

“Though institutions are the basis of the modern state, the instinct to favor family never disappears and will reassert itself whenever possible.”

(Francis Fukuyama quotation from an interview with Nicholas Wade in The New York Times, March 11, 2011)

The social costs of responsibility

Steven J. Humphrey[†] and Elke Renner^{*}

11 OCTOBER 2011

Abstract: We report experimental evidence that decisions taken by individuals with responsibility for the welfare of passive dependants result in less socially cooperative behaviour than when decisions are taken without responsibility. Responsibility is therefore socially costly. Our data suggest that the effects we observe are best explained by the role of social identity, whereby the behaviour of group members is biased in favour of the group and against outsiders. Given the ubiquity of decision-making with responsibility, such as that which predominates in families, public policy designed to foster social co-operation, such as charitable giving, volunteering and civic engagement, needs to address that these objectives may be fundamentally incompatible with private decision motives.

Keywords: responsibility, public goods game, risk attitudes, volunteering, social norms, social preferences, social identity

JEL classification: C72, C91, D74, H41

[†] Fachbereich Wirtschaftswissenschaften, Universität Osnabrück, Rolandstr. 8, D-49069 Osnabrück, Germany. Tel.: +49-(0) 541 969 2725, fax: +49-(0)541 969- 2705, e-mail: steve.humphrey@uni-osnabrueck.de.

^{*} *Corresponding author:* School of Economics, University of Nottingham, Nottingham, NG7 2RD, United Kingdom. Tel.: +44-(0) 115 951 5399, fax: +44 (0) 115 951 4159, e-mail: elke.renner@nottingham.ac.uk.

1. Introduction

Would the choices you make be affected by whether or not you have responsibility for the welfare of others, such as members of your family? Would you continue to smoke whilst pregnant or drive your car at the same speed when your children are passengers? As a parent would you donate more or less of your money to charity, more or less of your time to volunteering? Answers to these questions are important for two reasons. Firstly, decisions taken with responsibility are ubiquitous: household decisions are often taken by the head of the household but affect all family members. Managers or firm owners frequently take decisions as representatives of firms that affect themselves as well as other employees. Secondly, if responsibility has an impact on decision makers' choices, it can also affect the performance of a broad range of economic and social institutions.

To illustrate this, consider the case of volunteering. In modern societies volunteers play a central role in the provision of a variety of public goods and services. In situations where a shortage of volunteers has been identified, home and family responsibilities have often been cited as an important contributory factor. For example, in a 2005 interview in USA Today, a US fire chief's explanation for a shortage of volunteer fire-fighters was that, "Family's first, work's second and volunteering of course is going to be at the bottom of the list."¹ Similarly, responsibility might impede initiatives such as the current UK government's flagship policy, which goes under the rubric "The Big Society". The Big Society embodies a range of measures aimed at fostering civic engagement by encouraging social co-operation, volunteering and philanthropic giving. Survey evidence collected to assist in the design of this policy has consistently revealed that the demands that home responsibilities place on finite resources (time and money), are significant barriers to socially co-operative behaviour (e.g. Low et al. 2007; Fox et al., 2009).

Despite the importance of decision-making with responsibility, there are no economic theories of choice which explicitly address how it influences behaviour. One consequence of this is the absence of a formal framework to predict the outcomes of the type of economic policy described in the previous paragraph. This is perhaps unsurprising. In order to inform

¹ http://www.usatoday.com/news/nation/2005-11-06-volunteer-firefighters_x.htm. (Retrieved 1st Dec. 2010). Also see the CBS affiliate KYTX interview with the Chapel Hill (Texas) fire chief at <http://www.cbs19.tv/Global/story.asp?S=9094832>. (Retrieved 1st Dec. 2010). This view is consistent with survey data reported in Carpenter and Myers (2010) who find that, on average, volunteer firefighters in Vermont have fewer children at home than members of the community in general.

such a theory, it would first be necessary to address the question of *why* responsibility changes choices, and this question is yet to be addressed in the literature. For example, Song (2008) and Charness and Jackson (2009) observe that responsibility promotes an aversion to strategic risk in a trust game and stag-hunt game, respectively, but do not test possible behavioural reasons why it has this effect.^{2,3} In this paper, we report the results of a controlled laboratory experiment designed to tackle this question. The experiment uses two different kinds of decision task. The first is a repeated public goods game, the use of which is motivated by it having the same structure as the real-world social dilemmas described in the previous paragraph. The second is Holt and Laury's (2002) multiple price list lottery choice task which is used to measure attitude towards risk. The type of responsibility we consider is where a single dependant receives exactly the same outcome as their associated decision-maker, but plays no part in making the decision.

Before we outline how our experimental design discriminates between different reasons why responsibility might crowd-out co-operation, it should be pointed out that it is a priori unclear whether responsibility will generally reduce co-operation in social dilemmas. On one hand, the more resources an individual with responsibility voluntarily contributes to the public good, the less they will have to consume privately with their dependants. Voluntary contribution restricts the resources available for private consumption by the volunteer *and* the volunteer's dependant(s), and exposes both to strategic risk. These considerations may cause responsibility to crowd-out co-operation. On the other hand, responsibility causes voluntary contributions to be more socially efficient, because dependants as well as volunteers receive the benefits of co-operation, and this may cause it increase.⁴

The three explanations of why responsibility might crowd-out co-operation that we consider are *social norms*, a particular type of *social preferences* and *social identity*. We outline each of these here and expand upon them in the next section. Firstly, the simplest and most parsimonious reason that responsibility might crowd-out co-operation is the operation of an internalized social norm which dictates more cautious behaviour when decision-makers are responsible for the welfare of others. According to this explanation, responsibility should

² We follow Eckel and Wilson (2004) and define strategic risk a risky bet on the strategy adopted by the other player, given uncertainty about the strategy that the other player will adopt.

³ Related evidence suggests that groups are more risk-averse than individuals. Unlike work on responsibility, this research is predominantly concerned with the aggregation of individual preferences to a group preference. A review of this and other related work is provided by Engel (2010).

⁴ A standard finding in experimental public good games is that, with constant marginal per capita returns, contribution rates increase with group size (Isaac and Walker, 1988; Isaac et al., 1994; Carpenter, 2007).

result in lower contributions to the public good, because caution disinclines decision-makers to bet on the uncertain strategies adopted by others.

The second possible explanation is an aversion to unequal distributions of resources and can be derived from the models of Fehr and Schmidt (1999) and Bolton and Ockenfels (2000). These models are based on the premise that decision-makers experience disutility from both positive and negative payoff differences between themselves and others. As we show in the next section, voluntary co-operation can be sustained as an equilibrium in a public goods game if decision makers are sufficiently averse to inequality. For the type of responsibility we consider, these models predict lower co-operation rates when there is responsibility than when there is not. The reason is that for any given set of behaviour, responsibility dilutes the average payoff inequality between decision-makers and the other (passive and active) players, because one payoff comparison – that between each decision-maker and their dependant – cannot generate inequality. This guarantee is not present in the absence of responsibility, and responsibility thereby weakens the motivation to co-operate.⁵

A third possible explanation is a sense of *social identity* between decision-makers and their dependants. The concept of social identity was originally developed in the social psychology literature (Tajfel and Turner, 1979) but has recently become increasingly recognised in the economics literature (Akerlof and Kranton, 2010). It can be defined as the part of an individual's self-perception that is derived from membership of a particular group, called the "in-group". A decision-maker, such as a parent, who has responsibility for a dependant, is therefore a member of an in-group which, *ceteris paribus*, a decision-maker without responsibility is not. Many studies (e.g. Chen and Xin Li, 2009) have shown the existence of an *in-group bias*, whereby people treat those who they perceive to be in-group members ("us") more favourably to out-group members ("them"). A number of experiments have also found that in-group bias generates increasingly competitive behaviour, because in-groups seek a competitive advantage over out-groups (see Brewer (1979) for a review of the early evidence). In a public goods interaction, this would imply more free-riding when decision-makers have responsibility for a dependant who they perceive to be an in-group member than when they do not.

