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Are people ethical?
An experimental approach.

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ABSTRACT

Do ethical motivations and attitudes affect behaviour? We examine this issue in six Prisoner's Dilemma and Prisoner's Dilemma related games using an online experiment where individuals were asked to make choices and subsequently to express the motivations for their choices and their general attitudes. The experimental evidence of 1,701 students suggests that the motivations and attitudes of respondents regarding altruism, inequality aversion, reciprocity and aversion to lying are important for determining economic choices as well as self-interest. Econometric analysis of the choice to share indicates that ethical and self-interested motives are more important for determining choices than personal characteristics.

Key words: Individual decision making, ethics, experimental economics, prisoner's dilemma games, student attitudes and motivations

JEL classification: C72, C90, D64

1. Introduction

Do ethical motivations and attitudes affect behaviour? In recent years, many papers have explored non-self-interested motivations in game theory and experimental economics, demonstrating that non-self-interested motivations help to explain choices alongside self-interest. Therefore there is now general acceptance that individuals frequently make choices that do not maximise their monetary payoffs. However, despite a relatively large theoretical literature regarding ethics in economics, game theory and experimental literature focuses on non-self-interested motivations, rather than ethical motivations *per se*. A standard textbook definition of ethical behaviour is behaviour conforming to accepted social or professional standards of conduct. 'Ethics' is derived from the Greek word 'ethikos' which is translated as ethos or character and hence focuses upon the character traits of the individual, where ethical behaviour is behaviour in accordance with a virtuous character. Ethical behaviour is a subset of behaviours that may be classed as non-self-interested. However, non-self-interested behaviours are not necessarily ethical, such as envy or spitefulness.

In the game theory and experimental economics literature decisions are observed in order to reveal and assign the preferences and motivations that are in accordance with those decisions, concluding that both non-self-interested and self-interested motivations are important. However, it can be argued that economics has not comprehensively studied human nature, rather economists make propositions regarding human nature that are guided by personal opinions rather than incisive insights from economics (Gill, 1996). Many papers have explored only a selection of non-self-interested motivations, and hence observed behaviour may be explained by factors other than those factors that are analysed (Cox, 2004). It therefore appears that economists could be accused of making the world fit their theory, not the other way round.

Motivations that are currently used in the game theory literature to explain or account for why individuals act in ways that are not solely to their self-interest include reciprocity, inequality and inequity aversion, fairness, altruism, integrity and aversion to lying. A useful distinction between much of the inequity aversion, fairness and reciprocity literature is that three categories of game theory models exist (Cox, 2004). The first type of model incorporates other-regarding preferences into a utility function

(see Bolton and Ockenfels, 2000, and Fehr and Schmidt, 1999), the second type of model incorporates beliefs regarding the intentions of other players into a utility function (see Dufwenberg and Kirchsteiger, 2004, and Rabin, 1993) and the third type of model incorporates both other-regarding preferences and intentions into a utility function (see Charness and Rabin, 2002, and Falk and Fischbacher, 2000).

Inequality aversion and inequity aversion are considered jointly as the literature rarely distinguishes between inequality and inequity, and the majority of the literature uses the term 'inequity'. Inequality aversion occurs when an individual derives a disutility if they have a lower payoff than another individual, and furthermore some individuals may experience a disutility if they have a higher payoff than another individual. Issues of fairness are related in the literature to inequality aversion if the individual is concerned whether their payoff is equitable and hence fair in comparison to the payoffs of other individuals, and this is called inequity aversion. Leading game theory models in this category are Fehr and Schmidt (1999), Charness and Rabin (2002) and Bolton and Ockenfels (2000). However Charness and Rabin (2002) find little evidence for inequity aversion in their experimental data.

Reciprocity analyses situations where individuals have mutual dependences, actions or influence, and hence where there is a mutual or cooperative exchange of favours or benefits. Reciprocal behaviour can be understood as a specific example of ethical behaviour, where the principle of reciprocity may be one accepted standard of conduct that belongs to the set of accepted standards of conduct that govern ethical behaviour. Game theory models analysing fairness, reciprocity and intentions in a game theory context are Ellingsen and Johannesson (2004, 2005), Rabin (1993), Dufwenberg and Kirchsteiger (2004), Blount (1995), Falk and Fischbacher (2000), Cox (2004) and McCabe et al. (2003).[1] Charness and Rabin (2002), Fehr and Gachter (2000), Berg et al. (1995) and McCabe et al. (2003) find that reciprocity is important in explaining experimental data.

Altruism focuses upon an individual's regard for the well-being of another individual, and this has subtle differences to inequity aversion and fairness which instead focus upon the own position of the individual in comparison to the position of other individuals. Therefore issues of inequity aversion and fairness arise from how the

individual believes they are being treated, and reciprocity arises as a response to the actions of another individual. In contrast, altruism does not focus upon how others treat or regard you, it instead focuses upon how you wish to treat and regard others. Altruism in a game theory context is analysed by Gintis (2000), Levine (1998) and Andreoni and Miller (1993). Charness and Haruvy (2002) use a hybrid game theory model which incorporates issues of altruism, reciprocity and concerns over distribution and hence equity and fairness. Andreoni and Miller (1993), Hu and Liu (2003) and Andreoni and Vesterlund (2001) find that altruism is important in explaining experimental data and Charness and Haruvy (2002) and Cox (2004) find that both altruism and reciprocity are important in explaining experimental data.

Integrity and keeping promises leads to trust, and trust in turn enables economic transactions without costly enforceable contracts. Lying reduces trust as it leads to doubt regarding integrity and the reliability of promises. Minkler and Miceli (2004) argue using a game theory model that in some circumstances individuals will keep their promises due to the notion of integrity, and hence integrity provides a moral or ethical motivation rather than a material motivation to keep promises rather than lie, even if those promises are non-credible and are against the material advantage of the individual. Ellingsen and Johannesson (2004) analyse promises and threats finding that promises are credible using experimental data.

The game theory models and experimental approaches in the literature focus upon observed or hypothetical decisions in order to reveal and assign the preferences and motivations that are in accordance with those decisions. One disadvantage of this approach is that it is not possible to conclusively determine the motivation behind the observed behaviour as multiple motivations are consistent with the observed data. The experimental data may indicate that an individual is acting reciprocally yet their behaviour could also be explained by motivations of altruism or other-regarding preferences (Cox, 2004).

The purpose of this paper is to determine which motivations and attitudes are important for determining choices. The paper further analyses whether personal characteristic variables are important for determining choices, and analyses the linkages between choices, underlying motivations and general attitudes. The principal

advantage of this study is that the motivations behind decisions are determined by asking respondents directly what motivated their decisions, rather than by observing respondents decisions in order to reveal their preferences and to subsequently assign motivations that are in accordance with those decisions. Furthermore the study determines which attitudes and motivations are important from a comprehensive list and hence the study incorporates more motivations than previous approaches. This enables multiple explanations for observed behaviour and reduces the problem that observed behaviour may be explained by factors other than those factors that are analysed.

The focus of this study is upon ethical motivations rather than non-self-interested motivations in general, in order to analyse empirically whether ethics are important for determining choices as proposed by the large theoretical literature on ethics and economics. In order to operationalise ethical behaviour it must be specified as behaviour conforming to a set of principles, and the principles used here are altruism, inequality aversion, reciprocity and aversion to lying. Inequality aversion is used rather than inequity aversion as issues of fairness are not addressed. The ethical behaviour operationalised here does not encompass all possible ethical principles, but arguably encompasses all principles that are relevant in the experimental context used here.

Our results suggest that ethical motivations and attitudes alongside self-interest are important for determining choices. In what follows, section 2 outlines the experimental design, analysis and respondents, section 3 presents the results, section 4 provides discussion and section 5 provides concluding remarks.

