66	39.26	33.71

B. Appendix (not for publication)

B.1 Sample Instructions – Shared Cost Treatment

Before we start, please read the instructions carefully.

During the experiment, your earnings will be calculated in points rather than dollars. Points are converted to Dollars at the following exchange rate at the end of the session to determine your payment:

$$200 \text{ Points} = \text{AUD } 1.00$$

You will be paid in cash immediately after the experiment.

You are not allowed to communicate to other participants during the experiment.

If you have any questions, please raise your hand and we will attend to you individually.

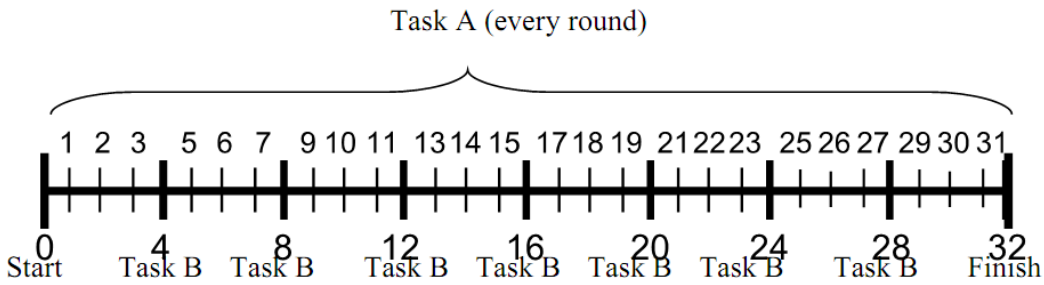
Failure to comply with the outlined rules will result in exclusion from the experiment and you will forfeit your payment.

Summary:

You will play a game (described in the game section below) for 32 rounds. The game consists of two reoccurring tasks.

1. Task A: For every round, you will have to decide how to divide 100 points between yourself and an investment project.
2. Task B: After every four rounds, you will have to make a decisions about your partnership.

Timeline of the game:



- You will play this game with a partner. Your initial partner is randomly chosen by a computer.

Details

Task A:

Task A consists of a game for two people. In what follows we will refer to the person you are playing with as your 'partner.' In each of the 32 rounds, you have to divide your endowment (100 points) between what you keep for yourself and what you invest in the project. Your partner chooses her/his investment at the same time.

The total income you earn will be the sum of two parts:

1. Points that you keep (endowment investment)
2. Your 'income from the project.'
   Income from the project = 0.8 $\times$ (your investment + your partners investment)

Therefore, your total income is calculated as follows:

$$\begin{aligned}\text{Total Income} &= \text{Points that you keep} + \text{income from the project} \\ &= (\text{endowment} \ \text{investment}) + 0.8 \times (\text{your investment + your partners investment})\end{aligned}$$

Your partner's income from the project is calculated the same way.

Task B:

After every four rounds you will have to make two decisions about your partnership:

1. Whether to breakup with your partner.
2. Whether to commit to your partner for the future.

1. The breakup decision:

After every four rounds, you will have to decide whether you want to continue the game with your current partner, or break up and become a 'single.' This option is also available to your partner. If you decide to break up you will be asked to provide reasons as to why. No-one else (including your ex-partner) has access to these reasons. 'Singles' are rematched according to the following procedure.

Rematching Procedure for 'Singles':

- We will display the contribution histories of other 'singles' over the last four periods of the game.
- You will then be asked to rank each 'single' in preference order, i.e. your most preferred candidate should get a ranking of '1.'
- The computer will collect the rankings from every 'single' and rematch all 'singles' according to these rankings. The partner you are matched with is determined by your preferences and the preference of all other 'singles'. The computer is programmed to give you the best partner available (according to your ranking).

Breaking up a partnership can be costly. The costs of break up are as follows:

- If you are in an uncommitted relationship: ZERO breakup costs for both partners
- If you are in a committed relationship: Break up is costly. See the table below for the different costs.

		Partner's Choice: Breakup	Partner's Choice: Not breakup
Your Choice	**Break up**	***Your Cost: $E 200*** Partner's Cost: $E 200	***Your Cost: $E 200*** Partner's Cost: $E 200
	Not Break up	***Your Cost: $E 200*** Partner's Cost: $E 200	***Your Cost: $E 0*** Partner's Cost: $E 0

These breakup costs will be subtracted from your total profit.

After everyone has been matched, the experiment will continue for another four rounds. After these four rounds, you will again be asked to make a decision: stay with your partner or break the relationship. All the same rules apply as outlined previously.

2. The commitment decision:

After the rematching has occurred uncommitted couples will have the option of committing to each other. Each partner is asked whether they want to commit to the relationship.

a. If both partners choose to commit, the relationship becomes a committed relationship.

b. If only one partner chooses to commit, the relationship becomes an uncommitted relationship.

c. If neither partner chooses to commit, the relationship becomes an uncommitted relationship.

After both commitment decisions have been made, you will be told whether your partnership becomes 'committed' or remains an 'uncommitted' partnership. Once a committed relationship forms, you and your partner will remain together until one partner decides to break up. Only one partner needs to decide to break up for a committed partnership to end.

If a committed partnership breaks up, both partners become 'single' and are rematched according to the procedure outlined previously. The new partnership formed as a result of the rematching is an 'uncommitted' partnership. This new partnership can become a 'committed' partnership depending on the commitment decisions of both partners.

This process will continue until 32 rounds have been played.

After the 32nd round your total profit will be recorded and you will be paid in cash.