⁵ Since it is possible that behaviour generates perfect payoff equality, it is strictly the case that responsibility will not increase average payoff inequality.

Our strategy to discriminate between these three explanations is based on a comparison of decisions taken with and without responsibility, and has two central features. The first is designed to separate out the influence of a caution norm from inequality-aversion and social identity. The second is to discriminate between the latter two explanations. Firstly, we compare behaviour in the public goods game, where the source of risk is the behaviour of other people, and behaviour in the lottery choice task, where the source of risk is nature. If there is a social norm which prescribes that decision-makers with responsibility should be more cautious, we should observe more risk-aversion in the lottery choice task and less voluntary co-operation in the public goods game. Inequality-aversion models do not predict a responsibility effect in the lottery choice task, because there is no source of inequality, whereas they predict less voluntary co-operation in the public goods game. Social identity theory makes a similar prediction: in the lottery choice task, the absence of strategic interaction means that there is no out-group against which an in-group bias can operate. In the public goods game, an in-group bias against other players and their associated dependants leads to the prediction of less voluntary co-operation.

Secondly, we discriminate between inequality-aversion and social identity by experimentally implementing responsibility in two treatments which vary the salience of the in-group. In a *Friends* treatment decision-makers have responsibility for the payoff of a dependant with whom they are socially tied (a friend, housemate, classmate etc.). A *Strangers* treatment is the same as the Friends treatment, except that the dependant is a randomly recruited and anonymous stranger. If the social identity explanation of responsibility effects is correct, the stronger salience of the in-group in the Friends treatment than the Strangers treatment should lead to a stronger in-group bias. If so, in relation to a *Baseline* treatment with standard versions of the decision tasks with no dependants, we should observe a lower level of voluntary co-operation in the Friends treatment than in the Strangers treatment.

Our main results are the following: Firstly, responsibility has a pronounced and negative effect on co-operation rates in the public goods game if the decision-maker and their dependant are friends. In relation to individual behaviour, responsibility in this case amplifies social costs by crowding-out co-operation. If, on the other hand, the dependant is an anonymous stranger, co-operation rates do not significantly differ from those of decision-makers who act solely on their own behalf. Our data are therefore inconsistent with the

prediction of inequality-aversion models. Nor can our data be organised by general norm of caution, because we find no evidence that responsibility promotes risk-aversion in lottery choices. Furthermore, we find no evidence in our data that more risk-aversion in the lottery choice task means less contribution in the public goods game. A straightforward interpretation of this finding is that decision-makers regard natural risk and strategic risk differently. An overall organisation of our data requires an account of preferences which allows decision-makers to prioritise the well-being of people close to them over that of anonymous strangers. This leads us to conclude that the crowding-out of co-operation by responsibility is best explained by the influence of social identity. The implications of this finding for policy and economic theory are discussed in the conclusion.

2. Experimental Design and hypotheses

2.1. Basic procedures

The experiment was conducted at the Centre for Decision Research and Experimental Economics (CeDEx) laboratory at the University of Nottingham. Subjects were recruited from a database of registered volunteers using ORSEE (Greiner, 2004) and invited to participate in one of a number of pre-arranged sessions. A total of 232 subjects participated in the experiment, 48 in the Baseline treatment, 80 in the Strangers treatment (40 of which were dependants) and 104 in the Friends treatment (52 of which were dependants). We therefore observed the behaviour of 140 decision-makers which, in the public goods task, gave us 12, 13 and 10 independent observations in the Baseline, Friends and Strangers treatments, respectively. Subjects could participate in only one session and had no prior experience of lottery choice or dilemma game experiments. The youngest subject was 19, the oldest 26 (with a mean of 21) and 48% of subjects were male.

To avoid income effects, the lottery choice task was completed before the public goods game, but not resolved until the end of the experiment. Each session, including instructions and payment, lasted for approximately one hour and fifteen minutes and average payment, made in private at the end of the experiment, was £10.45.⁶ Overall payment comprised the sum of payments from the lottery choice task and the public goods game.⁷

⁶ The exchange rate was approximately £1=\$2 during the period in which the experiments were conducted. The calculation of the average payment excludes, but is indicative of, the sums received by dependants in the Friends and Strangers treatments. The lottery choice task was designed such that, on the basis of its expected value, its contribution to total payoff was proportionate to the amount of time it took in relation to the public good task.

⁷ The public goods tasks were computerised using the Z-tree software (Fischbacher, 2007).

Upon entering the laboratory subjects in the Baseline treatment were randomly allocated to a computer, received instructions (which can be found as an appendix), completed the decision-making tasks, received payment and then left. The same procedure was followed in the Friends and Strangers treatments, with an additional procedure to pair decision-makers and dependants. In the Strangers treatment decision-makers were randomly and anonymously paired with their dependants. It was explained that dependants would be told nothing about the tasks completed by decision-makers, but that at the end of the experiment they would anonymously receive an amount of money equal to that earned by their decision-making partner. Dependants waited in a room adjacent to the experimental laboratory. When decision-makers received their payment, an identical amount was placed in an envelope marked with their partner's identifier. After all decision-makers had been paid and left the laboratory, dependants received their payment in private.

In the Friends treatment the procedure was the same, except that the recruitment message told subjects that participation required them to bring a friend to the experiment (e.g. classmate, housemate or partner). This ensured the existence of a social tie between the decision-maker and dependant. The subjects who received the recruitment email were allocated the role of decision-maker, in order that decision-makers in both Friends and Strangers treatments were recruited by the same method.

2.2. Public goods game

Subjects were randomly assigned to groups of four and played 10 repetitions of the linear public goods game. A 20 token endowment, with an exchange rate of 1 token = £0.03, was divided between the private and the public good with payoffs earned according to $\pi_i = 20 - g_i + 0.4\sum_j g_j$, where g_j is the contribution to the public good of players $j = 1, \dots, 4$ and g_i is player i 's contribution to the private good. Contributing everything would be socially efficient. The Nash equilibrium is that all four individuals will free ride ($g_j = 0$ for all j) and is a dominant strategy independently of the number of players or passive dependants. Thus, the Nash equilibrium is the same for all three treatments and we take this as our null hypothesis.

The alternative hypothesis is two-tailed. If decision-makers are motivated by efficiency (or are pure altruists) then contributions to the public good should be greater in the Friends and Strangers treatments than in the Baseline treatment. The opposite observation would count as evidence that responsibility crowds-out co-operation. This observation would be consistent

with the operation of a simple social norm of caution with responsibility, inequality-aversion and social identity theory. We consider each of these explanations in turn.

Following Young (2008), we consider a social norm to be a rule of behaviour which prescribes action which is considered to be “right” or socially acceptable in a particular situation. Charness and Jackson (2009) allude to the possibility that responsibility may invoke norm-driven behaviour, by suggesting that decision-makers with responsibility may have become socialized into being more cautious. There are several plausible ways in which this type of norm may have become internalized, so that it is enforced without explicit mechanisms such as punishment or social exclusion. For example, people may wish to avoid being blamed for bad outcomes (Charness and Jackson, 2009), or they may want to avoid the feeling that they have let down their dependants (Dufwenberg and Gneezy, 2000).

