

Nosenzo, Daniele; Quercia, Simone; Sefton, Martin

Working Paper

Cooperation in small groups: The effect of group size

CeDEx Discussion Paper Series, No. 2012-17

Provided in Cooperation with:

The University of Nottingham, Centre for Decision Research and Experimental Economics (CeDEx)

Suggested Citation: Nosenzo, Daniele; Quercia, Simone; Sefton, Martin (2012) : Cooperation in small groups: The effect of group size, CeDEx Discussion Paper Series, No. 2012-17, The University of Nottingham, Centre for Decision Research and Experimental Economics (CeDEx), Nottingham

This Version is available at:

<https://hdl.handle.net/10419/100148>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



CENTRE FOR DECISION RESEARCH & EXPERIMENTAL ECONOMICS



The University of
Nottingham

Discussion Paper No. 2012-17

Daniele Nosenzo, Simone
Quercia and Martin Sefton
December 2012

Cooperation in Small Groups:
The Effect of Group Size

CeDEx Discussion Paper Series

ISSN 1749 - 3293



CENTRE FOR DECISION RESEARCH & EXPERIMENTAL ECONOMICS

The Centre for Decision Research and Experimental Economics was founded in 2000, and is based in the School of Economics at the University of Nottingham.

The focus for the Centre is research into individual and strategic decision-making using a combination of theoretical and experimental methods. On the theory side, members of the Centre investigate individual choice under uncertainty, cooperative and non-cooperative game theory, as well as theories of psychology, bounded rationality and evolutionary game theory. Members of the Centre have applied experimental methods in the fields of public economics, individual choice under risk and uncertainty, strategic interaction, and the performance of auctions, markets and other economic institutions. Much of the Centre's research involves collaborative projects with researchers from other departments in the UK and overseas.

Please visit <http://www.nottingham.ac.uk/cedex> for more information about the Centre or contact

Sue MacCormick
Centre for Decision Research and Experimental Economics
School of Economics
University of Nottingham
University Park
Nottingham
NG7 2RD
Tel: +44 (0)115 95 15469
Fax: +44 (0) 115 95 14159
sue.maccormick@nottingham.ac.uk

The full list of CeDEx Discussion Papers is available at

<http://www.nottingham.ac.uk/cedex/publications/discussion-papers/index.aspx>

Cooperation in Small Groups: The Effect of Group Size

by

Daniele Nosenzo^a, Simone Quercia^b and Martin Sefton^c

19 December 2012

Abstract

Previous experiments have found a moderate, positive effect of group size on cooperation in voluntary contribution mechanism (VCM) games. This effect has been typically observed in experiments with groups of size 4 or more, and contrasts with results from n -person prisoner's dilemma and oligopoly experiments where group size has a negative effect on cooperation. In an attempt to reconcile these findings, we study VCM contributions in smaller groups. We conjectured that in groups of four or more players considerations about the social benefits of contributing, which increase with group size, may dominate any negative effect arising from the difficulties of cooperating in large groups. The negative effects of group size may instead be more evident in smaller groups. We test this conjecture in an experiment where we compare 2-3- and 4-person VCM games. We find that contributions are highest in groups of two players and lowest in groups of three. This U-shaped contributions pattern suggests that offsetting positive and negative effects operate in VCM games.

Keywords: voluntary contribution mechanism, cooperation, group size.

JEL classification: C72; H41.

^a School of Economics, University of Nottingham, University Park, Nottingham, NG7 2RD, United Kingdom. E-mail: daniele.nosenzo@nottingham.ac.uk

^b School of Economics, University of Nottingham, University Park, Nottingham, NG7 2RD, United Kingdom. E-mail: simone.quercia@nottingham.ac.uk

^c Corresponding author. School of Economics, University of Nottingham, University Park, Nottingham, NG7 2RD, United Kingdom. E-mail: martin.sefton@nottingham.ac.uk. Tel: +44 (0) 115 846 6130. Fax: +44 (0) 115 951 4159.