2. Methods

2.1 Experimental design

Six Prisoner's Dilemma and Prisoner's Dilemma related games were conducted to analyse choices, motivations and the underlying attitudes and values that are present in individual economic decision-making. An online questionnaire was used due to its many advantages: low costs, short time-span, quick and accurate data collection, relatively large sample size and reduction of experimenter bias.[2] A potential criticism of survey experiments is their absence of monetary rewards. But, as Rubinstein (2007)

points out, there appears to be no significant difference between survey results and results in experiments with monetary rewards. The focus of the online questionnaire was upon determining the motivations behind decisions in a game theory context by asking respondents directly what motivated their decisions in six modifications of a Prisoner's Dilemma game with the strategies 'share' or 'compete', and furthermore determining their overall self-interested and ethical beliefs. Respondents were questioned firstly about their personal characteristics, secondly to make choices in the six games, thirdly about what motivated these choices and fourthly about their general attitudes.

The first Prisoner's Dilemma game is shown in figure 1 below where 'you' refers to the respondent. As illustrated in figure 1 below, the payoff for mutual competition is £50, the payoff for competing when the other player, player 2, shares is £100, the payoff for mutual sharing is £75 and the payoff for sharing when then other player, player 2, competes is £25.

Game 2 uses a modification of the payoffs in game 1 to determine how actions are affected when the payoffs are changed such that all payoffs are higher but the differences between the payoffs are reduced.[3] Therefore although the respondent receives higher monetary payoffs from competing, their payoffs are only slightly higher through competing than sharing, and player 2 receives much higher payoffs if the respondent shares rather than competes. Payoffs are shown in figure 2 below.

Game 3 uses a modification of the payoffs in game 1 to determine how actions are affected when the payoffs are changed such that the highest payoff is reduced when the respondent competes and the other player shares. The change in the payoff is chosen because if the respondent dislikes having a higher payoff than the other player competing is now more attractive than in game one. However the monetary advantage of choosing to compete is now vastly reduced and hence the respondent may instead choose to share thus demonstrating that it is the high monetary payoff of £100 that encourages respondents to compete. Payoffs are shown in figure 3 below.

Game 4 uses a modification of the payoffs in game 1 to determine how actions are affected when the payoffs are changed such that the highest payoff now occurs under

mutual sharing, there is no dominant strategy and the game is no longer a Prisoner's Dilemma game. This game also tests whether responses are affected by the type of game. Payoffs are shown in figure 4 below.

		Player 2	
		Share	Compete
You	Share	£75, £75	£25, £100
	Compete	£100, £25	£50, £50

Fig. 1 Standard Prisoner's Dilemma game (game 1)

		Player 2	
		Share	Compete
You	Share	£105, £105	£65, £110
	Compete	£110, £65	£70, £70

Fig. 2 Game 2

		Player 2	
		Share	Compete
You	Share	£75, £75	£25, £80
	Compete	£80, £25	£50, £50

Fig. 3 Game 3

		Player 2	
		Share	Compete
You	Share	£105, £105	£65, £100
	Compete	£100, £65	£70, £70

Fig. 4 Game 4

Games 5 and 6 use the same payoffs as game 1 as shown in figure 1, but change the format of the game by introducing a prior stage where the respondent can choose to send a message to player 2 that says 'I promise I will share'. Respondents are told that they cannot have any other communication with player 2, that both players make their choice at the same time, and that they have no control over the choice of player 2. Each player is then told whether or not the other player decided to send a message. Finally the respondent then chooses whether to actually share or compete. Game 5 examines reciprocal altruism and to some extent lying as respondents are first asked whether they wish to send the message to the other player saying 'I promise I will share'. The respondent is then told that player 2 has sent them a message saying 'I promise I will share', and are then asked whether they wish to share or compete. The respondent is subsequently told to suppose instead that player 2 has not sent a message and are then asked whether they wish to share or compete in order to determine whether the choice to share or compete is affected by whether player 2 has sent a message saying 'I promise I will share'. This game therefore analyses whether reciprocal altruism is a motivating factor, as the respondent plays firstly against a player who has made a promise to share and secondly against a player who has not made a promise to share.

Game 6 examines lying whilst also analysing reciprocal altruism. The only difference that occurs in game 6 in comparison to game 5 is that respondents are now told that player 2 dislikes breaking their promises. Otherwise the game remains unchanged in order to analyse whether the knowledge that player 2 dislikes lying affects responses.

Respondents made their decisions in all six games before they were questioned about what motivated their decisions. Respondents were asked to tick from a list all motivations they considered or used to make their decisions, refer to table 4 for the list. The list of 17 motivations included altruism, inequality aversion, reciprocity, an aversion to lying and self-interest in order to appropriately capture the differing motivations of respondents. The list of motivations was based upon the literature and upon ethical principles of conduct applicable to Prisoner's Dilemma games. Furthermore respondents were asked whether any other factor was used to make their choices to ensure that all motivations were appropriately captured. A jumbled

ordering was used for the list and hence not all motivations regarding altruism appeared next to each other so that respondents consider each factor alone in order to monitor consistency and encourage greater consideration. The wording chosen for each of the factors was as simple as possible and did not include the words 'altruism, inequality aversion, reciprocity or self-interest,' to avoid affecting responses by the wording of the questions and to encourage greater understanding.

Respondents were then questioned about their underlying attitudes and values. Respondents were asked how much they agree or disagree with 20 statements, refer to table 5 for the statements. Each factor of altruism, inequality aversion, reciprocity, aversion to lying and self-interest had 4 statements each. Similar statements were not grouped, some negative statements were included such as 'I break a promise if it benefits me' and some generalised statements were included such as 'Breaking promises is bad'. The statements were varied throughout the section so that respondents realise there are differences in the format of the statements.

2.2 The analysis

The results are reported firstly in terms of the proportion of respondents who chose each answer to the questions regarding choices, motivations and attitudes. Secondly probit regression analysis is used to quantify the effects of personal characteristics, motivations and attitudes on the choice to share. The binary dependent variable takes the value 1 if the individual chose 'share' and 0 for 'compete'.[4] The probability of choosing share depends upon personal characteristics such as sex, age and so forth, and arguably upon motivations and attitudes.[5] For games 1, 2, 3 and 4 a regression is estimated to determine the probability of choosing share as a function of personal characteristics, motivations and attitudes as demonstrated in equation (1) below. S is the choice to share or compete, **C** is a vector of personal characteristics, **M** is a vector of motivations and **A** is a vector of indices representing attitudes.

$$S = S(\mathbf{C}, \quad \mathbf{M}, \quad \mathbf{A}) \tag{1}$$

The model as specified in equation (1) can be expressed respectively as a standard univariate probit model of the choice to share (Greene, 1998, 2000; Alexandre and French, 2004):

$$\Pr(S=1) = \Phi\left(\boldsymbol{\beta}_1\mathbf{C} + \boldsymbol{\beta}_2\mathbf{M} + \boldsymbol{\beta}_3\mathbf{A} + \varepsilon\right) \tag{2}$$

where Pr represents probability, the β_i's are parameters to estimate, the function $\Phi(.)$ is the distribution function of the standard normal distribution and ε is the error term. For games 5 and 6 regressions are estimated to determine the probability of choosing share as a function of whether a promise to share is made, personal characteristics, motivations and attitudes as demonstrated in equation (3) below. For games 5 and 6 regressions are also estimated to determine the probability of choosing to make a promise as a function of personal characteristics, motivations and attitudes as demonstrated in equation (4) below. *P* is the choice to promise.

$$S = S\left(\mathbf{C},\quad \mathbf{M},\quad \mathbf{A}\ ,\quad P\right) \tag{3}$$

$$P = P\left(\mathbf{C},\quad \mathbf{M},\quad \mathbf{A}\ \right) \tag{4}$$

The model as specified in equation (3) is expressed respectively as a standard univariate probit model of the choice to share in equation (5), and the model as specified in equation (4) is expressed respectively as a standard univariate probit model of the choice to promise in equation (6).

$$\Pr(S=1) = \Phi\left(\boldsymbol{\beta}_{11}\mathbf{C} + \boldsymbol{\beta}_{12}\mathbf{M} + \boldsymbol{\beta}_{13}\mathbf{A} + \beta_{14}P + \varepsilon\right) \tag{5}$$

$$\Pr(P=1) = \Phi\left(\boldsymbol{\beta}_{21}\mathbf{C} + \boldsymbol{\beta}_{22}\mathbf{M} + \boldsymbol{\beta}_{23}\mathbf{A} + \varepsilon\right) \tag{6}$$

All regressions are specified using the general-to-specific technique and hence different motivation and attitude variables are appropriate for different games. The specification of the models is identical for games 5 and 6 to enable greater comparison.