Our test of a simple internalized caution norm is based on the assumption that, if one operates, it will do so in both the Friends and Strangers treatments in our experiment. This assumption is the most parsimonious, and proposes that the operation of a caution norm does not require the presence of social ties between decision-makers and their dependants. The basis of this assumption is Young’s (2008) observation (and related experimental evidence) that people do not drop litter even when no-one can see them, and tip waiters in foreign cities despite there being no reason to fear the consequences of not doing so. Less voluntary co-operation in the public goods game in both the Friends and Strangers treatments than in the Baseline treatment will therefore be considered consistent with the operation of an internalized norm of caution.⁸

A similar pattern of behaviour would follow from a different interpretation of how norm-driven behaviour in the public goods game might be affected by responsibility. Responsibility can crowd-out co-operation because it provides an excuse to deviate from a social norm of co-operation. For example, people may prefer to behave selfishly and maximize their individual payoff, but in some situations feel compelled to behave contrary to their genuine preferences and in a more co-operative manner (see Dana et al., 2007). One reason for doing this is a dislike of appearing selfish to others and oneself. If, however, an excuse can be found to resort to true selfish preferences, people will do so. Responsibility for the welfare of a dependant provides the “moral wiggle room” to behave selfishly. This may weaken the

⁸ It is difficult to identify norms in the laboratory, and we do not attempt to measure a caution norm directly. Rather we regard this explanation as an empirical possibility we can distinguish from other explanations.

influence of a norm of co-operation and do so independently of whether decision-makers care about the welfare of dependants.

Turning to consider inequality-aversion, we illustrate the predictions of the Fehr and Schmidt (1999) model, but note that the Bolton and Ockenfels (2000) model has the same implications. In this model positive contributions to the public good can be part of an equilibrium strategy if players are sufficiently inequality averse. Players compare their own payoffs with other players' payoffs, and evaluate the disutility caused by both advantageous and disadvantageous payoff differences. By adding dependants in the public goods game, each player compares their own payoff with the payoff of the other players, and also with the payoffs of dependants. As described above, since each decision-maker and their own dependant receive the same payoff, this comparison can cause no disutility and this leads the model to predict less voluntary contribution in relation to when decisions are taken in the absence of responsibility.

The utility of decision-maker i depends on both their absolute payoff and the distributional implications of this payoff in relation to the absolute payoff received by others according to:

$$U_i(\pi_i, \pi_j) = \pi_i - \alpha_i [1/(n-1)] \sum_{j \neq i}^n \max\{\pi_j - \pi_i, 0\} - \beta_i [1/(n-1)] \sum_{j \neq i}^n \max\{\pi_i - \pi_j, 0\}$$

where π_i and π_j are the absolute payoffs of players i and j , respectively, n is the total number of players in the decision problem, $\alpha_i \geq 0$ measures the disutility of disadvantageous inequality and $\beta_i \geq 0$ measures the disutility from advantageous inequality.

In the Baseline treatment, without dependants, $n=4$. Assume all players contribute all tokens to the public good, $U_i(\pi_i, \pi_j) = 32$. This is an equilibrium if no player is better off keeping a single token in the private good. In this case, there is no disadvantageous inequality because if player i keeps one token whilst $j=1, \dots, 3$ contribute everything, i is better off than all of the other $j=1, \dots, 3$ players. Hence,

$$U_i(\pi_i, \pi_j) = (31.6 + 1) - 0 - \beta_i 3(1/3)(32.6 - 31.6) = 32.6 - \beta_i$$

The individual will therefore keep one token if $32.6 - \beta_i > 32$ and hence if $\beta_i < 0.6$.

With responsibility, each player has a dependant and so $n=8$. The utility of player i from keeping one token assuming everyone else contributes everything is given by,

$$U_i(\pi_i, \pi_j) = (31.6 + 1) - 0 - \beta_i 6(1/7)(32.6 - 31.6)$$

Here, the disutility of an advantageous inequality of $32.6 - 31.6 = 1$ is summed over 6 individuals (the other 3 players and their dependants), whilst $1/(n-1) = 1/7$ because there is a 7th “other”: the decision-maker’s dependant who receives an identical payoff. Decision-maker i will keep one token if $32.6 - (6/7)\beta_i > 32$ and hence if $\beta_i < 0.7$.

Comparing $\beta_i < 0.6$ with $\beta_i < 0.7$ reveals that contribution is easier to sustain as an equilibrium strategy in the absence of responsibility, because contributing to the public good can only be part of an equilibrium strategy for subjects with a β value at least as large as these critical values. Since this result does not depend upon the presence or absence of a social tie between decision-makers and their dependants, this model predicts a higher rate of voluntary contribution in the Baseline treatment than in both the Friends and Strangers treatments, and no difference in behaviour between the latter two treatments.

Finally in this section we outline our test of the role of social identity. Previous literature has not examined the influence on responsibility effects of social ties between decision-makers and their dependants. In Song’s (2008) experiment, for example, a group-building exercise prior to decision-making was intended to “produce some sort of group kinship and identity” (Song, 2008, p.683). In the absence of a control treatment, the influence of this exercise on behaviour cannot be understood and, therefore, it is not possible to gauge whether behaviour is appropriately described by social identity theory or not. If such group-building exercises are successful in establishing an in-group, then social identity survives as a plausible explanation of less cooperative behaviour in the presence of responsibility. If attempts to establish an in-group are not successful, then in-group bias cannot explain any responsibility effects that are observed.

The essence of our test is to directly vary the salience of the in-group and, thereby, the strength of any in-group bias.⁹ Since decision-makers and their dependants in the Friends treatment are socially tied, there exists a more salient in-group than in the Strangers treatment. In simple terms, it is easier for decision-makers in the Friends treatment to regard their dependant as “us” (rather than “them”) than it is in the in the Strangers treatment. In the latter case, a decision-maker’s dependant is an anonymous stranger, which is a characteristic they share with – and therefore makes them less distinguishable from – out-group members. If the crowding-out of co-operation by responsibility is due to an in-group bias, we should

⁹ In-group bias as a function of in-group salience is well established in social psychology. See, for example, Mullen, Brown and Smith (1992).

therefore observe less voluntary contribution in the Friends treatment than in the Strangers treatment.¹⁰

2.3. Lottery choice task

The experiment used lottery choice tasks developed by Holt and Laury (2002) and described in table 1. As subjects proceed from task 1 to 10 the expected values of lotteries A and B increase. Up to task 4 the expected value of A is greater than B, whereas for tasks 5 through 10 the reverse is true. A risk-neutral subject would choose A in tasks 1 to 4 and B in tasks 5 to 10. The point at which the subject switches from choosing A to B is a measure of risk attitude. At the end of the experiment one lottery choice task was randomly selected and the payoff determined by a resolution of the risk in the lottery the subject chose in that task.

Table 1: Lottery Choice Tasks *

Task	Lottery A			Lottery B			EV _A - EV _B
	£3.00	£2.40	EV _A	£5.75	£0.15	EV _B	
1	0.1	0.9	2.46	0.1	0.9	0.71	1.75
2	0.2	0.8	2.52	0.2	0.8	1.27	1.25
3	0.3	0.7	2.58	0.3	0.7	1.83	0.75
4	0.4	0.6	2.64	0.4	0.6	2.39	0.25
5	0.5	0.5	2.70	0.5	0.5	2.95	-0.25
6	0.6	0.4	2.76	0.6	0.4	3.51	-0.75
7	0.7	0.3	2.82	0.7	0.3	4.07	-1.25
8	0.8	0.2	2.88	0.8	0.2	4.63	-1.75
9	0.9	0.1	2.94	0.9	0.1	5.19	-2.25
10	1.0	0.0	3.00	1.0	0.0	5.75	-2.75

* The expected values of each lottery EV_A and EV_B were not shown to subjects.

Expected utility theory, and any other theory which defines utility solely in terms of outcomes received by the decision-maker, predicts that responsibility will not affect risk-aversion. This is also true of inequality-aversion models and social identity theory. In terms of the former, there is no inequality in payoffs in this task and, in terms of the latter, the absence of strategic interaction means that there is no out-group to mediate an in-group bias.