1. Introduction

The voluntary contributions mechanism (VCM) has become a widely used experimental framework for studying cooperation. In typical experiments participants are assigned to n -player groups. Each group member is endowed with tokens and chooses how many to place in a private account, from which that person earns α money units per token, and how many to place in a group account, from which every person in the group earns β money units per token. Parameters are chosen so that private and collective interests are in conflict: the group maximizes earnings by allocating all tokens to the group account ($n\beta > \alpha$), but each group member has a private incentive to place her tokens in her private account ($\alpha > \beta$). This task is then repeated over a number of periods. The framework in which tokens are allocated between private and group accounts was introduced by Marwell and Ames (1979); Isaac et al. (1984) modified their design to introduce the version described above. See Ledyard (1995) and Chaudhuri (2011) for reviews of experiments using this framework.

One factor that might be expected to affect contributions is the size of the group. Findings from other experimental settings where there is a tension between private and collective interests, such as n -person prisoner's dilemma or oligopoly experiments, suggest that subjects find it more difficult to attain collectively optimal outcomes in larger groups. For example Marwell and Schmitt (1972), compared two- and three-person iterated prisoner's dilemmas and find that cooperation rates are significantly lower in three-person groups. Numerous subsequent studies report further evidence that cooperation is inversely related to group size, although, as Kollock (1998) notes in a review of this literature, in some studies the decrease in cooperation as group size increases tapers off quickly. Most recently, Grujić et al. (2012) find that cooperation rates are higher in two-person groups than in groups with three, four or five players, though they do not observe differences between three, four or five player groups.

Similarly, a large literature on experimental oligopolies finds that cooperation (i.e. collusion) is more difficult in larger groups (i.e. when there are more competitors). For example Huck et al. (2004) study the textbook homogeneous goods Cournot model with two, three, four or five firms per market. They report higher aggregate quantities, and therefore lower prices, with more firms. This result can only partially be explained by the way equilibrium predictions change with the number of firms. Fouraker and Siegel (1963) examine the textbook Bertrand

model under duopoly and triopoly treatments. Although equilibrium predictions are the same for both treatments, prices are higher among duopolies. Similarly, Dolbear et al. (1968) study a model of price competition with differentiated goods where equilibrium predictions are independent of the number of competitors, and they too find prices to be higher with smaller numbers of firms.

There are several possible explanations for these negative effects of group size on cooperation. One is based on the idea that a number of factors conducive to cooperation, such as social pressure and social incentives, may be more effective in small than larger groups (Olson, 1965). Other authors (Marwell and Schmitt, 1972) have suggested the ‘bad apple’ hypothesis. Many individuals are willing to cooperate, but only as long as others do so as well. Thus, if a group contains one non-cooperator (a ‘bad apple’) cooperation will unravel. In a population containing a fixed proportion of non-cooperators larger groups are more likely to unravel. Another possibility is that, as discussed by Kim and Walker (1984), individuals in small groups have a greater perception that their free-riding may have an impact on others’ willingness to cooperate in the future.

Interestingly, previous VCM studies have found that, if there is an effect of group size, it is in the direction of higher contributions in larger groups (see below for a review). An explanation for this finding can be based on the private and social costs and benefits of a contribution. For each token contributed a contributor incurs a cost of α and a benefit of β money units, regardless of group size, whereas the social benefits of the contribution, n times β money units, increase with group size. If individuals care about more than just own earnings, and instead internalize some of the social benefits of contributing, they may be willing to contribute more in larger groups where the social benefits are larger.

Taking together the results from previous VCM, n -person prisoner’s dilemma, and oligopoly experiments, we conjectured that observed group size effects in VCM experiments reflect two factors operating in opposite directions. A positive effect of group size stems from the increased social benefits from a contribution, while a negative effect stems from the difficulty of sustaining cooperative outcomes in larger groups. The moderately positive effects observed in previous experiments may then reflect the focus of the literature on groups of four or more players, which in the standard VCM setup is already sufficiently large to make it difficult to

sustain cooperation, and where the positive effects dominate. We conjectured that the negative effect of group size may be more evident in smaller groups.

To test this conjecture we compare cooperation rates in VCM experiments using small groups of two, three and four players. In all treatments initial contributions are around 75% of endowments. Treatments then differ in how contributions unravel across periods. The pattern in three- and four-person games follows that typically observed in previous VCM experiments: contributions decline steadily across periods with a particularly marked decline in the final period. In contrast, in two-person games contributions are stable across periods (until a marked end-game effect). The difference in treatments results in a U-shaped pattern in average contributions with respect to group size: average contributions are highest in two-person groups and lowest in three-person groups. These results support our conjecture that observed group size effects in VCM studies reflect offsetting forces, and that, at least in small groups, increasing group size has a negative effect on contributions.

