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Donna Rowen and Michael Dietrich*

Attitudes and motivations of Economics students: Some recent evidence

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* Department of Economics
University of Sheffield
9 Mappin Street
Sheffield
S1 4DT
United Kingdom
www.shef.ac.uk/economics

ABSTRACT

There is disagreement amongst economists regarding whether economics students are more self-interested than other students in economic and non-economic contexts. Econometric analysis of the choice to share in a Prisoner's Dilemma game suggests that it may not be economics students per se that have a lower probability of choosing share rather than compete, but instead that individuals with attitudes, motivations and values similar to those assumed by standard economic theory have a lower probability of choosing share. The experimental evidence here of 1,701 students suggests that it is the motivations and attitudes of subjects that are important for determining economic choices rather than simply whether the individual studies economics. The results confirm that a higher proportion of economics students have motivations in a game theory context that are similar to those assumed by standard economic theory, yet that their related general attitudes and values are not significantly different. Overall the results suggest that the assumptions of standard economic theory are appropriate for a subset of individuals, and for many individuals who do not study economics.

Key words: Individual decision making, experimental economics, prisoner's dilemma games, economists versus non-economists, student attitudes and motivations

JEL classification: A13, C72, C90

1. Introduction

Economists disagree about whether economics students are more self-interested than other students. Some studies address whether economics students are more self-interested in an economic context, generally finding that economics students are more self-interested in an economic context. Other studies address whether economics students are more self-interested in a more general context, generally finding that they are not more self-interested in a general context, although the evidence is somewhat mixed.[1] This study finds empirical support for both of these seemingly contradictory findings. We analyse whether economics students are more self-interested in an economic and a more general context using data on decisions in an economic context, the motivations for those decisions and general attitudes and values. This study is different to other studies as decisions are not only observed but subjects also state why they made their decisions and their general attitudes in a non-economic context. Furthermore the same students are analysed regarding whether they are more self-interested both in an economic and a more general context.

2. Previous Studies

The results of the studies of Marwell and Ames (1981), Frank et al. (1993) and Carter and Irons (1991) suggest that economics students act according to economic theory in an economic context. Marwell and Ames (1981) found that economics students were more likely to free ride than other students regarding contributions towards a public good. Frank et al. (1993) found that economics students were significantly more likely to defect in a Prisoner's Dilemma game than non-economics students. Carter and Irons (1991) found that in an ultimatum bargaining game economics students act more accordingly than other students to economic theory in an economic context, as when dividing a sum of money between themselves and another player in comparison to other students, economics students propose higher amounts of money for themselves yet accept lower amounts of money when proposed by the other player. However, Stanley and Tran (1998) found the reverse, and suggest that economics students can be more altruistic than other students. Although the sample size is small, the findings of Stanley and Tran (1998) suggest the possibility that economics students may not always act more accordingly than other students to economic theory in an economic context, and that for some economics students issues such as altruism and fairness may be important.

The evidence is somewhat mixed regarding whether economics students are more self-interested in a more general context. The results of the studies of Yezer et al. (1996) suggest that economics students are less likely than other students to act according to economic theory in a general non-economic context, however Laband and Beil (1999) suggest that economics students are no more likely than other students to act according to economic theory in a general non-economic context, and Frey and Meier (2003, 2005) and Frank and Schulze (2000) suggest that economics students are more likely than other students to act according to economic theory in a general non-economic context. Yezer et al. (1996) found that in a lost letter experiment economics students were more cooperative than non-economics students. Laband and Beil (1999) found that professional economists are no less cooperative than non-economists regarding cheating on their Association dues. Frey and Meier (2003, 2005) found that economics students donate less money to a pure public good in a real-life context, but that this is due to a selection effect rather than indoctrination and hence economics education does not cause economics students to act according to economic theory, the difference already exists. Frey et al. (1993) found that economics students believe the price system is more fair than the general population, but that this is due to a selection effect rather than indoctrination. Frank and Schulze (2000) found that economics students are more corrupt that non-economics students using a bribery experiment, but that this is due to self-selection rather than indoctrination.

Many of the above studies find that the differences observed between economics and non-economics students is due to self-selection rather than indoctrination. Therefore the focus of this study differs from previous studies as it does not examine whether economics students are different due to self-selection or indoctrination, but seeks to instead examine these differences in order to determine whether they can be explained in terms of motivations and attitudes and to examine the impact of these in the context of economic decision-making and a more general context.