¹⁰ There are several possible dimensions to greater in-group salience and bias in the Friends treatment than the Strangers treatment. Better knowledge of dependants' preferences, and an adjustment of behaviour in this direction is one possibility (as suggested by Song, 2008). Evidence suggests that individuals typically have a superior view of themselves (e.g. less selfish, more cooperative) than others (Epley and Dunning, 2000; Miller and Ratner, 1998). Decision-makers may also feel more accountable to their friends for their choices. Although none of our experimental procedures provided any information regarding behaviour to dependants in either the Friends or Strangers treatments, the strength of in-group bias is known to be a function of accountability (e.g. Abrams et al., 2007). Our experiment is not designed to discriminate between these different possible dimensions of in-group bias. Should our results favour social identity theory over other potential explanations of responsibility effects, so doing might be a fruitful avenue for further research.

If, however, there is social norm of caution, responsibility will increase risk-aversion: subjects in the Strangers and Friends treatments will switch from lottery A to lottery B later than subjects in the Baseline treatment.

3. Results

3.1. Public goods game

The average overall (first period) contribution to the public good in the Baseline, Friends and Strangers treatments is 6.30 (9.56), 4.45 (8.52) and 7.41 (10.68), respectively. Figure 1 shows the mean voluntary contribution to the public good for each treatment in each of 10 periods. In relation to the Baseline treatment, responsibility for a stranger slightly increases cooperation, whereas responsibility for a friend reduces it. The data also reveal the usual pattern of decay in contributions with repetition in all three treatments. By the final period, average contribution rates in the Baseline and Strangers treatments had fallen to 14.4% and 17.4% of resources, respectively. In the Friends treatment this figure was 5%.

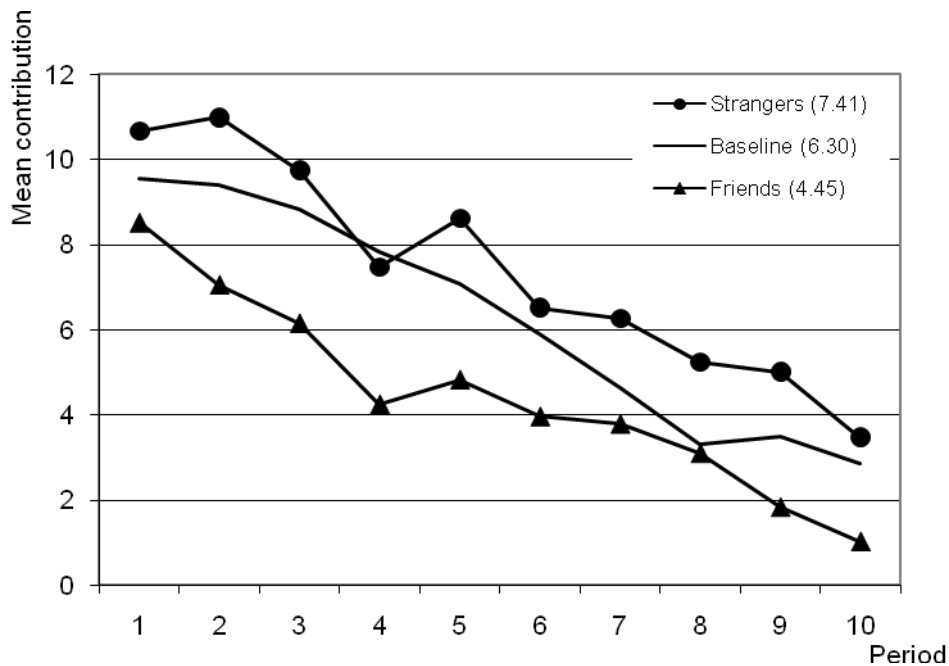


FIGURE 1. MEAN CONTRIBUTIONS OVER TIME

Turning to our hypothesis tests, we first consider behaviour in the Baseline and Friends treatments. A Mann-Whitney test of the null hypothesis that groups' average contributions over all 10 periods are the same, against the two-tailed alternative yields $p=0.087$. Thus, the null hypothesis can be rejected with significance greater than 10%. This establishes our first

result: *Responsibility for the financial welfare of another individual, with whom the decision-maker has social ties, reduces the propensity to contribute resources to the public good in relation to when no such responsibility exists.* This preference is sufficiently strong to prevail against the potentially countervailing influence of efficiency motivations. Responsibility crowds-out co-operation.

The same Mann-Whitney test between the Baseline and Strangers treatments gives $p=0.674$. We therefore cannot reject the null hypothesis in favour of either an efficiency effect, or the crowding-out of co-operation. This is our second result: *Responsibility for the financial welfare of another individual, with whom the decision-maker is not socially tied, does not influence the propensity to contribute resources to the public good.*

When taken together, our first two results clarify the conditions under which responsibility might be expected to crowd-out co-operation. In the absence of social ties, we find no evidence that the behaviour of decision-makers with responsibility differs from that of individuals in strategic games. In this respect, behaviour in our Strangers treatment is consistent with models of individual preferences.¹¹ Our data therefore do not support the social norm or inequality-aversion explanations of why responsibility might crowd-out co-operation. Under these explanations the lower contribution rates in the Friends treatment in relation to the Baseline treatment should extend to the Strangers treatment as well.

The importance of social ties between decision-makers and their dependants in mediating voluntary contributions to the public good can be observed most clearly by comparing behaviour between the Friends and Strangers treatments. In this comparison, all decision-makers have responsibility and therefore efficiency considerations are controlled. We test the null hypothesis that social ties do not influence contributions to the public good. This encompasses a broad class of behaviour, including standard models of preferences, inequality-aversion models of social preferences, and pure altruism. The alternative hypothesis is provided by social identity theory and is that social ties will lower contributions to the public good in the Friends treatment in relation to the Strangers treatment: the greater salience of the in-group in the Friends treatment mediates a stronger in-group bias and a lower level of voluntary contribution. A Mann-Whitney test of these hypotheses gives

¹¹ Engel and Rockenbach (2010) report an analogous result when contributions to the public good generate a positive externality for a whole group of anonymous bystanders. This result only holds when contributions cannot cause bystanders to be better off than decision-makers. If contributions to the public good can result in bystanders doing better than decision-makers, contributions fall.

$p=0.0375$ and the null hypothesis can be rejected at significance greater than the 5% level. Our third result, therefore, is: *Responsibility for the financial welfare of another individual, with whom the decision-maker has social ties, reduces the propensity to contribute resources to the public good in relation to when responsibility exists without social ties.*¹²

Our third result firmly confirms the implications of the first two results. Our data are not organised by inequality-aversion models and neither do they provide evidence supporting the operation of a caution norm. In relation to that latter, our data do not support the possibility that responsibility weakens the operation of a social norm of co-operation by providing an excuse to behave selfishly. If this were the case, we should observe lower rates of voluntary contribution in the Strangers treatment, which we do not.

3.2. Lottery choice task

We have established that the data from the public goods game are not consistent with a caution norm. Since the remaining hypotheses, those based on inequality-aversion and social identity, predict no influence of responsibility on risk-aversion, a coherent overall organization of our data requires that we observe no treatment differences in the lottery choice task. Our data confirm this. Figure 2 shows the fraction of safer Lottery A choices in each of the ten lottery choices for all three treatments.¹³ The preponderance of choices to the right of the risk-neutrality benchmark indicates risk-aversion in our data, but there is no evidence that responsibility increases risk-aversion. Indeed, the data plots for each of the three treatments are statistically indistinguishable. This establishes our fourth result: *Responsibility does not cause decision-makers to be more risk-averse.*¹⁴

The data from our lottery choice task are also consistent with other observations in the literature. An experiment reported by Bolton and Ockenfels (2010) has different concerns to those here, but contains a lottery choice task where decision-makers are responsible for a

¹² In a post-experimental questionnaire, subjects in the Friends treatment were asked to select from a number of options the most appropriate description of the nature of their relationship with their dependant. Those who described themselves as (merely) “friends” contributed an average of 29% of resources to the public good. This is considerably more than the average of 20% of resources contributed by subjects who described themselves as “best mates”. This observation is consistent with the salience of the in-group, and therefore the in-group bias, being a function of the nature of the relationship between members of the in-group.