The attitude index combines the responses to the four attitude questions outlined in table 2. Responses for each question are numbered according to the scale that 4 = response in strongest agreement with the attitude and 0 = response in weakest agreement. For example, for the attitude index representing attitudes in accordance with altruism, the first question in table 5 asks respondents how much they agree or disagree with the statement 'I am a generous person', and the responses are coded according to the scale that 4 = agree strongly, 3 = agree slightly, 2 = neither agree nor disagree, 1 = disagree slightly and 0 = disagree strongly. The scale is reversed for the second statement 'I am a self-centred person'. The responses for all four statements regarding altruism are aggregated to give a total out of 16 and then the total is divided by 16 to determine the index and hence the index lies between 0 and 1. A value of 0 indicates weak agreement with statements regarding altruism, and a value of 1 indicates strong agreement.

2.3 The respondents

The study was carried out at the University of Sheffield, UK in February and March 2006. All undergraduate and postgraduate students at the University of Sheffield received an email requesting them to complete the questionnaire and hence all participants were volunteers and were not pre-selected. Information that respondents are given prior to the completion of the questionnaire is very important. In order to reduce respondent bias the objective of the questionnaire to analyse motivations and attitudes in economic decision-making is not stated in the email or introduction to the questionnaire, because if respondents are aware of the objective of the questionnaire this may encourage responses from respondents interested in the objective and may bias responses through a greater awareness that the questions are focussing upon motivations and attitudes. Therefore respondents are informed in the email and introduction to the questionnaire that they are being invited to take part in a research project examining the way people make decisions in real world transactions.

The sample of 1,701 students is 7.27% of the total population which is a relatively high response rate for this recruitment method.[6] The characteristics of the respondents, and how they compare with the University of Sheffield student population, are shown in table 1. The sample is older, has a higher proportion of females and students from the faculty of Pure Science and a lower proportion of

students from the faculty of Medicine than the University of Sheffield student population.

Table 1

Respondent characteristics (*n*=1,701)

Characteristic	*Sample*	*University of Sheffield*[7]
Sex		
Male	37%	45%
Female	63%	55%
Age group		
Under 21	51%	70%
21-24	34%	15%
25-39	13%	12%
40-59	2%	2%
60+	0%	0%
Student status		
Undergraduate	79%	79%
Taught postgraduate	11%	12%
Research postgraduate	10%	8%
Faculty		
Architectural Studies	3%	5%
Arts	19%	14%
Engineering	13%	10%
Law	8%	7%
Medicine	10%	23%
Pure Science	34%	15%
Social Science	30%	26%
Respondents in more than one faculty in the questionnaire	16%	-
Monthly term-time expenditure		
£0-£199	22%	-
£200-£399	46%	-
£400-£599	19%	-
£600-£799	5%	-
£800-£999	3%	-
£1000-£1199	3%	-
Over £1200	2%	-

3. Results

3.1 Choices

Table 2 shows the results of the choice to share or compete in the six Prisoner's Dilemma and Prisoner's Dilemma related games. In game 1 a large proportion of the population chose compete but a significant number of respondents did not choose compete and this is in accordance with much of the literature regarding the standard Prisoner's Dilemma game. A much larger proportion of respondents chose share in game 2 than in game 1. In game 3 the proportions are identical to game 1 but cross-tabulations (not reported here) indicate that 15% of the sample chose different options in games 1 and 3. Game 4 is a coordination game and hence there is no dominant strategy, and more respondents chose share rather than compete.

Table 2 shows that a large proportion of respondents chose to make a promise to share in game 5 and table 3 shows that 73% of respondents who chose to make a promise to share kept their promise when the other player also made a promise, but only 29% kept their promise to share when the other player did not make a promise. Table 2 shows that a larger proportion of respondents chose to make a promise to share in game 6 when the respondent is told that the other player dislikes lying, and table 3 shows that this increases the proportion of players who kept their promise to share when the other player also made a promise to share, but reduces the proportion of players who kept their promise to share when the other player did not make a promise to share. For respondents who chose to not make a promise to share in games 5 and 6, the proportions of respondents choosing compete is similar for game 1 when no promise is received from the other player, but when a message is received from the other player the proportion of players choosing compete is much higher. For games 5 and 6 when no message is received from the other player the proportion of all respondents choosing compete is higher than for game 1, regardless of whether a promise is made, yet the payoffs are identical for games 1, 5 and 6. Using the chi-squared p-value, the choice to compete or share is not independent at the 1% significance level of the choice made regarding whether to send a promise, both for when a message is received and when no message is received from player 2, for both game 5 and game 6.

Table 2

Results of the six Prisoner's Dilemma and Prisoner's Dilemma related games

	Compete, %	*Share, %*	*n*
Game 1	67.24	32.76	1697
Game 2	51.94	48.06	1698
Game 3	67.12	32.88	1697
Game 4	40.95	59.05	1697
	No promise made, %	*Promise made, %*	*n*
Game 5 - promise to share	39.94	60.06	1695
Game 6 - promise to share	31.14	68.86	1699
	Compete, %	*Share, %*	*n*
Game 5 - message received	43.15	56.85	1687
Game 5 - no message received	77.26	22.74	1684
Game 6 - message received	34.43	65.57	1696
Game 6 - no message received	76.70	23.30	1691

n records the number of responses for each game, thus indicating under 1% missing responses.

Table 3

Analysis of the effect of promises in games 5 and 6

	Game 5 - message received			*Game 5 - no message received*		
	Compete, %	*Share, %*	*n*	*Compete, %*	*Share, %*	*n*
No promise made	67.86	32.14	672	86.65	13.35	674
Promise made	26.73	73.27	1014	70.93	29.07	1008
Total	43.12	56.88	1686	77.23	22.77	1682
	Game 6 - message received			*Game 6 - no message received*		
	Compete, %	*Share, %*	*n*	*Compete, %*	*Share, %*	*n*
No promise made	61.03	38.97	526	88.19	11.81	525
Promise made	22.5	77.5	1169	71.59	28.41	1165
Total	34.45	65.55	1695	76.75	23.25	1690

3.2 Motivations

Table 4 lists the motivating factors for the choices in the six Prisoner's Dilemma and Prisoner's Dilemma related games used in this study. These responses appear to suggest that self-interest captures the motivations of a large proportion of respondents, but also a significant proportion of respondents do not act according to standard economic assumptions based on self-interest. The motivating factors used in this study include altruism, inequality aversion, reciprocity, aversion to lying and self-interest and other motivating factors in accordance with standard economic assumptions based on self-interest. The list of motivating factors include both positive/pure and negative altruism and inferiority and superiority aversion in order to

capture a wide range of motivations. For example ‘did not want player 2 to have a high payoff’ cannot be regarded as pure altruism but is instead classed as altruism in a negative sense. Furthermore ‘avoided payoffs for myself that were much lower than player 2’ measures inferiority aversion, where the respondent dislikes having a lower payoff than the other player. The responses in table 4 demonstrate that altruism, inequality aversion, reciprocity and aversion to lying are motivating factors for a large proportion of respondents, as well as self-interest and other motivating factors in accordance with standard economic assumptions based on self-interest.

Other motivating factors analysed in the study include ‘didn’t understand the game’ and ‘other, please specify’, where 202 respondents specified other motivations. Many respondents reiterated previous motivations, but the responses to this question can be roughly separated into 3 groups: respondents who had difficulties or questions regarding the game, respondents primarily motivated by factors included in standard economic assumptions based on self-interest and respondents primarily motivated by ethical factors. The responses were varied and there were no common responses. Overall this appears to suggests that the list in table 4 captures the majority of motivations and that no additional significant motivating factors were important.