3. Experimental Design

A Prisoner's Dilemma game was conducted at the University of Sheffield, UK to analyse 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] 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.[3] The sample of 1,701 students is 7.27% of the total population which is a relatively high response rate.[4] Of the 1,701 students, 63% are female, 79% are undergraduate students, 51% are aged under 21 and 5% (83 single honours and 9 dual honours subjects) are economics students. The sample is largely representative of the University of Sheffield student population where 55% are female, 79% are undergraduate and 70% are aged under 21.

The focus of the online questionnaire was upon determining the motivations behind decisions in a game theory context by asking subjects 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.[5] Subjects made their decisions in all six games before they were questioned about what motivated their decisions. Subjects were asked to tick from a list all motivations they considered or used to make their decisions and were then questioned about their underlying attitudes and values. The Prisoner's Dilemma game analysed here is shown in figure 1 below where 'you' refers to the subject.[6] As illustrated in figure 1 below, the payoff for mutual competition is £50, the payoff for competing when the other player shares is £100, the payoff for mutual sharing is £75 and the payoff for sharing when then other player competes is £25. A large proportion (67%) of the sample chose compete but a significant number of subjects did not choose compete and this is in accordance with much of the literature regarding the standard Prisoner's Dilemma game. A statistically significant larger proportion (80%) of all economics students in the sample chose compete, and hence their observed actions in a game theory context are more self-interested and this is in accordance with Carter and Irons (1991), Frank. et al (1993) and Marwell and Ames (1981).

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

Figure 1 Standard Prisoner's Dilemma game

4. Analysis and Results

Table 1 lists the four motivation questions that capture standard economic theory as a motivating factor for the choices in the six Prisoner's Dilemma games. These responses demonstrate that not wanting to have a low payoff, wanting to have a high payoff and wanting to have the highest payoff possible are motivating factors for a large proportion of subjects. Only 55% of subjects were motivated by having the highest payoff possible every time, which is lower than may be expected from standard economic theory. A large proportion of subjects never used the potential amounts of money received to anticipate the choice of player 2. These results overall suggest that standard economic theory captures the motivations of a large proportion of subjects, but also a significant proportion of subjects do not act according to economic theory.[7]

The motivations capturing the assumptions of standard economic theory are generally motivating factors for a statistically significant higher proportion of males, undergraduate students and younger age groups. The motivations capturing the assumptions of standard economic theory are generally motivating factors for a statistically significant higher proportion of economics students, thus suggesting that economics students largely have motivations in a game theory context that are in accordance with economic theory and this includes first year students who have not yet studied game theory. This is largely in accordance with the literature (Carter and Irons (1991); Frank et al. (1993); Marwell and Ames (1981)).

Table 1 Responses for standard economic theory as a motivating factor for responses in six Prisoner's Dilemma games

Motivation question	*Response*	*All subjects, %*	*Economics students, %*	*Non economics students, %*
Q1 Not wanting to have a low payoff*	Every time	72.17	84.78	71.45
	Sometimes	19.83	10.87	20.35
	Never	7.99	4.35	8.20
Q2 Wanting to have a high payoff*	Every time	67.91	81.52	67.13
	Sometimes	26.89	16.30	27.50
	Never	5.20	2.17	5.38
Q3 Wanting to have the highest payoff possible	Every time	54.99	59.78	54.71
	Sometimes	33.98	34.78	33.94
	Never	11.03	5.43	11.35
Q4 Using the potential amounts of money received to anticipate the choice of player 2*	Every time	28.61	40.22	27.94
	Sometimes	41.96	43.48	41.88
	Never	29.43	16.30	30.19

* Using the chi-squared p-value to determine statistical significance, motivations are not independent of and hence are affected by whether the subject is an economics student.

Table 2 summarises the responses for general attitudes and values regarding those assumed by standard economic theory in a game theory context. Ninety four percent of subjects agree with the statement 'I consider how my actions affect others' and 93% of subjects agree with the statement 'I am concerned about how my actions affect others'. Thirty four percent and 41% of subjects agree and disagree respectively with the statement 'I always choose to do what benefits me most' and 13% and 73% of subjects agree and disagree respectively with the statement 'I choose to do what benefits me regardless of how it affects others'. These responses indicate that the majority of subjects do consider and are concerned by how their actions affect others. Although some subjects will choose actions to benefit themselves at the expense of others, a large proportion of subjects will not do this. Therefore this suggests that one important factor in the decision-making process is considering others as well as oneself.