¹³ We excluded from analysis 6 subjects who switched between choosing Lottery A and B more than once.

¹⁴ A *post hoc* norm-related explanation of the data from the public goods game might be that a social norm of caution is only enforced in the presence of a social tie between the decision-maker and their dependant. However, if this were to provide a convincing explanation of our data, we should expect to see a similar treatment difference in the lottery choice task, and we do not.

passive recipient's payoff. They also observe that responsibility does not affect behaviour. A notable contrast is provided by Sutter (2009), who observes that responsibility characterized by payoff commonality in an investment lottery choice task is sufficient to cause an increase in risk-seeking behaviour. Sutter's (2009) experiment, unlike ours, involved groups of decision-makers with each member taking it in turns to make decisions on behalf of the other group members, who remain passive for that decision. All group members were also provided with feedback on the decision and its outcome after every choice. These differences may be responsible for the contrasting results, and may be worthy of further, controlled investigation.

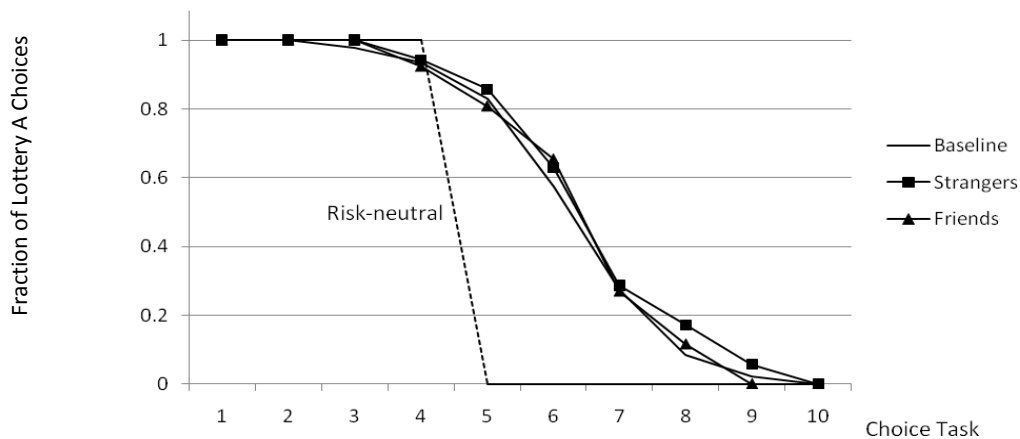


FIGURE 2. BEHAVIOUR IN THE LOTTERY CHOICE TASK

When considered alongside the data from the public goods game, the behaviour we observe in the lottery choice task lends support to growing evidence that decision-makers perceive natural risk and strategic uncertainty differently. Bohnet et al. (2008), for example, find that people are less willing to take a risk when it involves trusting another person compared to a chance move with the same odds. Similarly, Eckel and Wilson (2004) find no correlation between measurements of risk attitude and the propensity to trust another person.

To further investigate this possibility in our data we calculate Spearman's rank correlation coefficients between a subject's number of lottery B choices (higher numbers correspond with less risk-aversion) and their contribution to the public good in the first period. If there is a relationship between the manner in which decision-makers perceive and respond to each type of risk, then we would expect a correlation between these measures. If this perception exists, and is robust to the presence of responsibility, this relationship should remain in the Friends and Strangers treatments. Our results show that in the Strangers treatment there is a positive but insignificant correlation (Spearman's rho = 0.21, $p = 0.64$). In both the Control

and Friends treatments the correlation is negative with coefficients of -0.76 ($p = 0.028$) and -0.75 ($p = 0.084$), respectively. The latter two correlations are respectively significant at the 5% and 10% levels. Pooling the data, the negative correlation survives with significance at the 10% level (Spearman's $\rho = -0.643$, $p = .086$). More risk-averse decision-makers do not contribute less in the public goods game. Indeed the tendency in our data is for more risk-averse subjects to contribute more in the public goods game. This provides further evidence that, in our experiment, responsibility does not induce a general inclination towards more cautious behaviour.

Our findings are analogous to those of Eckel and Wilson (2004), who report that people who are more risk-averse in terms of the Holt and Laury (2002) measurement are more likely to reciprocate in a trust game. Reciprocal trust and contributing to the public good would both ordinarily be considered strategically risky, but pro-social behaviours. Eckel and Wilson (2004, p. 459 & p.464) raise the possibility that their observation is explained by “social risk-aversion”: more risk-averse people in lottery choice tasks are also more inclined to behave pro-socially in strategic games to avoid the “social risk” of their behaviour being deemed unacceptable. On this interpretation, responsibility does not lead to risk-aversion, but in the presence of social ties, has an attenuating influence on “social risk-aversion”.

4. Discussion and conclusion

The questions which motivated our research were whether responsibility will crowd-out co-operation and, if so, why. We have found that it does, but only in the presence of social ties between the decision-maker and their dependant. Our results thereby establish experimental evidence of a *paradox of social preferences*. This paradox is succinctly described by the idiom *charity begins at home*: Responsibility causes decision-makers to consider how their behaviour impacts upon the welfare of others, but, by crowding-out co-operation, the resultant reduction in social welfare harms the very people decision-makers have responsibility for. In relation to decision-making in the absence of responsibility, this imposes greater costs on society. On the basis of our data, the most likely explanation of this behaviour is provided by the influence of social identity in mediating an in-group bias.

The paradox of social preferences presents a substantial challenge for government policy. It implies that two ubiquitous political principles – family values and pro-sociality – are incompatible. The success of policies based upon broad-ranging social co-operation may

therefore crucially depend on the extent to which this incompatibility, and other manifestations of in-group bias, can be overcome. In this respect, history serves a note of caution. Fukuyama (2011) discusses examples where the instinct to favour family has been considered so strong that the achievement of other, conflicting goals prompted measures which amounted to the very destruction of the family. In the 11th century, Pope Gregory VII imposed celibacy on Catholic priests in order to ensure loyalty to the church. The Mamluk army of slaves in the Middle East comprised kidnapped boys who, free of family ties, were raised and trained as soldiers. Without the instinct to favour family, the army was highly effective and defeated both the Mongols and Crusaders. This institution declined when rulers allowed soldiers to have sons which succeeded their positions, thereby propagating loyalty to family rather than state.

Of course, modern democratic governments cannot resort to such extreme measures to solve this problem. But other, less drastic, measures might help. One possibility is extrinsic financial rewards for volunteers. Volunteer fire-fighters in the US receive tax credits, and there are plans in the UK to reward volunteers with reduced fees for education or leisure activities.¹⁵ The use of extrinsic rewards is not without controversy, however, because there is evidence that they can further crowd-out intrinsic motivations and hinder citizens' propensity to engage in pro-social activities (Frey and Jegen, 2001). Moreover, our findings suggest that unless systems of extrinsic rewards can be implemented in a way which addresses the influence of in-group bias, their effectiveness will be constrained. In this respect, the diversity of potential in-groups presents its own challenges: Survey evidence has identified a variety of groups considered to be at risk of social exclusion and as being less likely to participate in socially co-operative activities. These include some black and ethnic minorities, those with no qualifications, and those with disabilities or long-term illnesses (Low et al., 2007).