The remainder of the paper is organized as follows. In the next section we review previous evidence on group-size effects in VCM experiments. In Section 3 we describe our experimental design and procedures. In Section 4 we present the results, and Section 5 concludes.

2. Group Size Effects in Previous VCM Experiments

We are aware of six previous studies that have systematically examined the effects of group size in VCM games holding other game parameters constant. These studies are listed in Table 1, along with the marginal per capita return from contributions to the group account ($MPCR = \beta/\alpha$) and group sizes used in each treatment. We also report the average contributions as a percentage of endowments and levels of statistical significance.¹

With the exception of Goeree et al. (2002) who use one-shot games, all studies use repeated VCM games. In most studies group composition does not change across periods

¹ For all studies the original data were either included as an appendix or supplied by the authors. Average contributions are computed holding constant other features of the experiment such as MPCR, subjects' experience with the VCM (for the Isaac et al. 1984 study), and subject pool (for the Goeree et al. 2002 study). To assess group size effects we apply the same methods as we use below in our own data – two-sided Fisher's randomization tests treating average contributions in each group across all periods as the unit of observation (see Moir, 1998 for a discussion of the randomization test.). Exceptions are Goeree et al. (2002) one-shot within-subject experiment, where we treat individual average contributions as the unit of observation, and Carpenter (2007) strangers matching protocol experiment, where we use average contributions in a session as the unit of observation. Isaac et al. (1984) have insufficient number of independent groups to conduct meaningful tests.

(partners matching protocol). In Carpenter (2007) groups are randomly reformed at the beginning of each new period (strangers matching protocol). Group size effects are studied by varying the number of players matched in a group. In all studies group sizes are varied in a between-subject design, except in Goeree et al. (2002) who use a within-subject design. Most studies have investigated group size effects using groups of 4 or more players. An exception is Goeree et al. (2002) that compares groups with 2 and 4 players.

Table 1 – Group size effects in previous VCM experiments

Study	MPCR	Group size (average contribution as % of endowment)	Statistical significance
Isaac et al. (1984) (<i>inexperienced subjects</i>)	0.3	4 (27%); 10 (33%)	n.a.
	0.75	4 (65%); 10 (65%)	n.a.
Isaac et al. (1984) (<i>experienced subjects</i>)	0.3	4 (12%); 10 (34%)	n.a.
	0.75	4 (50%); 10 (54%)	n.a.
Isaac and Walker (1988)	0.3	4 (13%); 10 (29%)	**
	0.75	4 (50%); 10 (46%)	n.s.
Isaac et al. (1994)	0.3	4 (18%); 10 (26%); 40 (44%); 100 (40%)	4 vs. 10 n.s.; 4 vs. 40 **; 4 vs. 100 ** 10 vs. 40 **; 10 vs. 100 *
	0.75	4 (43%); 10 (44%); 40 (39%); 100 (38%)	40 vs. 100 n.s. any comparison: n.s.
Goeree et al. (2002) (<i>UVA subject pool</i>)	0.8	2 (48%); 4 (39%)	n.s.
Goeree et al. (2002) (<i>USC subject pool</i>)	0.8	2 (50%); 4 (45%)	n.s.
Carpenter (2007)	0.375	5 (37%); 10 (54%)	n.s.
	0.75	5 (50%); 10 (70%)	n.s.
Weimann et al. (2012)	0.02	60 (11%); 100 (13%)	**
	0.04	60 (20%); 100 (23%)	*

Levels of statistical significance are based on two-sided Fisher's randomization tests (see footnote 1 for details). ** = significant at the 5% level; * = significant at the 10% level; n.s. = not significant; n.a. = insufficient number of independent observations for a meaningful test.

Most studies report a positive effect of group size on cooperation. The effect seems stronger in settings where the MPCR is low. The reported effect is not always statistically significant, although in some cases this may reflect our conservative testing procedure. In the studies where subjects interact repeatedly we treat groups in which subjects interact as a single observation, resulting in a small effective sample size. For example, the averages reported for Carpenter (2007) are based on 2100 choices (210 subjects x 10 periods), but only 13 independent

groups. It is therefore not surprising that the large observed effect is insignificant.² In some cases, increasing group size is found to reduce average contributions (e.g., in Goeree et al., 2002, or when comparing 40- and 100-person groups in Isaac et al., 1994), although these negative effects are always statistically insignificant.