Generally males demonstrate stronger general attitudes and values regarding those assumed by standard economic theory in a game theory context, whereas arts students and dual faculty students demonstrate weaker attitudes and values. The results for motivations and attitudes regarding standard economic theory is consistent for males. Attitudes regarding standard economic theory are independent of and hence are not

affected by whether the subject studies economics for 3 out of the 4 statements. This suggests that although a significantly higher proportion of economics students choose compete rather than share and have motivations that capture the assumptions of standard economic theory in the six Prisoner's Dilemma games, studying economics does not necessarily mean that students adopt general attitudes and values similar to those assumed by standard economic theory. This is generally consistent with the literature as discussed above as it suggests that economics students are more self-interested in a game theory context, but that this does not imply that they are more self-interested in a non-economic context. Overall the results suggest that standard economic theory captures the motivations of a large proportion of subjects, but also a significant proportion of subjects do not act according to and do not have attitudes that are accurately captured by standard economic theory.

Table 2 Responses for attitudinal questions regarding standard economic theory

Attitudinal question	*Response*	*All subjects, %*	*Economics students, %*	*Non-economics students, %*
Q1 I consider how my actions affect others	Disagree strongly	0.30	0.00	0.31
	Disagree slightly	1.07	1.10	1.06
	Neither agree nor disagree	4.20	9.89	3.88
	Agree slightly	45.92	56.04	45.34
	Agree strongly	48.52	32.97	49.41
Q2 I am concerned about how my actions affect others	Disagree strongly	0.35	0.00	0.37
	Disagree slightly	1.42	3.30	1.31
	Neither agree nor disagree	5.14	5.49	5.12
	Agree slightly	39.72	48.35	39.23
	Agree strongly	53.37	42.86	53.97
Q3 I always choose to do what benefits me most*	Disagree strongly	11.33	5.49	11.67
	Disagree slightly	29.99	29.67	30.01
	Neither agree nor disagree	24.85	21.98	25.02
	Agree slightly	29.22	36.26	28.82
	Agree strongly	4.60	6.59	4.49
Q4 I choose to do what benefits me regardless of how it affects others	Disagree strongly	32.33	20.88	32.98
	Disagree slightly	40.25	42.86	40.10
	Neither agree nor disagree	14.54	17.58	14.37
	Agree slightly	11.82	17.58	11.49
	Agree strongly	1.06	1.10	1.06

* Using the chi-squared p-value to determine statistical significance, motivations are not independent of and hence are affected by whether the subject is an economics student.

Table 3 presents the results of a probit analysis. The binary dependent variable is takes the value 1 if the individual chose 'share' and 0 for 'compete'.[8] The probability of choosing share depends upon personal characteristics such as sex, age and so forth, and arguably upon personal motivations and attitudes. For each game different regressions are estimated to determine the probability of choosing share as a function of personal characteristics as demonstrated in equation (1) below, as a function of personal characteristics and motivations as demonstrated in equation (2) below and as a function of personal characteristics, motivations and attitudes as demonstrated in equation (3) below. S is the choice to share or compete, $\mathbf{C}$ is a vector of personal characteristics, $\mathbf{M}$ is a vector of motivations and A is a dummy variable or index representing attitudes.

$$S = S(\mathbf{C}) \tag{1}$$

$$S = S(\mathbf{C}, \quad \mathbf{M}) \tag{2}$$

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

The models as specified in equations (1) to (3) above can be expressed respectively as standard univariate probit models of the choice to share (Greene, 1998, 2000; Alexandre and French, 2004):

$$\Pr(S = 1) = \Phi(\boldsymbol{\beta}_1 \mathbf{C}) \tag{4}$$

$$\Pr(S = 1) = \Phi(\boldsymbol{\beta}_1 \mathbf{C} + \boldsymbol{\beta}_2 \mathbf{M}) \tag{5}$$

$$\Pr(S = 1) = \Phi(\boldsymbol{\beta}_1 \mathbf{C} + \boldsymbol{\beta}_2 \mathbf{M} + \beta_3 A) \tag{6}$$