In terms of theory, our results can be used to inform better behavioural models of choice. We can conclude that our data are not described by the most popular behavioural models of strategic decision-making currently on the market. But this does not mean that responsibility effects are not manifestations of other-regarding or pro-social preferences. Indeed, an implication of our data – that strategically irrelevant players are behaviourally important – is

¹⁵ The Giving White Paper launched on 23rd May 2011 earmarks £400k of government money to pilot the “Spice” system of rewards for civic engagement, whereby volunteers can earn credits for time spent volunteering which can be subsequently used to access local events, training and leisure services. “Spice” is a social enterprise which began at The University of Wales and aims to promote citizen engagement.

something that models of pro-social behaviour have made substantial strides to address: The reams of evidence from experimental dictator games, for example, has directly informed the development of such models. And even decision-makers in our Friends treatment contribute positively to the public good. However, in terms of organising our data, models based solely on a dislike of payoff inequality are insufficient.

A potentially fruitful theoretical approach is taken by Akerlof and Kranton (2010), who incorporate the concept of social identity into a neoclassical framework. In their model people divide themselves into social categories. These categories are associated with social norms that dictate how people “should” behave. Deviating from these norms causes disutility. One difficulty in this approach is the identification of what the norm or appropriate behaviour entails. In some cases this can be obvious, but in the case of decision-making with responsibility we have argued that it is not so. For example, whilst a norm of “caution with responsibility” may seem plausible, indeed reasonable, it is not borne-out by our data. This example illustrates the importance that theoretical and empirical works remain connected.

To which end, by clarifying some of the properties of situations in which responsibility affects behaviour and when it does not, we have made progress in identifying the probable characteristics of models of responsible decision-making. A key finding is that purely consequentialist models of behaviour may not be appropriate. Another is that it cannot be presumed that responsibility is sufficient to establish an in-group. Account needs to be taken of the nature of the relationship between the decision-maker and their dependant. The presence or absence of social ties is just one of many possible ways in which this can vary.

Finally, given that the social costs of the types of responsibility effects we observe are real, understanding the anatomy of such effects is worthy of additional attention. To which end, natural extensions to our research might address the fact our experiment imposed the *minimum* responsibility for a single additional person on decision-makers. This may be an appropriate representation of couples, but may understate the role played by responsibility in family decisions where more people experience the consequences of decisions. In our Friends treatment, social ties were also of a particular type. If blood is thicker than water, blood ties may exert a stronger influence in family decision-making than is suggested by our data.

Acknowledgements

We acknowledge research funding from The University of Nottingham Research Committee and The School of Economics. Nikhil Masters provided research assistance. We thank seminar participants in Bonn, Kiel, Mannheim, Norwich, and Nottingham and participants in the 2010 ESA meeting in Copenhagen. Martin Sefton made helpful comments.

References

- Abrams, D., Rutland, A., Cameron L., Ferrell, J. 2007. Older but wiler: In-group accountability and the development of subjective group dynamics, *Developmental Psychology* 43, 134-148.
- Akterlof, G.A. and Kranton, R.E. 2010. *Identity Economics: How Our Identities Shape Our Work, Wages, and Well-Being*, Princeton University Press, Princeton.
- Bohnet, I., Greig, F., Herrmann, B. and Zeckhauser, R., 2008. Betrayal Aversion: Evidence from Brazil, China, Oman, Switzerland, Turkey, and the United States, *American Economic Review* 98, 294-310.
- Bolton, G.E. and Ockenfels, A., 2000. A theory of equity, reciprocity and competition, *American Economic Review* 100, 166-193.
- Bolton, G.E. and Ockenfels, A., 2010. Betrayal Aversion: Evidence from Brazil, China, Oman, Switzerland, Turkey, and the United States: Comment, *American Economic Review* 100, 628-633.
- Brewer M. B., 1979. In-Group Bias in the Minimal Intergroup Situation: A Cognitive-Motivational Analysis, *Psychological Bulletin* 86(2) 307-324.
- 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.
- Carpenter, J. and Myers, C., 2010. Why volunteer? Evidence on the role of altruism, image and incentives, *Journal of Public Economics* 94, 911-920.
- Charness, G. and Jackson, M.O., 2009. The role of responsibility in strategic risk-taking. *Journal of Economic Behavior and Organization* 69, 241-247.
- Dufwenberg, M, and Gneezy, U. (2000). Measuring beliefs in an experimental lost wallet game. *Games and Economic Behavior* 30, 163-182.
- Chen, Y. and Li, S.X., 2009. Group Identity and Social Preferences. *American Economic Review* 99, 431-457.
- Dana, J., Weber, R.A., and Kuang, J.X., 2007. Exploiting moral wiggle room: experiments demonstrating an illusory preference for fairness? *Economic Theory* 33, 67-80.
- Eckel, C. C., and Wilson R.K., 2004. Is trust a risky decision? *Journal of Economic Behavior and Organization* 55, 447-465.
- Engel, C., 2010. The behaviour of corporate actors: How much can we learn from the experimental literature? *Journal of Institutional Economics* 6, 445-475.
- Engel, C. and Rockenbach, B., 2010. We are not alone: The impact of externalities in public good provision. Working Paper, Max Planck Institute for Research on Collective goods.

- Epley, N. and Dunning, D., 2000. Feeling “holier than thou”: Are self-serving assessments produced by errors in self- or social prediction? *Journal of Personality and Social Psychology* 79, 861-875.
- Fehr, E. and Schmidt K.M., 1999. A theory of fairness, competition and cooperation. *Quarterly Journal of Economics* 114, 817-868.
- Fischbacher, U., 2007. Z-Tree: Zurich toolbox for readymade economic experiments, *Experimental Economics* 10, 171-178.
- Fischbacher, U. and Gächter, S., 2010. Social preferences, beliefs and the dynamics of free riding in public good experiments. *American Economic Review* 100, 541-556.
- Fox, R., Kalitowski, S., Korris, M. and Atkins N., (2009). Audit of political engagement 6. The 2009 report with a focus on political participation and citizenship. London: The Hansard Society.
- Frey, B.S. and Jegen, R. 2001. Motivation crowding theory, *Journal of Economic Surveys* 15, 589–611.
- Fukuyama, F. 2011. *The Origins of Political Order: From Prehuman Times to the French Revolution*. London: Profile Books.
- Greiner, B., 2004. An online recruitment system for economic experiments. In K. Kremer and V. Macho (eds.). *forschung und wissenschaftliches rechnen. GWDG Bericht 63*, 79-93. Göttingen: Gesellschaft für Wissenschaftliche Datenverarbeitung.
- Holt, C.A. and Laury, S.K., 2002. Risk aversion and incentive effects. *American Economic Review* 92, 1644-55
- Isaac, R. M. and Walker, J.M., 1988. Group Size Hypotheses of Public Goods Provision: An Experimental Examination. *Quarterly Journal of Economics* 103, 179 -199.
- Isaac, R. M., Walker, J.M., and Williams, A., 1994. Group Size and the Voluntary Provision of Public Goods. *Journal of Public Economics* 54, 1–36.
- Low, N., Butt, S., Ellis Paine, A. and Davis Smith, J. (2007). *Helping out: A national survey of volunteering and charitable giving*. Office of the Third Sector, The Cabinet Office: London.
- Miller, D.T. and Ratner, R.K., 1998. The disparity between the actual and assumed power of self-interest, *Journal of Personality and Social Psychology* 74, 53-62.
- Mullen, B., Brown, R. and Smith, C., 1992. Ingroup bias as a function of salience, relevance, and status - an integration. *European Journal of Social Psychology* 22, 103-122.
- Song, F., 2008. Trust and Reciprocity Behavior and Behavioral Forecasts: Individuals versus group-representatives, *Games and Economic Behavior* 62, 675-696.