Overall, the picture that emerges from previous studies is that group size has a moderate, positive effect on cooperation in VCM games. This conclusion is reinforced by the meta-analysis results reported by Zelmer (2003). She uses data from 27 VCM experiments conducted using different parameterizations and procedures, and finds a positive and marginally significant (at the 10% level) effect of group size on contributions. While most of previous experiments have focused on groups of size 4 or more, in the next section we describe a new experiment designed to test whether this effect is obtained in smaller groups.

3. Experimental Design and Procedures

The experiment was conducted at the University of Nottingham using the software z-Tree (Fischbacher, 2007) and 168 student subjects from a wide range of disciplines, recruited through the online recruiting system ORSEE (Greiner, 2004). Multiple sessions were conducted and no participant took part in more than one session.

At the beginning of each session participants were randomly matched into groups that remained the same for the whole experiment. We varied the number of players matched into a group across sessions. In three sessions (thirty-six subjects in all) subjects played the VCM game in two-person groups (**VCM_2** treatment), in five sessions (sixty subjects) we used three-person groups (**VCM_3**), and in six sessions (seventy-two subjects) we used four-person groups (**VCM_4**). Thus we collected data on 18 two-person groups, 20 three-person groups, and 18 four person groups.

Participants did not know the identities of the other subjects in the room with whom they were grouped. They were given instructions for the experiment (reproduced in the Appendix) and these were read aloud by the experimenter. Any questions were answered by the

² Carpenter uses regression methods to analyse his data and finds a significant group size effect when contributions are regressed on a group size dummy along with other explanatory variables. However he does not report separate regressions for separate MPCRs. Applying his regression model to the different MPCR treatments separately we found the group size dummy to be significant at the 1% level for both MPCR values.

experimenter in private, and no communication between participants was allowed. No information passed across groups during the entire session.

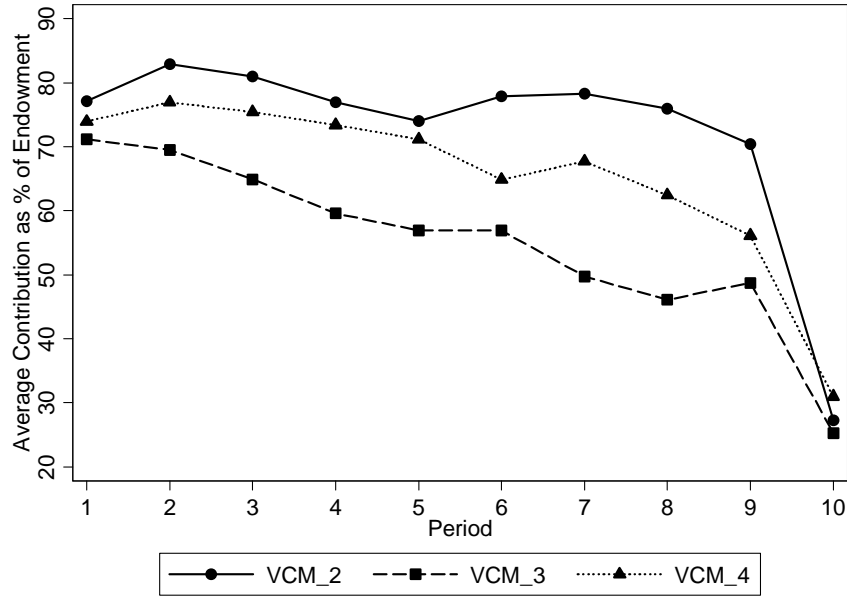
All groups played a ten-period VCM game. In each period, players received an endowment of 20 tokens and had to choose how many to allocate to a public account and how many to keep in a private account. A player earned $\alpha = 4$ points for each token she kept in her private account, and $\beta = 3$ points from each token allocated to the public account (regardless of which group member had contributed it). At the end of the period players were informed of the decisions and earnings of each group member.

At the end of a session the accumulated point earnings from all periods were converted into cash at a rate of £0.0075 per point. Participants' earnings ranged from £5.74 and £17.92, averaging £11.29, for sessions lasting between 30 and 60 minutes.