where Pr represents probability, the β_i's are parameters to estimate and the function $\Phi(.)$ is the distribution function of the standard normal distribution. Equations (4) and (5) are estimated in models [1] and [2] in table 3 below and equation (6) is estimated in models [3] and [4] below where model [3] measures attitudes using an index and model [4] measures attitudes using a dummy variable.[9] Several regressions for each game are reported to indicate robustness of the models and to illustrate that the use of variables representing motivations and attitudes provides better specified models. Separate regressions are estimated using attitude indices and attitude dummy variables as these variables should not be used together and these regressions indicate that the use of either measure produces similar results.

In all models for game 1 females have a higher probability of sharing, in accordance with the results of Frank, Gilovich and Regan (1993), Hu and Liu (2003) and Ortmann and Tichy (1999).[10] The female dummy variable loses significance in models [2], [3] and [4] when motivations and attitudes are used alongside personal characteristics variables. This suggests that some differences in observed decision-making that are usually attributed to sex may be better explained using motivations and attitudes rather than sex. In all models for game 1 older students have a higher probability of sharing whereas non-white students have a lower probability of sharing. Expenditure categories affect the probability of sharing but the relationship is not straightforward. In comparison to students in the faculty of arts (reference group),

students from all other faculties, and from the economics department have a lower probability of sharing.[11] Models [2], [3] and [4] are better specified than model [1] as indicated by the goodness of fit statistics (pseudo R-squared, likelihood ratio and log likelihood) in table 3, and hence the use of motivations and attitudes alongside personal characteristics improves the model.

Model [2] includes motivations in addition to personal characteristics in the specification of the model, and models [3] and [4] also include attitude variables. These motivation and attitude dummy variables are individually analysed and added one by one into model [1] and the results for the variables of interest are presented in table A1 in the appendix indicating that the signs of these variables are robust. Pearson's correlation coefficient for the motivation and attitude variables are presented in table A2 in the appendix. The correlation coefficients indicate that these variables do not suffer from multicollinearity and hence the use of these motivation and attitude dummy variables together is acceptable.[12]

If the subject responded that they 'used the potential amounts of money received to anticipate the choice of player 2' every time or sometimes this reduces the probability of sharing by 7% and 5% respectively in model [2] using the marginal effects in table 3. This therefore suggests that the probability of sharing is reduced if individuals anticipate the choice of the other player, and hence this is in accordance with standard economic theory. If the subject responded that they 'did not want to have a low payoff' every time this reduces the probability of sharing by 22% in model [2] using the marginal effects. If the subject responded that they 'wanted to have the highest payoff possible' every time or sometimes this reduces the probability of sharing by 35% and 14% respectively in model [2] using the marginal effects. This suggests that the probability of sharing is reduced if the individual does not want to have a low payoff and wants to have the highest payoff possible, and hence this is in accordance with standard economic theory.

In model [3] the attitude index reduces the probability of sharing and in model [4] the attitude dummy variable reduces the probability of sharing, thus suggesting that if individuals have attitudes in accordance with the assumptions of standard economic theory they have a lower probability of sharing. The attitude index performs better

than the attitude dummy variable. The dummy variable representing economics students is significant in models [1], [2] and [4] but loses significance when motivation variables are included in the specification of the model.[13] The results in table 3 are in accordance with the discussion above, suggesting that economics students have a lower probability of choosing share. The results also indicate that subjects with motivations, attitudes and values similar to those assumed by standard economic theory have a lower probability of choosing share and these are important variables in the estimated models. This suggests that it may not be economics students per se that have a lower probability of choosing share, but instead that individuals with attitudes, motivations and values similar to those assumed by standard economic theory have a lower probability of choosing share, and the economics department has a higher proportion of subjects with these motivations.