Table 4

Motivating factors for responses in six Prisoner's Dilemma and Prisoner's Dilemma related games

Motivation	*Response, %*			*n*
	Every time	Sometimes	Never	
Altruism as a motivating factor				
Wanted player 2 to have a high payoff	6.54	33.88	59.58	1697
Did not want player 2 to have a high payoff	18.36	37.97	43.66	1688
Wanted player 2 to have a low payoff	11.83	31.22	56.95	1691
Did not want player 2 to have a low payoff	12.42	36.37	51.21	1691
Inequality aversion as a motivating factor				
Avoided payoffs for myself that are much higher than player 2	11.87	29.12	59.01	1693
Avoided payoffs for myself that were much lower than player 2	55.15	25.59	19.25	1688
Wanted equal payoffs for myself and player 2	25.21	49.82	24.97	1690
Reciprocity and aversion to lying as motivating factors[8]				
Responded to the promise of player 2	52.93	36.22	10.85	1687
Used whether or not player 2 made a promise to share to anticipate their choice whether or not to share	51.27	36.35	12.37	1689
Kept your promise	55.81	28.02	16.17	1695
Did not want to lie by breaking a promise	55.90	24.26	19.83	1694
Motivating factors in accordance with standard economic assumptions based on self-interest				
Did not want to have a low payoff	72.17	19.83	7.99	1689
Wanted to have a high payoff	67.91	26.89	5.20	1692
Wanted to have the highest payoff possible	54.99	33.98	11.03	1695
Used the potential amounts of money received to anticipate the choice of player 2	28.61	41.96	29.43	1692
Other motivating factors				
Didn't understand the game	2.01	15.46	82.52	1688
Other, please specify	15.64	9.77	74.59	921

3.3 Attitudes

Table 5 summarises the responses for general attitudes and values. The responses indicate how much respondents agree or disagree with statements regarding altruism, inequality aversion, reciprocity, aversion to lying and self-interest. These responses suggest that self-interest captures the attitudes and values of some respondents, but also a significant proportion of respondents do not have attitudes that are accurately captured by self-interest alone. The responses indicate strong attitudes regarding altruism and reciprocity and strong attitudes towards promises and aversion to lying. Only 14% of respondents agree that they break a promise if it benefits them,

suggesting that the majority of respondents keep their promises even if it benefits them to break it. Attitudes regarding self-interest suggest that the majority of respondents do consider and are concerned by how their actions affect others. Attitudes regarding inequality aversion are mixed as significant proportions of respondents demonstrate all possible responses in this section.

Table 5

Responses for attitudinal questions

Attitudinal statement	*Disagree strongly*	*Disagree slightly*	*Neither agree nor disagree*	*Agree slightly*	*Agree strongly*	*n*
Altruism						
I am a generous person	0.18	2.95	12.55	56.87	27.46	1697
I am a self-centred person	23.49	37.01	18.36	19.24	1.89	1694
Being concerned with other people's welfare is good	0.18	0.94	4.42	31.49	62.97	1696
If the welfare of others increases this causes my welfare to increase	2.84	9.88	39.11	36.21	11.95	1690
Inequality						
I dislike income inequality	6.89	13.14	24.51	31.59	23.87	1697
I would prefer to have similar income to others rather than much higher income than others	7.41	20.51	30.71	27.27	14.11	1687
I like other people to have more money than me	10.61	30.42	53.83	3.95	1.18	1696
I like having more money than others	7.30	14.95	43.24	28.00	6.52	1686
Reciprocity						
I am more likely to be nice to people who are nice to me	0.83	2.07	3.08	32.98	61.04	1689
I am more likely to respond generously to generous people	1.06	2.66	10.35	35.19	50.74	1691
I treat others how they treat me	3.13	11.10	12.64	46.78	26.34	1693
I am more concerned with other people's welfare if they are concerned with my welfare	3.02	12.18	20.17	44.35	20.28	1691
Promises and an aversion to lying						
I keep my promises	0.47	1.83	8.27	42.91	46.51	1692
I feel bad if I break a promise	0.95	3.01	4.49	31.66	59.89	1693
Breaking promises is bad	0.77	2.60	7.09	31.56	57.98	1692
I break a promise if it benefits me	39.35	33.04	13.27	13.45	0.88	1695
Self-interest						
I am concerned about how my actions affect others	0.35	1.42	5.14	39.72	53.37	1692
I consider how my actions affect others	0.30	1.07	4.20	45.92	48.52	1690
I always choose to do what benefits me most	11.33	29.99	24.85	29.22	4.60	1694
I choose to do what benefits me regardless of how it affects others	32.33	40.25	14.54	11.82	1.06	1692

3.4 Choices, motivations and attitudes

Tables 6 and 7 summarise the results of the probit regressions. Table 6 summarises the results for all personal characteristics variables included in the regressions for all games. Table 7 summarises the results for all motivation and attitude variables included in the regressions for all games. Table A1 in the appendix shows the marginal effects of the probit regressions for all games. Tables 6 and 7 indicate that the personal characteristics variables are largely insignificant and the variables representing motivations and attitudes are highly significant. We have shown elsewhere that the use of variables representing motivations and attitudes provides better specified models than using personal characteristics variables alone and that the motivation variables are more effective than the attitude variables (Rowen and Dietrich, 2007). Table A3 in the appendix shows the Pearson's correlation coefficients for the motivation and attitude variables. Correlations are generally weak hence multicollinearity should not be a problem and therefore the use of these motivation and attitude dummy variables together is acceptable.

Table 7 illustrates that the sign and significance of the motivation and attitude variables are robust across all regression models. Overall the regression results indicate that motivations regarding altruism, inequality aversion, reciprocity and assumptions of standard economic theory based on self-interest and attitudes in accordance with altruism, aversion to lying and self-interest are statistically significant.

Table 6

Summary of personal characteristics variables used in the econometric models for each game

Game	*1*	*2*	*3*	*4*	*5 promise*	*5 message received*	*5 no message received*	*6 promise*	*6 message received*	*6 no message received*
Female	N	–	–	–	–	+	N	–	+	–
Faculty of Architecture	N	N	N	–	N	N	–	N	N	N
Faculty of Engineering	–	N	N	N	N	N	N	N	N	N
Faculty of Law	N	N	N	–	N	N	N	N	N	N
Faculty of Medicine	N	N	N	N	N	N	N	N	N	N
Faculty of Pure Science	N	N	N	N	N	N	N	N	N	N
Faculty of Social Science	N	N	N	N	N	N	N	N	N	N
Dual faculty student	N	N	N	N	+	N	N	N	N	N
Economics student	N	N	N	N	N	N	N	+	N	N
Age 21-24	+	N	N	N	N	–	N	N	N	N
Age 25-39	N	N	N	N	N	–	N	N	–	N
Aged 40 or above	+	N	N	N	N	N	N	N	N	N
Monthly term-time expenditure £200 -399	N	N	N	N	N	–	N	N	N	N
Monthly term-time expenditure £400 -599	N	N	N	N	N	N	N	N	N	N
Monthly term-time expenditure £600 -799	N	N	N	N	N	N	N	N	N	N
Monthly term-time expenditure £800 -999	N	N	N	N	N	N	N	N	N	N
Monthly term-time expenditure £1000 -1199	N	N	N	+	N	N	+	N	N	N
Monthly term-time expenditure over £1200	N	+	N	+	N	N	N	N	N	N
Non-white	–	–	N	N	N	N	N	N	N	+

Notes: A '+' sign indicates that the relationship is positive and significant at the 10 percent level, a '–' sign indicates that the relationship is negative and significant at the 10 percent level, 'N' indicates that the variable was included in the regression but was not significant at the 10 percent level.