4. Results

Figure 1 shows average contributions (as percentage of endowment) in the three treatments across the ten periods of the experiment. In the first period contributions are similar across treatments (VCM_2: 77%; VCM_3: 71%; VCM_4: 74%). Between periods 2 and 9 contributions remain fairly stable in VCM_2, whereas they steadily decline in VCM_3 and VCM_4, with a more pronounced downward trend in VCM_3. In all treatments there is a noticeable drop in contributions in the last period of the experiment, where contributions are again similar across treatments (VCM_2: 27%; VCM_3: 25%; VCM_4: 31%).

Figure 1 – Average contributions across periods



We examine these contribution dynamics using OLS regressions of contributions on the variable *Period*, a dummy variable taking value 1 for contributions made in the last period of the experiment, and a constant.³ The regressions (reported in Table 2) show that contributions decline significantly over time in VCM_3 and VCM_4, but not in VCM_2.

Table 2 – Contribution dynamics

	VCM_2	VCM_3	VCM_4
Period	-0.86 (1.01)	-3.21*** (0.88)	-2.31*** (0.65)
1 if Last Period	-45.64*** (9.39)	-16.85** (7.41)	-26.57*** (6.39)
Constant	81.49*** (4.19)	74.25*** (5.15)	80.69*** (4.33)
<i>N.</i>	360	600	720
<i>R</i> ²	0.18	0.10	0.10

OLS regressions. Dependent variable is subject's contribution as percentage of endowment. Robust standard errors adjusted for intragroup correlation in parentheses (a subject's group is used as the independent clustering unit). * $0.05 \leq p \leq 0.10$; ** $0.01 \leq p < 0.05$; *** $p < 0.01$.

³ We obtain qualitatively similar results using alternative models that take into account the censored nature of the data. These estimates are available upon request.

These different contribution dynamics result in overall differences in contributions across treatments: averaging across all periods, contributions are highest in VCM_2 (72% of endowment) and lowest in VCM_3 (55%), with contributions in VCM_4 taking an intermediate value (65%). The difference in contributions between VCM_2 and VCM_3 is significant at the 5% level using a two-sided Fisher's randomization test ($p = 0.039$). We do not find significant differences in contributions between VCM_3 and VCM_4 ($p = 0.239$), or between VCM_2 and VCM_4 ($p = 0.388$). Thus, our data reveal a U-shaped pattern in group contributions across treatments: contributions are highest in two-person groups, and lowest in three-person groups.

5. Conclusions

Previous studies on the effects of group size in the voluntary contribution mechanism report a moderate, positive relation between the number of contributors and average contributions. This stands in contrast to the notion that small groups may be more successful in overcoming the free-riding problem than large groups (Olson, 1965), and may reflect the fact that the social benefits of a contribution are higher in larger groups.

This positive effect has been documented in groups of size four or more, where players may face similar difficulties in sustaining cooperative outcomes (low effectiveness of social pressure and social incentives; high likelihood that the group will contain at least one 'bad apple'; etc.), and the social benefits of contributing are substantial. In such settings, the positive effects of group size may dominate the negative effect. We conjectured that the negative effects of group size on contributions may be more evident in smaller groups.

In a laboratory experiment with two-, three-, and four-person groups we document a U-shaped relation between the number of contributors and average contributions. Contributions are highest in two-person groups and lowest in three-person groups, with four-person groups' contributions at an intermediate level. Taken together, our data and the results from previous studies suggest that the negative effect of group size on cooperation is dominant in small groups whereas positive effects prevail in larger groups.