Sutter, M., 2009. Individual Behavior and Group Membership: Comment. *American Economic Review* 99, 2247-2257.

Tajfel, H., & Turner, J. C. (1979). An integrative theory of intergroup conflict. In W. G. Austin & S. Worchel (Eds.), *The social psychology of intergroup relations*, 33–47. Monterey, CA: Brooks/Cole

Young, H.P. (2008). Social Norms. in S.N. Durlauf and L.E. Blume (eds.), *New Palgrave Dictionary of Economics*, Second Edition. London: Macmillan.

Appendix: Instructions

1. General information

At the beginning of an experimental session the following general information was handed and read out to subjects:

i. Baseline treatment

General information on the experiment

Welcome to the experiment. Thanks for coming. Before we begin we will give you some general information about the experimental procedures.

Anonymity

All decisions and responses are made anonymously: This means that none of the other participants will learn what decisions you made, or what answers you gave in a questionnaire, and you will never discover the responses of other people. All participants will receive their payment anonymously at the end of the experiment in cash. Do you have any questions?

ii. Stranger treatment

General information on the experiment

Welcome to the experiment. Thanks for coming. Before we begin we will give you some general information about the experimental procedures.

Matching with a partner

You have just selected an envelope from a bowl. Half of them are yellow, half of them are blue. Please do not open your envelope until asked. Inside the blue envelopes are blue tickets with numbers from 1 to x. Inside the yellow envelopes there yellow tickets with numbers from 1 to x. So whatever you selected, another person in this room has a ticket of the other colour with same number. This person is your PARTNER. You will be paired with your PARTNER through the entire experiment. However, you will not find out who your PARTNER is and they will not find out who you are. In a moment we will separate PARTNERS into different rooms. This means that either everyone with a blue ticket or everyone with a yellow ticket will go to room C 43 next door and everyone with the other colour will stay here in the lab.

Your payments and your PARTNER's payments

The PARTNER who stays in this room (the lab) will complete several decision making tasks for which they will earn money. The amount of money a person in this room (the lab) earns depends on the decisions they make. The PARTNER who leaves and goes to room C43 will not be paid for completing decision making tasks. Instead we will simply pay them exactly the same amount as their PARTNER in the lab has earned. Thus, everybody who goes into room C43 will depend on their PARTNER in the lab for their earnings. Likewise, everybody who stays in this room (the lab) will make decisions that not only determine their own earnings, but also determine what their PARTNER in room C43 will be paid. What will the partner in room C43 be doing? PARTNERS in room C43 will be asked to fill in some questionnaires. Of course, since payments depend only on the decisions of the PARTNER in the lab, the answers to these questionnaires will not affect anybody's earnings.

Anonymity

All decisions and responses are made anonymously: This means that none of the other participants (including your PARTNER) will learn what decisions you made, or what answers you gave in a questionnaire, and you will never discover the responses of other people (including your PARTNER). Please note: You will be told nothing

about the decision making tasks or questionnaires being completed by the people in the other room. The only information that will pass between rooms is that, at the end of the experiment, the PARTNERS in room C43 will learn how much their PARTNER in the lab earned because this is the amount they will also be paid.

All participants will receive their payment anonymously at the end of the experiment in cash. When we pay a participant in the lab we will place the identical amount of money in a sealed envelope, mark that envelope with that participant's ticket number and pay it to their PARTNER who has the same ticket number in room C43. Do you have any questions?

To separate PARTNERS and determine which colour participants will go to room C43 we will place one yellow and one blue ball into this empty bag. A ball will now be drawn at random and everybody holding a ticket of the same colour as the selected ball will go to room C43.

iii. Friends treatment

General information on the experiment

Welcome to the experiment. Thanks for coming. Before we begin we will give you some general information about the experimental procedures. You came to this experiment with a friend. From now on we will refer to this person as your PARTNER. You will be paired with your PARTNER throughout the entire experiment. You and your PARTNER have a ticket with the same number but a different colour (blue or yellow). In a moment we will separate PARTNERS into different rooms: either everyone with a blue ticket or everyone with a yellow ticket will go to room C 43 next door and everyone with the other colour will stay here in the lab.

Your payments and your PARTNER's payments

The PARTNER who stays in this room (the lab) will complete several decision making tasks for which they will earn money. The amount of money a person in this room (the lab) earns depends on the decisions they make. The PARTNER who will be in room C43 will not be paid for completing decision making tasks. Instead we will simply pay them exactly the same amount as their PARTNER in the lab has earned. Thus, everybody who goes into room C43 will depend on their PARTNER in the lab for their earnings. Likewise, everybody who stays in this room (the lab) will make decisions that not only determine their own earnings, but also determine what their PARTNER in room C43 will be paid. What will the partner in room C43 be doing? PARTNERS in room C43 will be asked to fill in some questionnaires. Of course, since payments depend only on the decisions of the PARTNER in the lab, the answers to these questionnaires will not affect anybody's earnings.

Anonymity

All decisions and responses are made anonymously: This means that none of the other participants (including your PARTNER) will learn what decisions you made, or what answers you gave in a questionnaire, and you will never discover the responses of other people (including your PARTNER). Please note: You will be told nothing about the decision making tasks or questionnaires being completed by the people in the other room. The only information that will pass between rooms is that, at the end of the experiment, the PARTNERS in room C43 will learn how much their PARTNER in the lab earned because this is the amount they will also be paid.

All participants will receive their payment anonymously at the end of the experiment in cash. When we pay a participant in the lab we will place the identical amount of money in a sealed envelope, mark that envelope with that participant's ticket number and pay it to their PARTNER who has the same ticket number in room C43.

Do you have any questions?

2. Instructions for part 1 of the experiment

Below are the instructions for the individual choice task. The instructions for the stranger and friends treatment are identical and differ only in two sentences to the instructions of the baseline treatment as indicated.

Part 1: LOTTERY CHOICE

In this part of the experiment you will be asked to make 10 choices. Attached to this instruction sheet you will find a decision sheet which shows these 10 choices. Each choice is between two lotteries, called “OPTION A” and “OPTION B”. Each option offers a prize, the size of which depends on the number drawn at random from a bag containing 10 discs consecutively numbered from 1 to 10. You should record each choice by placing a cross in the box next to the option you prefer.

An example of the type of choice you will be asked to make is as follows:

Question	OPTION A	My choice: option A	OPTION B	My choice: option B
3	Numbers 1-3 pays £3.00 Numbers 4-10 pay £1.20	<input type="radio"/>	Number 1-3 pays £5.00 Numbers 4-10 pay £0.00	<input type="radio"/>

If you prefer OPTION A in this example, you should record your choice by placing a cross in the circle under “My choice: option A”. If you prefer OPTION B, you should record your choice by placing a cross in the circle under “My choice: option B”.

Payment from Lottery Choice Tasks

Payment from this part of the experiment will be the prize of the lottery you chose in ONE of the ten questions. This question is called the “payment question”. You will not discover which of the 10 questions the “payment question” is until the very end of the experiment (after all tasks have been completed).

At the end of the experiment we will come to your desk and ask you to draw a disc from the bag containing 10 discs with the numbers 1 to 10. The number on this disc is the “payment question”. E.g. if number 3 is selected then question 3 will be used to determine earnings from this part of the experiment.

The disc will then be placed back into the bag and you will draw a second time to determine the outcome of the lottery you chose in the “payment question”.

Imagine that the above example question was selected as the “payment question” by your first draw. In this example, if you chose OPTION A this lottery would be relevant for your payment. If your second draw from the bag is a disc numbered 1, 2 or 3 your payment would be £3.00. If your second draw is disc 4, 5, 6, 7, 8, 9 or 10 payment would be £1.20. This means that option A offers a 70% chance of winning £1.20 and a 30% chance of winning £3.00.