Table 7

Summary of motivation and attitude variables used in the econometric models for each game

Game		*1*	*2*	*3*	*4*	*5 promise*	*6 promise*	*5 message received*	*6 message received*	*5 no message received*	*6 no message received*
Motivation variables											
Altruism	Wanted player 2 to have a high payoff		+								
	Did not want player 2 to have a high payoff				–	–	–	N	–	–	–
Inequality aversion	Avoiding payoffs for myself that are much higher than player 2	+	+	+	+					+	+
	Wanted equal payoffs for myself and player 2	+	+	+	+	+	+	+	+	+	+
Reciprocity	Responded to the promise of player 2							+	+		
Standard economic assumptions based on self-interest	Used the potential amounts of money received to anticipate the choice of player 2	–	–					–	–		
	Did not want to have a low payoff	–									
	Used whether or not player 2 made a promise to share to anticipate their choice whether or not to share									–	–
	Wanted to have the highest payoff possible	–	–	–	–			–	–	–	–
Attitude variables											
Altruism	Attitude index representing attitudes in accordance with altruism		+		+	+	+				
Aversion to lying	Attitude index representing attitudes in accordance with the avoidance and undesirability of lying					–	–	+	+	N	N
Self interest	Attitude index representing attitudes in accordance with self-interest and standard economic assumptions based on self-interest		–		–						

Notes: A '+' sign indicates that the relationship is positive and significant at the 10 percent level, a '–' sign indicates that the relationship is negative and significant at the 10 percent level, 'N' indicates that the variable was included in the regression but was not significant at the 10 percent level, all blank cells indicate that the variable was not included in the regression.

4. Discussion

4.1 Personal characteristics

Few personal characteristics variables are significant in the regressions for each game and no variables are significant for all games. The results indicate that females often have a lower probability of sharing yet there is not a robust pattern across all games. This is in accordance with the literature, as, for example, Rapoport and Chammah (1965) find that females have a lower frequency of cooperative choices, whereas Frank, Gilovich and Regan (1993), Hu and Liu (2003) and Ortmann and Tichy (1999) find the opposite. Females generally have a lower probability of making a promise to share. The results are mixed regarding faculties, but the reference group of students from the faculty of arts generally demonstrate a higher probability of sharing and making a promise to share.[9] The relationship for expenditure is not straightforward, and expenditure is rarely statistically significant, suggesting that although these payoffs are high relative to the monthly expenditure of these students, the size and scaling of the payoffs chosen does not affect the results.

4.2 Altruism and inequality aversion

Many respondents stated that altruistic motivations were considered or used to make their choices and many respondents stated strong attitudes regarding altruism, both positive/pure and negative altruism. Table 7 shows that altruism as a motivating factor is statistically significant in games 2 and 4 and games 5 and 6 when no message is received, game 6 when a message is received and the choice to make a promise in games 5 and 6. The altruistic motivation used in the regressions with the exception of game 2 is negative altruism, where not wanting player 2 to have a high payoff reduces the probability of sharing or making a promise to share for all games. The altruistic motivation used in game 2 is positive altruism which increases the probability of sharing. Attitudes in accordance with altruism are statistically significant and increase the probability of sharing in games 2 and 4 and the choice to make a promise in games 5 and 6.

Many respondents stated that motivations regarding inequality aversion were considered or used to make their choices. However, the largest proportion of respondents stated that inferiority aversion was considered or used to make their

choices, where the respondent did not want to have a lower payoff than the other player. This is not appropriately regarded as ethical. Attitudes regarding inequality aversion are mixed as table 4 showed that significant proportions of respondents demonstrate all possible responses in this section. However, table 4 shows that 'wanting equal payoffs for myself and player 2' is a motivating factor for 75% of respondents, and hence responses regarding inequality aversion as a motivating factor demonstrate that inequality aversion is important, yet general attitudes towards inequality aversion are more mixed. One reason may be that two attitudinal statements are phrased in terms of money and two attitudinal statements are phrased in terms of income, yet results do not appear to be affected by this. Another reason may be that income inequality as a general principle may be different to income inequality aversion amongst two players. For example, an individual may believe that income inequality is not undesirable in a society, yet may not wish to cause inequality amongst themselves and another individual as a result of their choices.

Table 7 shows that equality as a motivating factor is statistically significant in all games, where wanting equal payoffs for both players increases the probability of sharing or making a promise to share. Inferiority aversion is statistically significant as a motivating factor in games 1, 2, 3 and 4 and in games 5 and 6 when no message is received, where a dislike of having a higher payoff than the other player increases the probability of sharing or making a promise to share.

4.3 Promises, reciprocity and lying

Tables 7 and 8 indicate that making a promise to share increases the probability of sharing.[10] The results of the Wald test statistics for games 5 and 6 are shown in table A1 in the appendix and can be summarised in three points. Firstly the results suggest that there are differences between individuals who choose to send a message saying 'I promise I will share' and those who actually share. Secondly the results suggest that reciprocity affects responses as the estimated coefficients are affected by whether a message is received from the other player. Thirdly the results suggest that the knowledge that the other player dislikes lying also affects responses. These three points are also illustrated in tables 2 and 3 as the questionnaire responses are different for games 5 and 6, and in table A1 in the appendix because the marginal effects and

the regressors that are statistically significant are affected by the game, whether the model is for the choice to promise or to share and whether or not a message is received. These three points are in accordance with the argument that factors such as reciprocity and aversion to lying affect choices in a game theory context.

Many respondents stated that motivations regarding reciprocity were considered or used to make their choices and many respondents stated strong attitudes regarding reciprocity. Table 7 shows that reciprocity is statistically significant as a motivating factor in games 5 and 6 where a message is received, where 'responding to the promise of player 2' increases the probability of sharing. Attitudes in agreement with reciprocity are not statistically significant in any of the regression models. One argument is that motivation variables represent principles that are strategically important, as they constitute the plan for achieving a long-term goal whilst fully considering the interactions amongst players in a game theoretic context. Attitude variables represent principles that are intrinsically important, and are therefore exogenous characteristics that define the moral make-up of the person and hence determine their long-term goals. This suggests that reciprocity may be strategically important rather than intrinsically important for choices in the games.

Many respondents stated that motivations regarding an aversion to lying were considered or used to make their choices and many respondents stated strong attitudes regarding the undesirability and aversion to lying. Table 7 shows that an aversion to lying is not statistically significant as a motivating factor for any of the models, suggesting that an aversion to lying may be intrinsically important rather than strategically important in the models. One factor to be taken into consideration is that the proportion of respondents who state that keeping their promise is a motivating factor is higher than the proportion of respondents who chose to make a promise in both game 5 and game 6. This may be because some respondents decided not to promise because they would not have been able to keep the promise. Attitudes in agreement with the avoidance and undesirability of lying are statistically significant in games 5 and 6, where they reduce the probability of making a promise. The lying index increases the probability of sharing when a message is received in games 5 and 6 thus suggesting that individuals who do not wish to lie and who believe that breaking promises is bad are more likely to share potentially for two different reasons:

firstly they believe that the other player will keep their promise to share, and secondly if the individual made a promise to share they are more likely to keep the promise.

4.4 Self-interest

Many respondents did not choose share for each of the Prisoner's Dilemma games and Prisoner's Dilemma related games which is the choice that maximises self-interest. Many respondents stated that motivations regarding self-interest or motivations in accordance with standard economic assumptions based on self-interest were considered or used to make their choices, yet few respondents stated strong attitudes regarding self-interest or attitudes in accordance with standard economic assumptions based on self-interest theory. Table 7 shows that motivations representing self interest and standard economic assumptions based on self-interest are statistically significant for all games with the exception of the choice to promise in games 5 and 6. Using the potential amounts of money received to anticipate the choice of player 2 is statistically significant and reduces the probability of sharing in games 1 and 2 and games 5 and 6 when a message is received. Not wanting to have a low payoff is statistically significant and reduces the probability of sharing in game 1. Using whether or not player 2 made a promise to share to anticipate their choice whether or not to share is statistically significant and reduces the probability of sharing in games 5 and 6 when no message is received. Wanting the highest payoff possible is statistically significant and reduces the probability of sharing for all games but is unimportant for the choice to promise in games 5 and 6. Attitudes in agreement with self-interest are statistically significant and reduce the probability of sharing in games 2 and 4.

5. Conclusions and implications

Experimental evidence reported here suggests that ethical motivations and attitudes are important for determining choices as well as self-interest. An experiment was conducted to determine the motivations behind decisions in a game theory context by asking respondents directly what motivated their decisions in six Prisoner's Dilemma and Prisoner's Dilemma related games with the strategies 'share' or 'compete', and furthermore determining their overall self-interested beliefs. The responses indicated that ethical motivations including altruism, inequality aversion, reciprocity and aversion to lying as well as self-interest were considered or used to make choices. The

responses indicated strong attitudes regarding altruism and reciprocity and strong attitudes towards promises and an aversion to lying, but attitudes regarding inequality aversion are mixed. This suggests that self-interest captures the motivations, attitudes and values of some respondents, but a significant proportion of respondents do not act according to and do not have attitudes that are accurately captured by self-interest alone. Furthermore, a significant proportion of respondents have attitudes that are accurately captured by negative altruism and inferiority aversion, and hence this suggests that some respondents appear to be selfish or even unethical. The literature generally supports the finding here that altruism, inequality aversion and reciprocity are important alongside self-interest, and that some individuals may be more appropriately regarded as selfish.