References

- Carpenter, J. 2007. Punishing free-riders: how group size affects mutual monitoring and the provision of public goods. *Games and Economic Behavior* 60(1), 31–51.
- Chaudhuri, A. 2011. Sustaining cooperation in laboratory public goods experiments: a selective survey of the literature. *Experimental Economics* 14(1), 47–83.
- Dolbear, F.T., L.B. Lave, G. Bowman, A. Lieberman, E. Prescott, F. Rueter, and R. Sherman. 1968. Collusion in Oligopoly: An Experiment on the Effect of Numbers and Information. *The Quarterly Journal of Economics* 82(2), 240–259.
- Fischbacher, U. 2007. z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics* 10(2), 171–178.
- Fouraker, L., and S. Siegel. 1963. *Bargaining Behavior*. New York: McGraw-Hill.
- Goeree, J.K., C.A. Holt, and S.K. Laury. 2002. Private costs and public benefits: unraveling the effects of altruism and noisy behavior. *Journal of Public Economics* 83(2), 255–276.
- Greiner, B. 2004. An Online Recruitment System for Economic Experiments. In *Forschung und wissenschaftliches Rechnen. GWDG Bericht 63*, ed. K. Kremer and V. Macho, 79–93. Göttingen: Ges. für Wiss. Datenverarbeitung.
- Grujić, J., B. Eke, A. Cabrales, J.A. Cuesta, and A. Sánchez. 2012. Three is a crowd in iterated prisoner's dilemmas: experimental evidence on reciprocal behavior. *Scientific Reports* 2.
- Huck, S., H.-T. Normann, and J. Oechssler. 2004. Two are Few and Four Are Many: Number Effects in Experimental Oligopoly. *Journal of Economic Behavior & Organization* 53, 435–446.
- Isaac, R.M., and J.M. Walker. 1988. Group size effects in public goods provision: The voluntary contributions mechanism. *Quarterly Journal of Economics* 103, 179–199.
- Isaac, R.M., J.M. Walker, and S.H. Thomas. 1984. Divergent Evidence on Free Riding - an Experimental Examination of Possible Explanations. *Public Choice* 43(2), 113–149.
- Isaac, R.M., J.M. Walker, and A.W. Williams. 1994. Group-size and the voluntary provision of public goods - Experimental evidence utilizing large groups. *Journal of Public Economics* 54, 1–36.
- Kim, O., and J.M. Walker. 1984. The Free Rider Problem - Experimental-Evidence. *Public Choice* 43(1), 3–24.
- Kollock, P. 1998. Social dilemmas: The anatomy of cooperation. *Annual Review of Sociology* 24, 183–214.
- Ledyard, J.O. 1995. Public goods: A survey of experimental research. In *The Handbook of Experimental Economics*, ed. Alvin E. Roth and John H. Kagel, 111–181. Princeton: Princeton University Press.
- Marwell, G., and R. Ames. 1979. Experiments on the provision of public goods I: Resources, interest, group size, and the free-rider problem. *American Journal of Sociology* 84(6), 1335–1360.
- Marwell, G., and D.R. Schmitt. 1972. Cooperation in a three-person Prisoner's Dilemma. *Journal of Personality and Social Psychology* 21(3), 376–383.
- Moir, R. 1998. A Monte Carlo analysis of the Fisher randomization technique: reviving randomization for experimental economists. *Experimental Economics* 1(1), 87–100.
- Olson, M. 1965. *The logic of collective action*. Cambridge: Harvard University Press.
- Weimann, J., J. Brosig-Koch, H. Hennig-Schmidt, C. Keser, and C. Stahr. 2012. Public-good experiments with large groups. University Magdeburg FEMM Working Paper n. 120009.
- Zelmer, J. 2003. Linear public goods experiments: A meta-analysis. *Experimental Economics* 6, 299–310.

Appendix – Experimental Instructions

Below are the instructions given to experimental subjects. Differences between treatments are indicated in square brackets.

Instructions

Welcome!

You are about to participate in a decision-making experiment. Please do not talk to any of the other participants until the experiment is over. If you have a question at any time please raise your hand and an experimenter will come to your desk to answer it.

At the beginning of the experiment you will be matched with one [two] [three] other person [people], randomly selected from the participants in this room, to form a group of two [three] [four]. You will remain in this same group throughout the experiment. Each person in the group will be identified as either ‘group member A’ or ‘group member B’ [‘group member A’, ‘group member B’ or ‘group member C’] [‘group member A’, ‘group member B’, ‘group member C’ or ‘group member D’].

Your earnings will depend on the decisions made within your group, as described below. Your earnings will not be affected by decisions made in other groups. All decisions are made anonymously and you will not learn the identity of the other participant [participants] in your group.

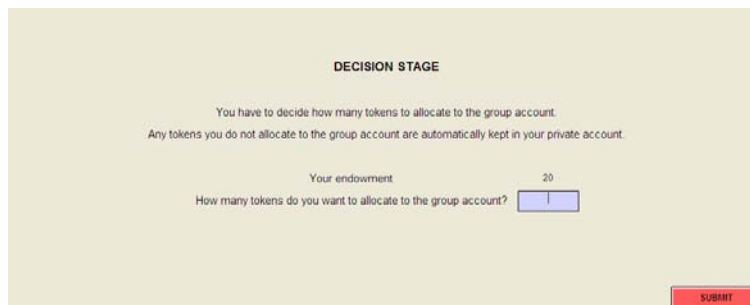
The experiment will consist of 10 periods, and in each period you can earn points. At the end of the experiment your accumulated point earnings from all periods will be converted into cash at the exchange rate of 0.75 pence per point. You will be paid in cash and in private.