Table 3 Probit models for the choice to share

	[1]		[2]		[3]		[4]	
	Coefficient (Z-value)	*Marginal effect (Z-value)*	*Coefficient (Z-value)*	*Marginal effect (Z-value)*	*Coefficient (Z-value)*	*Marginal effect (Z-value)*	*Coefficient (Z-value)*	*Marginal effect (Z-value)*
Control variables								
Gender (female = 1)	0.173	0.061	0.132	0.046	0.121	0.041	0.133	0.046
	(2.39)**	(2.39)**	(1.69)***	(1.69)***	(1.51)	(1.51)	(1.68)***	(1.68)***
Faculty of Architecture	-0.412	-0.131	-0.393	-0.122	-0.389	-0.119	-0.397	-0.122
	(1.86)***	(1.86)***	(1.69)***	(1.69)***	(1.61)	(1.61)	(1.66)***	(1.66)***
Faculty of Engineering	-0.298	-0.100	-0.314	-0.102	-0.279	-0.090	-0.297	-0.096
	(2.13)**	(2.13)**	(2.11)**	(2.11)**	(1.82)***	(1.82)***	(1.95)***	(1.95)***
Faculty of Law	-0.103	-0.036	-0.102	-0.035	-0.062	-0.021	-0.081	-0.028
	(0.71)	(0.71)	(0.66)	(0.66)	(0.39)	(0.39)	(0.52)	(0.52)
Faculty of Medicine	-0.107	-0.038	-0.134	-0.045	-0.141	-0.047	-0.131	-0.044
	(0.75)	(0.75)	(0.87)	(0.87)	(0.90)	(0.90)	(0.84)	(0.84)
Faculty of Pure Science	-0.440	-0.147	-0.475	-0.153	-0.458	-0.146	-0.453	-0.146
	(3.88)*	(3.88)*	(3.93)*	(3.93)*	(3.71)*	(3.71)*	(3.70)*	(3.70)*
Faculty of Social Science excluding economics students	-0.044	-0.016	-0.043	-0.015	-0.002	-0.001	-0.020	-0.007
	(0.36)	(0.36)	(0.33)	(0.33)	(0.02)	(0.02)	(0.15)	(0.15)
Dual faculty subjects	0.057	0.020	-0.023	-0.008	-0.032	-0.011	-0.018	-0.006
	(0.48)	(0.48)	(0.18)	(0.18)	(0.25)	(0.25)	(0.14)	(0.14)
Economics student	-0.459	-0.145	-0.367	-0.116	-0.298	-0.095	-0.360	-0.113
	(2.65)*	(2.65)*	(2.02)**	(2.02)**	(1.61)	(1.61)	(1.95)***	(1.95)***
Age 21-24	0.174	0.063	0.202	0.071	0.201	0.070	0.203	0.071
	(2.36)**	(2.36)**	(2.56)**	(2.56)**	(2.50)**	(2.50)**	(2.54)**	(2.54)**
Age 25-39	0.218	0.081	0.118	0.042	0.110	0.039	0.148	0.053
	(1.93)***	(1.93)***	(0.96)	(0.96)	(0.87)	(0.87)	(1.19)	(1.19)
Aged over 40	0.895	0.345	0.737	0.284	0.756	0.290	0.750	0.288
	(3.74)*	(3.74)*	(2.79)*	(2.79)*	(2.81)*	(2.81)*	(2.84)*	(2.84)*
Monthly term-time expenditure £200 -399	-0.147	-0.052	-0.100	-0.035	-0.087	-0.030	-0.112	-0.039
	(1.73)***	(1.73)***	(1.10)	(1.10)	(0.94)	(0.94)	(1.22)	(1.22)
Monthly term-time expenditure £400-599	-0.017	-0.006	0.018	0.006	0.022	0.008	0.029	0.010
	(0.16)	(0.16)	(0.16)	(0.16)	(0.20)	(0.20)	(0.26)	(0.26)
Monthly term-time expenditure £600-799	-0.400	-0.129	-0.382	-0.120	-0.363	-0.113	-0.378	-0.118
	(2.37)**	(2.37)**	(2.12)**	(2.12)**	(1.98)**	(1.98)**	(2.08)**	(2.08)**
Monthly term-time expenditure £800-999	-0.125	-0.043	-0.073	-0.025	0.002	0.001	-0.041	-0.014
	(0.57)	(0.57)	(0.32)	(0.32)	(0.01)	(0.01)	(0.17)	(0.17)