This study builds on the existing literature but incorporates more motivations than previous approaches. This enables multiple explanations for observed behaviour and reduces the problem that observed behaviour may be explained by factors other than those factors that are analysed. The principal advantage of this study is that the motivations behind decisions are determined by asking respondents directly what motivated their decisions, whereas studies in the literature observe respondents decisions in order to reveal their preferences and to subsequently assign motivations that are in accordance with those decisions. Furthermore the relatively large sample size in comparison to the literature enables appropriate econometric analysis alongside tabulations.

Econometric analysis of the choice to share and the choice to promise demonstrates that motivations representing a desire for equality and wanting the highest payoff possible are the most important variables across all games. The motivation variables are more effective than the attitude variables in the regressions. This is consistent with an argument that motivation variables represent principles that are strategically important, and these are more important in the regression models than attitude variables which represent principles that are intrinsically important. Few personal characteristics variables are significant in each game and no variables are significant for all games.

Games 5 and 6 introduce a prior stage where the respondent can choose to send a message to the other player saying 'I promise I will share'. The results for games 5 and 6 suggest five points. Firstly there are differences between individuals who choose to send a message saying 'I promise I will share' and those who actually share. Secondly choosing to send a message saying 'I promise I will share' increases the probability of sharing. Thirdly reciprocity affects responses as the choice to share is affected by whether a message is received from the other player. Fourthly the knowledge that the other player dislikes lying also affects responses. Fifthly stronger attitudes towards keeping promises and an aversion to lying increase the probability of keeping a promise but reduce the probability of making a promise. These five points suggest that reciprocity and an aversion to lying affect choices in a game theory context.

These conclusions are based on a student sample and use only Prisoner's Dilemma and Prisoner's Dilemma related games. While this game theory setting is characteristic of much of the literature, it does not follow that these findings necessarily hold in other contexts and for other members of the community. Further research is required to examine the importance of ethical motivations and attitudes for determining choices in contexts other than Prisoner's Dilemma related games.

References

Alexandre, P.K., French, M.T., 2004. Further Evidence on the Labor Market Effects of Addiction: Chronic Drug Use and Employment in Metropolitan Miami. Contemporary Economic Policy 22, 382-393.

Andreoni, J., Miller, J.H., 1993. Rational cooperation in the finitely repeated prisoners' dilemma. Economic Journal 103, 570-585.

Andreoni, J., Vesterlund, L., 2001. Which Is the Fair Sex? Gender Differences in Altruism. The Quarterly Journal of Economics 116, 293-312.

Berg, J. et al., 1995. Trust, Reciprocity and Social History. Games and Economic Behavior 10, 122-142.

Blount, S., 1995. When Social Outcomes Aren't Fair: The Effect of Causal Attributions on Preferences. Organizational Behavior and Human Decision Processes 63, 131-144.

Bolton, G., Ockenfels, A., 2000. ERC: A Theory of Equity, Reciprocity, and Competition. American Economic Review 90, 166-193.

Charness, G., Haruvy, E., 2002. Altruism, equity, and reciprocity in a gift-exchange experiment: An encompassing approach. Games and Economic Behavior 40, 203-231.

Charness, G., et al. 2007. Social Distance and Reciprocity: An Internet Experiment. Journal of Economic Behavior and Organization 63, 88-103.

Charness, G., Rabin, M., 2002. Understanding Social Preferences with Simple Tests. The Quarterly Journal of Economics 117, 817-869.

Cox, J.C. 2004. How to identify trust and reciprocity. Games and Economic Behavior 46, 260-281.

Dufwenberg, M., Kirchsteiger, G. 2004. A theory of sequential reciprocity. Games and Economic Behavior 47, 268-298.

Ellingsen, T., Johannesson, M. 2004. Promises, Threats and Fairness. The Economic Journal 114, 397-420.

Ellingsen, T., Johannesson, M. 2005. Sunk costs and fairness in incomplete information bargaining. Games and Economic Behavior 50, 155-177.

Falk, A., Fischbacher, U., 2000. A Theory of Reciprocity. Institute for Empirical Research in Economics, University of Zurich, Working Paper Series (Working Paper No. 6), 1-47.

Fehr, E., Gachter, S., 2000. Fairness and Retaliation: The Economics of Reciprocity. Journal of Economic Perspectives 14, 159-181.

Fehr, E., Schmidt, K.M., 1999. A Theory of Fairness, Competition and Cooperation. The Quarterly Journal of Economics 114, 817-868.

Fong, C., 2007. Evidence from an experiment on charity to welfare recipients: Reciprocity, altruism, and the empathic responsiveness hypothesis. The Economic Journal 117, 1008-1024.

Gill, F., 1996. Comment: On Ethics and Economic Science. In: Groenewegen, P., (Ed.). Economics and ethics?. London and New York: Routledge, 138-56.

Greene, W.H., 1998. Gender Economics Courses in Liberal Arts Colleges: Further Results. The Journal of Economic Education 29, 291-300.

Greene, W.H., 2000. Econometric Analysis. New Jersey: Prentice Hall.

Hu, Y.-A., Liu, D.-Y., 2003. Focus on Homoeconomicus: Altruism versus Egoism in Human Behavior of Mixed Motives: An Experimental Study. American Journal of Economics and Sociology 62, 677-705.

Levine, D.I., 1998. Modeling Altruism and Spitefulness in Experiments. Review of Economics Dynamics 1, 593-622.

McCabe, K., et al. 2003. Positive reciprocity and intentions in trust games. Journal of Economic Behavior and Organization 52, 267-275.

Minkler, L. P., Miceli, T.J., 2004. Lying, Integrity, and Cooperation. Review of Social Economy 62, 27-50.

Rabin, M., 1993. Incorporating Fairness into Game Theory and Economics. American Economic Review 83, 1281-1302.

Rowen, D., Dietrich, M., 2007. Attitudes and motivations of economics students: Some recent evidence. Sheffield Economics Research Paper SERP2007007, April 2007.

Rubinstein, A., 2007. Instinctive and Cognitive Reasoning: A Study of Response Times. The Economic Journal 117, 1243-59.

Sethi, R., Somanathan, E., 2003. Understanding reciprocity. Journal of Economic Behavior and Organization 50, 1-27.

Appendix

Table A1

Marginal effects for the probit models for the choice to share in all games and the choice to promise in games 5 and 6