{In the stranger and friends treatment the following was added: REMEMBER: Whatever you earn in this part of the experiment will be paid to your partner (in the other room) as well. So your partner depends on you for their earnings. }

Because you will not know which of the 10 questions the “payment question” is until the very end of the experiment, any of the 10 problems could be for real money. You should therefore treat them all as if they are being played for real money. Any questions? Please do not talk during the experiment, just raise your hand if you have a question. You may now begin making your choices. When you have finished, please wait quietly for everyone else to finish. We will then move on to the next part of the experiment.

Decision Sheet Part 1:

Question	OPTION A					My choice: option A	OPTION B					My choice: option B
1	Number Numbers	1 2-10	pays pay	£3.00 £2.40		<input type="radio"/>	Number Numbers	1 2-10	pays pay	£5.75 £0.15		<input type="radio"/>
2	Numbers Numbers	1-2 3-10	pay pay	£3.00 £2.40		<input type="radio"/>	Numbers Numbers	1-2 3-10	pay pay	£5.75 £0.15		<input type="radio"/>
3	Numbers Numbers	1-3 4-10	pay pay	£3.00 £2.40		<input type="radio"/>	Numbers Numbers	1-3 4-10	pay pay	£5.75 £0.15		<input type="radio"/>
4	Numbers Numbers	1-4 5-10	pay pay	£3.00 £2.40		<input type="radio"/>	Numbers Numbers	1-4 5-10	pay pay	£5.75 £0.15		<input type="radio"/>
5	Numbers Numbers	1-5 6-10	pay pay	£3.00 £2.40		<input type="radio"/>	Numbers Numbers	1-5 6-10	pay pay	£5.75 £0.15		<input type="radio"/>
6	Numbers Numbers	1-6 7-10	pay pay	£3.00 £2.40		<input type="radio"/>	Numbers Numbers	1-6 7-10	pay pay	£5.75 £0.15		<input type="radio"/>
7	Numbers Numbers	1-7 8-10	pay pay	£3.00 £2.40		<input type="radio"/>	Numbers Numbers	1-7 8-10	pay pay	£5.75 £0.15		<input type="radio"/>
8	Numbers Numbers	1-8 9-10	pay pay	£3.00 £2.40		<input type="radio"/>	Numbers Numbers	1-8 9-10	pay pay	£5.75 £0.15		<input type="radio"/>
9	Numbers Numbers	1-9 10	pay pay	£3.00 £2.40		<input type="radio"/>	Numbers Numbers	1-9 10	pay pay	£5.75 £0.15		<input type="radio"/>
10	Numbers	1-10	pay	£3.00		<input type="radio"/>	Numbers	1-10	pay	£5.75		<input type="radio"/>

3. Instructions for part 2 of the experiment

Below are the instructions for the public good game. Differences between the treatments are indicated.

Part 2: Instructions

Earnings

In this part of the experiment you earn points which will be converted into British Pounds at the exchange rate:

$$1 \text{ point} = \text{£ } 0.03$$

At the end of the experiment your total earnings will be paid to you in cash, along with your earnings from the previous part of the experiment.

{Stranger treatment: REMEMBER: You have been randomly paired with a partner in the other room. They cannot do anything in this experiment to affect your earnings but whatever you earn from this part of the experiment will be paid to your partner as well. So, your partner depends on you for their earnings.}

{Friends treatment: REMEMBER: The person you came to the experiment with, who we called your "partner", is in the other room. They cannot do anything in this experiment to affect your earnings, but whatever you earn from this part of the experiment will be paid to your partner as well. So, your partner depends on you for their earnings.}

Group membership and anonymity

During this part of the experiment you are a member of a group of four participants, i.e. in your group there will be you plus three more group members. The assignment of people to groups is done randomly. You will never be told who else is in your group, but all members are participants who are in this room right now. The composition of your group is the same during the whole experiment. Thus you form a group with the same participants throughout the experiment.

{Stranger treatment: NOTE: Just like you, each of the other 3 people in your group have a randomly allocated partner, who is in the other room. Their partners, just like your partner, can do nothing to affect your earnings or your group members' earnings. But, just as is the case for you and your partner, everyone else's partner will be paid exactly the same earnings as them. So each person in your group has a partner who depends on them for their earnings.}

{Friends treatment: NOTE: Just like you, each of the other 3 people in your group have a partner, who is in the other room. Their partners, just like your partner, can do nothing to affect your earnings or your group members' earnings. But, just as is the case for you and your partner, everyone else's partner will be paid exactly the same earnings as them. So each person in your group has a partner who depends on them for their earnings.}

All decisions are made anonymously (so you cannot identify your group members and they cannot identify you). To ensure anonymity it is imperative that you do not communicate with other people in the room. Should you have any questions just raise your hand.

The experimental procedure

This part consists of 10 periods. The procedure for each of these 10 periods is the same and is as follows: At the beginning of each period every group member receives an endowment of 20 tokens. Your task is to decide how you use your endowment. You have to decide how many of the 20 tokens you want to contribute to a project and how many of them to keep for yourself. Your earnings from each period are calculated as follows:

The calculation of your earnings for each period

Your income consists of two parts:

- 1) Each token you keep for *yourself* earns you 1 point.
- 2) Each token contributed the *project* earns you:
(0.4) x (the total contribution of all 4 group members to the project) points. The income of each group member from the project is calculated in the same way, this means that each group member receives the same income from the project.

Your earnings in points are therefore:

$$(20 - \text{your contribution to the project}) + 0.4 * (\text{total contributions to the project})$$

Examples:

Suppose the sum of the contributions of all group members is 60 tokens. In this case each member of the group receives an income from the project of: $0.4 * 60 = 24$ points.

If the total contribution to the project is 9 tokens, then each member of the group receives an income of $0.4 * 9 = 3.6$ points from the project.

For each token which you keep for yourself you earn an income of 1 point for yourself. Supposing you contributed this token to the project instead, then the total contribution to the project would rise by one point. Your income from the project would rise by $0.4 * 1 = 0.4$ points. However the income of the other group members would also rise by 0.4 points each, so that the total income of the group from the project would rise by 1.6 points.

Your contribution to the project therefore also raises the income of the other group members. This means that you also earn an income for each point contributed by the other members to the project. For each point contributed by any group member you earn $0.4 * 1 = 0.4$ points.

Making your decision

You will see the following input-screen:



The screenshot shows a user interface for making a decision. At the top, there is a text box labeled "Period" containing the number "1". Below this, the text "Including you there are 4 people in your group." is displayed. Further down, there are two labels: "My endowment is" followed by the number "20", and "My contribution to the project is" followed by a small input box containing the number "1". A red "OK" button is located in the bottom right corner of the main area. At the very bottom, there is a "Help" section with the text "Please enter your decision and confirm by pressing the 'OK'- button."

The period number appears in the top left of the screen. In the middle of the screen you will find the following information: Your group consists of 4 members. Your endowment is 20 tokens. You make your decision by typing a number between 0 and 20 in the input field. Because you have a total of 20 tokens for each decision, as soon as you have decided how many points to contribute to the project, you have also “automatically” decided how many points you keep for your self: This is $(20 - \text{your contribution to the project})$ tokens. After entering your contribution to the project you must press the O.K. button (either with the mouse, or by pressing the Enter-key). Once you have done this, your decision can no longer be revised.

After all four group members have taken their decision an income-screen is displayed for all members of the group with the following information:

- your own contribution to the project,
- the total contribution of all group members (including your contribution),
- your earnings in this period (in points)
*{stranger and friends treatment:
and, therefore, your partner's earnings in this period (in points)}*

Do you have any questions?