Description of a period

At the beginning of each period you will be endowed with 20 tokens. Similarly, the other member [two members] [three members] of your group will be endowed with 20 tokens [each].

You must choose how many of these tokens to allocate to a group account and how many to keep in your private account. At the same time that you are making your decision the other member [two members] [three members] of your group must choose how many tokens to allocate to the group account and how many to keep in his or her private account [accounts].

You will enter your decision on a screen like the one shown below. You must enter the number of tokens you allocate to the group account. Any tokens you do not allocate to the group account will automatically be kept in your private account.



DECISION STAGE

You have to decide how many tokens to allocate to the group account.
Any tokens you do not allocate to the group account are automatically kept in your private account.

Your endowment 20

How many tokens do you want to allocate to the group account?

SUBMIT

Your earnings will be determined as follows:

For each token you keep in your private account you will earn 4 points.

For each token you allocate to the group account you and the other member [two members] [three members] of your group will earn 3 points each.

Similarly, for each token the other [another] group member keeps in his or her private account he or she will earn 4 points, and for each token he or she allocates to the group account both [all three] [all four] group members will earn 3 points each.

Your point earnings will be the sum of your earnings from your private account and the group account.

Thus:

Your point earnings = 4 x (number of tokens kept in your private account) + 3 x (total number of tokens allocated to the group account by yourself and the other member [two members] [three members] of your group).

At the end of the period you will be informed of the decisions in your group and each group member's earnings for the period in a screen like the one below [*the screen below was changed accordingly in VCM_3 and VCM_4*].

FEEDBACK STAGE		
The Table below shows the number of tokens allocated by each group member to the group account in the DECISION STAGE.		
The Table also shows each group member's earnings for the period.		
	Tokens allocated to group account in the DECISION STAGE	Earnings for the period
YOU	xxx	xxx
group member xxx	xxx	xxx

At the end of period 10 your accumulated points from all periods will be converted to cash at a rate of 0.75 pence per point. You will be paid in private and cash.

Before we begin the decision-making part of the experiment we want to check that each participant understands how their earnings will be calculated. To do this we ask you to answer some questions. You will find these on the next page. In a couple of minutes the experimenter will check your answers. When each participant has answered all questions correctly we will continue with the experiment.

Questions

1. How many periods will there be in the experiment? _____
2. How many people are in your group (including yourself)? _____
3. Will you be matched with the same or different people in every period? (circle one)
SAME DIFFERENT
4. Suppose in a period the [each] other group member allocates 0 tokens to the group account. If you allocate 0 tokens to the group account
How many tokens do you keep in your private account? _____
What will be your earnings from your private account? _____
What is the total number of tokens allocated to the group account? _____
What will be your earnings from the group account? _____
What will be your earnings for the period? _____

5. Suppose in a period the [each] other group member allocates 20 tokens to the group account. If you allocate 20 tokens to the group account

How many tokens do you keep in your private account? _____

What will be your earnings from your private account? _____

What is the total number of tokens allocated to the group account? _____

What will be your earnings from the group account? _____

What will be your earnings for the period? _____

6. Suppose in a period the [each] other group member allocates 5 tokens to the group account. If you allocate 15 tokens to the group account

How many tokens do you keep in your private account? _____

What will be your earnings from your private account? _____

What is the total number of tokens allocated to the group account? _____

What will be your earnings from the group account? _____

What will be your earnings for the period? _____

7. Suppose in a period the [each] other group member allocates 15 tokens to the group account. If you allocate 5 tokens to the group account

How many tokens do you keep in your private account? _____

What will be your earnings from your private account? _____

What is the total number of tokens allocated to the group account? _____

What will be your earnings from the group account? _____

What will be your earnings for the period? _____

Beginning the experiment

If you have any questions please raise your hand and an experimenter will come to your desk to answer it.

We are now ready to begin the decision-making part of the experiment. Please look at your computer screen and begin making your decisions.