	Game1	*Game2*	*Game3*	*Game4*		*Game 5*			*Game 6*	
					Promise to share	*Message received*	*No message received*	*Promise to share*	*Message received*	*No message received*
Control variables										
Female	0.016	-0.076**	-0.052*	-0.058**	-0.054*	0.098***	-0.030	-0.045*	0.056*	-0.054**
Faculty of Architecture	-0.125*	-0.092	-0.094	-0.153*	-0.073	-0.101	-0.115***	-0.040	0.019	-0.070
Faculty of Engineering	-0.089*	0.023	-0.046	-0.024	-0.081	0.010	0.053	-0.030	0.006	0.018
Faculty of Law	0.004	-0.084	-0.058	-0.114*	0.047	-0.059	0.019	0.019	0.038	0.040
Faculty of Medicine	-0.033	-0.057	-0.062	-0.089	-0.007	-0.097	-0.033	0.005	-0.060	0.053
Faculty of Pure Science	-0.118***	-0.037	-0.037	-0.020	0.013	0.021	-0.035	0.007	0.018	-0.023
Faculty of Social Science	-0.009	0.013	0.016	-0.010	0.008	-0.015	0.034	-0.009	0.058	0.006
Dual faculty student	0.014	-0.012	0.027	-0.037	0.130***	0.012	0.046	0.023	-0.017	0.056
Economics student	-0.034	-0.045	-0.042	-0.039	0.092	-0.059	-0.037	0.106**	-0.006	-0.024
Age 21-24	0.083***	-0.022	0.041	0.005	0.030	-0.007	0.057**	-0.000	0.018	0.009
Age 25-39	0.042	-0.062	0.026	-0.059	0.059	0.074	-0.001	-0.011	0.036	-0.031
Aged 40 or above	0.350***	0.063	0.040	0.088	-0.068	0.106	0.120	-0.131	0.074	0.243**
Monthly term-time expenditure £200 -399	-0.001	0.054	0.009	0.010	-0.001	-0.074*	-0.019	0.018	-0.084**	-0.029
Monthly term-time expenditure £400 -599	0.009	0.062	-0.001	0.043	-0.008	-0.017	-0.010	-0.002	-0.004	-0.020
Monthly term-time expenditure £600 -799	-0.092*	0.112*	-0.079	0.093	-0.064	-0.130	-0.006	-0.009	-0.035	-0.009
Monthly term-time expenditure £800 -999	0.013	-0.061	-0.045	0.080	0.091	-0.050	-0.013	0.040	-0.129	-0.071
Monthly term-time expenditure £1000 -1199	0.053	0.146*	0.130	0.141*	0.094	0.111	0.000	0.062	-0.104	0.062
Monthly term-time expenditure over £1200	-0.135*	0.270***	0.141	0.198**	-0.038	-0.007	0.024	-0.010	0.077	-0.013
Non-white	-0.100***	-0.093**	-0.003	-0.061	0.007	-0.097**	-0.012	-0.017	-0.057	-0.000
Promise variables										

	Game1	*Game2*	*Game3*	*Game4*		*Game 5*			*Game 6*	
					Promise to share	*Message received*	*No message received*	*Promise to share*	*Message received*	*No message received*
Game 6 – promise to share									0.336***	0.128***
Game 5 – promise to share						0.372***	0.110***			
Motivation and attitude variables										
Wanted player 2 to have a high payoff 'every time'		0.049								
Wanted player 2 to have a high payoff 'sometimes'		0.081**								
Did not want player 2 to have a high payoff 'every time'				-0.140***	-0.118***	-0.039	-0.048*	-0.094***	-0.177***	-0.089***
Did not want player 2 to have a high payoff 'sometimes'				-0.105***	-0.084***	0.058	-0.067***	-0.014	-0.086***	-0.007
Wanted equal payoffs for myself and player 2 'every time'	0.555***	0.466***	0.545***	0.285***	0.309***	0.389***	0.238***	0.264***	0.281***	0.249***
Wanted equal payoffs for myself and player 2 'sometimes'	0.193***	0.153***	0.176***	0.065**	0.134***	0.234***	0.086***	0.104***	0.254***	0.116***
Avoided payoffs for myself that are much higher than player 2 'every time'	0.142***	0.092*	0.160***	0.062	0.004	0.022	0.127***	-0.041	0.117***	0.146***
Avoiding payoffs for myself that are much higher than player 2 'sometimes'	0.097***	0.084**	0.071**	0.076**	0.006	0.073*	0.112***	0.007	0.013	0.094***
Used the potential amounts of money received to anticipate the choice of player 2 ‘every time’	-0.109***	-0.082**			-0.016	-0.177***	-0.023	0.063**	-0.070*	0.004
Used the potential amounts of money received to anticipate the choice of player 2 ‘sometimes’	-0.023	-0.072*			0.035	-0.079*	-0.034	0.026	-0.114***	-0.036
Did not want to have a low payoff 'every time'	-0.205***									
Did not want to have a low payoff 'sometimes'	-0.044									
Wanted to have the highest payoff possible 'every time'	-0.102**	-0.240***	-0.204***	-0.096*	-0.030	-0.112*	-0.105***	-0.065	-0.117**	-0.100***

	Game1	*Game2*	*Game3*	*Game4*		*Game 5*			*Game 6*	
					Promise to share	*Message received*	*No message received*	*Promise to share*	*Message received*	*No message received*
Wanted to have the highest payoff possible 'sometimes'	-0.019	-0.096*	-0.144***	-0.040	0.015	0.035	-0.076**	-0.013	0.003	-0.078**
Responded to the promise of player 2 'every time where relevant'						0.495***			0.374***	
Responded to the promise of player 2 'sometimes'						0.205***			0.237***	
Used whether or not player 2 made a promise to share to anticipate their choice whether or not to share 'every time where relevant'						-0.019	-0.186***		-0.002	-0.208***
Used whether or not player 2 made a promise to share to anticipate their choice whether or not to share 'sometimes'						-0.041	-0.084***		-0.013	-0.149***
Attitude index representing attitudes in accordance with self-interest and standard economic assumptions of self-interest	-0.349***		-0.363***							
Attitude index representing attitudes in accordance with altruism		0.160		0.173*	0.238**			0.364***		
Attitude index representing attitudes in accordance with the avoidance and undesirability of lying					-0.293***	0.554***	0.075	-0.207***	0.594***	0.120*
Observations	1580	1592	1594	1588	1568	1554	1561	1573	1563	1569
LR Chi-squared	619.19	439.23	490.09	205.37	172.47	835.85	308.27	153.32	706.37	322.65
Pseudo R-squared	0.31	0.20	0.24	0.10	0.08	0.39	0.18	0.08	0.35	0.19
Log likelihood	-687.81	-882.74	-765.11	-973.58	-967.73	-643.32	-682.78	-895.07	-649.14	-688.56
Wald test comparing these models to the equivalent promise models[11]						131.55	58.55		70.33	68.04
Wald test comparing these models to the equivalent message received models[12]							136.95			109.88
Wald test comparing games 5 and 6[13]								27.96	16.48	41.74

Notes: Reference group consists of ‘male’, ‘faculty of arts’, ‘aged under 21’, ‘monthly term-time expenditure £0-199’, ‘white’, ‘avoided payoffs for myself that are much higher than player 2 'never'', ‘wanted equal payoffs for myself and player 2 'never'', ‘wanted to have the highest payoff possible 'never'’ and for game 1 ‘used the potential amounts of money received to anticipate the choice of player 2 ‘never’’, ‘did not want to have a low payoff 'never'', ‘have attitudes of weak agreement with statements regarding self interest and standard economic assumptions based on self-interest’, and for game 2 ‘used the potential amounts of money received to anticipate the choice of player 2 ‘never’’, ‘wanted player 2 to have a high payoff ‘never’’, ‘have attitudes of weak agreement with statements regarding altruism’ and for game 3 ‘have attitudes of weak agreement with statements regarding self interest and standard economic assumptions based on self-interest’ and for game 4 ‘did not want player 2 to have a high payoff 'never'’ and ‘have attitudes of weak agreement with statements regarding altruism’.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table A2

Pearson's correlation coefficients for the motivation and attitude variables used in the models estimated in tables 6, 7 and 8