	[1]		[2]		[3]		[4]	
	Coefficient (Z-value)	*Marginal effect (Z-value)*	*Coefficient (Z-value)*	*Marginal effect (Z-value)*	*Coefficient (Z-value)*	*Marginal effect (Z-value)*	*Coefficient (Z-value)*	*Marginal effect (Z-value)*
Monthly term-time expenditure £1000-1199	0.048	0.017	0.159	0.058	0.155	0.056	0.156	0.056
	(0.22)	(0.22)	(0.69)	(0.69)	(0.67)	(0.67)	(0.68)	(0.68)
Monthly term-time expenditure over £1200	-0.583	-0.175	-0.468	-0.141	-0.441	-0.132	-0.453	-0.136
	(2.17)**	(2.17)**	(1.57)	(1.57)	(1.44)	(1.44)	(1.51)	(1.51)
Non-white	-0.150	-0.052	-0.224	-0.075	-0.152	-0.051	-0.214	-0.071
	(1.50)	(1.50)	(2.08)**	(2.08)**	(1.36)	(1.36)	(1.94)***	(1.94)***
Motivation and attitude variables								
Used the potential amounts of money received to anticipate			-0.217	-0.074	-0.244	-0.082	-0.239	-0.080
the choice of player 2 'every time'			(2.23)**	(2.23)**	(2.46)**	(2.46)**	(2.43)**	(2.43)**
Used the potential amounts of money received to anticipate			-0.135	-0.047	-0.120	-0.041	-0.137	-0.047
the choice of player 2 'sometimes'			(1.57)	(1.57)	(1.37)	(1.37)	(1.57)	(1.57)
Did not want to have a low payoff 'every time'			-0.610	-0.223	-0.596	-0.216	-0.610	-0.222
			(4.41)*	(4.41)*	(4.23)*	(4.23)*	(4.39)*	(4.39)*
Did not want to have a low payoff 'sometimes'			0.009	0.003	0.046	0.016	0.012	0.004
			(0.06)	(0.06)	(0.31)	(0.31)	(0.08)	(0.08)
Wanted to have the highest payoff possible 'every time'			-1.001	-0.346	-0.861	-0.297	-0.931	-0.322
			(8.11)*	(8.11)*	(6.74)*	(6.74)*	(7.35)*	(7.35)*
Wanted to have the highest payoff possible 'sometimes'			-0.404	-0.135	-0.322	-0.108	-0.366	-0.122
			(3.31)*	(3.31)*	(2.57)**	(2.57)**	(2.95)*	(2.95)*
Attitude index representing attitudes in accordance with					-1.514	-0.523		
standard economic theory assumptions					(6.20)*	(6.20)*		
Attitude dummy variable representing attitudes in accordance							-0.190	-0.065
with standard economic theory assumptions							(2.46)**	(2.46)**
Constant	-0.374		0.848		1.063		0.848	
	(3.06)*		(4.58)*		(5.51)*		(4.54)*	
Observations	1631		1612		1592		1592	
LR Chi-squared	81.50		352.70		393.07		359.36	
Pseudo R-squared	0.04		0.17		0.20		0.18	
Log likelihood	-989.86		-842.40		-807.79		-824.64	

Notes: Reference group consists of 'male', 'faculty of arts', 'aged under 21', 'monthly term-time expenditure £0-199', 'white', and for models [2], [3] and [4] 'used the potential amounts of money received to anticipate the choice of player 2 'never'', 'did not want to have a low payoff 'never'', 'wanted to have the highest payoff possible 'never'' and for models [3] and [4] 'have attitudes of weak agreement with statements regarding assumptions of economic theory'.
Absolute value of z statistics in parentheses, *** significant at 10%; ** significant at 5%; * significant at 1%

5. Conclusions

An experiment was conducted to determine the motivations behind decisions in a game theory context by asking subjects 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 beliefs. The results of the first Prisoner's Dilemma game indicates that a significantly higher proportion of economics students chose compete. Analysis of the motivations of all subjects for their choices in all six games indicates that a higher proportion of economics students have motivations in accordance with the assumptions of standard economic theory. However, an analysis of general attitudes and values in accordance with the assumptions of standard economic theory indicates that economics students do not have significantly different attitudes to other subjects regarding the assumptions of standard economic theory. Further analysis indicates that motivations and attitudes significantly affect the choice to share or compete and these variables are more important explanatory variables than purely whether the subject studies economics.