		Wanted player 2 to have a high payoff 'every time'		*Avoided payoffs for myself that are much higher than player 2*		*Used the potential amounts of money received to anticipate the choice of player 2*		*Wanted equal payoffs for myself and player 2*		*Did not want to have a low payoff*	
		Every time	*Sometimes*	*Every time*	*Sometimes*	*Every time*	*Sometimes*	*Every time*	*Sometimes*	*Every time*	*Sometimes*
Wanted player 2 to have a high payoff 'every time'	*Every time*	1									
	Sometimes	-0.1903	1								
Avoided payoffs for myself that are much higher than player 2	*Every time*	0.2643	0.0164	1							
	Sometimes	0.004	0.2652	-0.2337	1						
Used the potential amounts of money received to anticipate the choice of player 2	*Every time*	-0.0286	0.0937	-0.0411	0.0585	1					
	Sometimes	-0.0656	0.0054	-0.05	0.0116	-0.5386	1				
Wanted equal payoffs for myself and player 2	*Every time*	0.2513	0.0968	0.3229	0.1407	-0.0522	-0.1369	1			
	Sometimes	-0.1331	0.1725	-0.1587	0.1291	0.0919	0.1139	-0.5772	1		
Did not want to have a low payoff	*Every time*	-0.0814	-0.0943	-0.1717	-0.1479	0.161	0.0416	-0.3141	0.092	1	
	Sometimes	0.0455	0.1323	0.0766	0.1952	-0.0979	-0.0074	0.2497	-0.0385	-0.7977	1
Responded to the promise of player 2	*Every time*	0.0978	0.1267	0.0758	0.1019	0.0481	-0.0535	0.236	-0.0642	-0.0682	0.0994
	Sometimes	-0.1192	-0.0479	-0.0774	-0.0261	-0.0107	0.089	-0.1962	0.1488	0.0682	-0.05
Did not want player 2 to have a high payoff	*Every time*	-0.0658	0.1441	-0.0215	0.1852	0.0298	0.1084	-0.0036	0.1618	-0.0704	0.1363
	Sometimes	0.093	-0.0143	0.0231	-0.0932	-0.0754	-0.1452	0.1127	-0.15	-0.0575	-0.0269
Used whether or not player 2 made a promise to share to anticipate their choice whether or not to share	*Every time*	0.0007	0.0221	-0.0494	0.0208	0.1437	-0.0875	0.042	-0.028	0.0941	-0.0422
	Sometimes	-0.0446	0.0434	-0.0141	0.0451	-0.0604	0.162	-0.1019	0.1491	-0.0331	0.0497
Wanted to have the highest payoff possible	*Every time*	-0.0867	-0.2151	-0.1393	-0.2777	0.0813	0.0773	-0.3366	0.0087	0.3765	-0.3
	Sometimes	-0.0344	0.2458	-0.0039	0.2691	-0.0097	-0.0089	0.1329	0.0979	-0.1647	0.2138

		Wanted player 2 to have a high payoff 'every time'		*Avoided payoffs for myself that are much higher than player 2*		*Used the potential amounts of money received to anticipate the choice of player 2*		*Wanted equal payoffs for myself and player 2*		*Did not want to have a low payoff*	
		Every time	*Sometimes*	*Every time*	*Sometimes*	*Every time*	*Sometimes*	*Every time*	*Sometimes*	*Every time*	*Sometimes*
Attitude index representing altruism		0.1053	0.0358	0.0816	0.0652	0.0069	-0.0051	0.1785	-0.0451	-0.0788	0.0397
Attitude index representing attitudes in accordance with the avoidance and undesirability of lying		0.0861	0.046	0.0387	0.0598	-0.0646	-0.0308	0.1445	-0.0046	-0.0597	0.0225
Attitude index representing self-interest and standard economic assumptions based on self-interest		-0.1067	-0.0682	-0.0973	-0.0807	0.0271	0.0721	-0.246	0.0962	0.1157	-0.0585

		Responded to the promise of player 2		*Did not want player 2 to have a high payoff*		*Used whether or not player 2 made a promise to share to anticipate their choice whether or not to share*		*Wanted to have the highest payoff possible*		*Attitude index representing altruism*	*Attitude index representing attitudes in accordance with the avoidance and undesirability of lying*
		Every time, where relevant	*Sometimes*	*Every time*	*Sometimes*	*Every time, where relevant*	*Sometimes*	*Every time*	*Sometimes*		
Responded to the promise of player 2	*Every time, where relevant*	1									
	Sometimes	-0.8004	1								
Did not want player 2 to have a high payoff	*Every time*	-0.07	0.1505	1							
	Sometimes	0.1674	-0.1933	-0.6901	1						
Used whether or not player 2 made a promise to share to anticipate their choice whether or not to share	*Every time, where relevant*	0.3421	-0.2226	-0.0552	0.0817	1					

		Responded to the promise of player 2		*Did not want player 2 to have a high payoff*		*Used whether or not player 2 made a promise to share to anticipate their choice whether or not to share*		*Wanted to have the highest payoff possible*		*Attitude index representing altruism*	*Attitude index representing attitudes in accordance with the avoidance and undesirability of lying*
		Every time, where relevant	*Sometimes*	*Every time*	*Sometimes*	*Every time, where relevant*	*Sometimes*	*Every time*	*Sometimes*		
Wanted to have the highest payoff possible	*Sometimes*	-0.2499	0.326	0.157	-0.1684	-0.7714	1				
	Every time	-0.163	0.1235	-0.0769	-0.0988	0.0249	0.0117	1			
	Sometimes	0.115	-0.0584	0.1408	-0.0182	0.0243	0.016	-0.7891	1		
Attitude index representing altruism		0.1765	-0.1093	0.0211	0.073	0.0687	-0.0725	-0.1222	0.051	1	
Attitude index representing attitudes in accordance with the avoidance and undesirability of lying		0.2719	-0.2041	-0.0322	0.1484	0.0947	-0.1051	-0.1063	0.0511	0.3277	1
Attitude index representing self-interest and standard economic assumptions based on self-interest		-0.2055	0.1315	0.0461	-0.1946	-0.0903	0.0998	0.2141	-0.0995	-0.5232	-0.3996

Notes

[1] Refer to Sethi and Somanathan (2003) for a comprehensive discussion of the large literature using game theory to model reciprocity.

[2] The use of internet experiments is becoming increasingly popular, for a comprehensive discussion of the advantages and disadvantages see Charness et al. (2007). The questionnaire is available from the authors on request.

[3] In the questionnaire the explanation of each game includes details clearly explaining how much each player receives for every combination of choices from the respondent and the other player, player 2. The explanation of games 2 to 6 includes details of how the payoffs are changed from the previous game in order to firstly clearly indicate the differences between the payoffs in that game and previous games, secondly make the instructions as clear as possible and thirdly enable respondents to be able to quickly understand the differences in each of the games. No information is given regarding how the respondent could or should make their decision, hence the individual will have to determine their own criteria for making their choice, and even if they are already familiar with game theory they must decide whether to act in accordance with the theory.

[4] A probit model with an equivalent dependent variable which equals 1 for cooperate and 0 for defect is used in Hu and Liu (2003). Their estimated model uses personal characteristics, promises received and payoff levels as regressors.

[5] Fong (2007) uses similar model specifications to the models specified here. For example, Fong (2007) uses an instrumental variable regression of offers in an n-donor dictator game on predicted values of posterior beliefs and on personal characteristics variables. Fong (2007) also uses median and OLS regressions predicting offers in n-donor dictator games using dummy variables as regressors representing mid and high values of the HE scale, which is a constructed measure of attitudes derived from responses to multiple attitudinal questions.

[6] The University of Sheffield had a student population of 23,399 in February 2006. All responses were collected from 18 February 2006 until 23 March 2006. The response rate is higher than other research-based online questionnaires undertaken at the University of Sheffield that generally have a response rate of 2-4.5%.

[7] Ages shown are for full-time students at the University of Sheffield only due to data availability, yet all part-time and full-time students were requested to complete the questionnaire.

[8] The choice of responses regarding reciprocity and lying as motivating factors were ‘every time where relevant’, ‘sometimes’ and ‘never’, as promises are only used in games 5 and 6 and hence reciprocity and an aversion to lying are unlikely to be motivating factors for the other games.

[9] The attitudes and motivations of economics students is discussed in Rowen and Dietrich (2007).

[10] A bivariate probit approach of the choice to share and the choice to promise was also used for games 5 and 6, and a log likelihood ratio test of rho indicated that the error terms were not correlated and hence the univariate approach is appropriate.

[11] Wald test for equality of coefficients for the models of the choice to share and the choice to promise for the same specification of model. For example, for game 5 the model of the choice to share when no message is received is compared to the choice to share when a message is received. The altruism index and dummy variable only appear in the promise equation and hence the equality of coefficients is not tested for these variables.

[12] Wald test for equality of coefficients for the models for the share equations when a message is received and when no message is received for the same specification of model in this table. Some motivations only appear in the models when a message is received and hence for these regressions the equality of coefficients is not tested for these variables.

[13] Wald test for equality of coefficients for the models for game 6 for the same specification of model for game 5. For example, the Wald test statistic has the null hypothesis that the estimated coefficients for game 6 are equal to those for the model which has the same specification but is calculated using the data collected for game 5.