Therefore, it may not be economics students per se that have a lower probability of choosing share rather than compete, but instead that individuals with attitudes, motivations and values similar to those assumed by standard economic theory have a lower probability of choosing share, and the economics department has a higher proportion of subjects with these motivations. The analysis of motivations and general attitudes and values suggests that the assumptions of standard economic theory are appropriate for a subset of individuals, and for many individuals who do not study economics. However, many individuals do not act according to the assumptions of standard economic theory and this requires greater analysis.

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Appendix

Table A1 Probit models for the choice to share adding motivation and attitude variables one by one to personal characteristics

	[5]	[6]	[7]	[8]	[9]
Motivation and attitude variables	*Coefficient (Z-value)*	*Coefficient (Z-value)*	*Coefficient (Z-value)*	*Coefficient (Z-value)*	*Coefficient (Z-value)*
Used the potential amounts of money received to anticipate the choice of player 2 'every time'	-0.529 (5.97)*				
Used the potential amounts of money received to anticipate the choice of player 2 'sometimes'	-0.353 (4.49)*				
Did not want to have a low payoff 'every time'		-1.041 (8.41)*			
Did not want to have a low payoff 'sometimes'		-0.101 (0.74)			
Wanted to have the highest payoff possible 'every time'			-1.376 (12.31)*		
Wanted to have the highest payoff possible 'sometimes'			-0.610 (5.35)*		
Attitude index representing attitudes in accordance with standard economic theory				-2.047 (8.92)*	
Attitude dummy variable representing attitudes in accordance with standard economic theory assumptions					-0.435 (6.06)*
Constant	-0.093 (0.71)	0.449 (2.65)*	0.514 (3.32)*	0.086 (0.64)	-0.247 (1.95)***
Observations	1624	1621	1626	1611	1611
LR Chi-squared	119.52	253.81	291.32	168.81	121.84
Pseudo R-squared	0.06	0.12	0.14	0.08	0.06
Log likelihood	-966.63	-898.29	-880.79	-931.77	-955.26

Absolute value of z statistics in parentheses, *** 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 table 3

		Used the potential amounts of money received to anticipate the choice of player 2		*Did not want to have a low payoff*		*Wanted to have the highest payoff possible*		*Attitude index*	*Attitude dummy variable*
	Response	*Every time*	*Sometimes*	*Every time*	*Sometimes*	*Every time*	*Sometimes*		
Used the potential amounts of money	*Every time*	1.00	-0.54	0.16	-0.10	0.08	-0.01	0.02	0.04
received to anticipate the choice of player 2	*Sometimes*	-0.54	1.00	0.03	0.00	0.07	-0.01	0.07	0.04
Did not want to have a low payoff	*Every time*	0.16	0.03	1.00	-0.80	0.38	-0.18	0.11	0.14
	Sometimes	-0.10	0.00	-0.80	1.00	-0.31	0.23	-0.06	-0.10
Wanted to have the highest payoff possible	*Every time*	0.08	0.07	0.38	-0.31	1.00	-0.79	0.21	0.22
	Sometimes	-0.01	-0.01	-0.18	0.23	-0.79	1.00	-0.10	-0.14
Attitude index		0.02	0.07	0.11	-0.06	0.21	-0.10	1.00	0.69
Attitude dummy variable		0.04	0.04	0.14	-0.10	0.22	-0.14	0.69	1.00

Notes

[1] One point not addressed in the literature is whether some observed differences are due to differences across countries or cultures as the different studies use samples from different countries.
[2] The questionnaire is available form the authors on request.
[3] Information that subjects 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 subjects are aware of the objective of the questionnaire this may encourage responses from subjects interested in the subject and may bias responses through a greater awareness that the questions are focussing upon motivations and attitudes. Therefore subjects 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.
[4] 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 amount of observations is lower in the regressions as subjects are included only if there is no missing data for any of the variables.
[5] The ethical motivations and attitudes are not discussed in this paper and will be discussed elsewhere.
[6] Only the first Prisoner's Dilemma game is here analysed for brevity but the results are robust across all games. Explanation of the other games and their results are available from the correspondence author.
[7] 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 subjects to be able to quickly understand the differences in each of the games. The strategy chosen by respondents should not be affected by the information regarding what has happened to the payoffs as insufficient details are included in this information to be able to make a considered decision using only this information. 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.
[8] 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.
[9] 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 assumptions of standard economic theory and 0 = response in weakest agreement. For example, question 1 asks subjects how much they agree or disagree with the statement 'I consider how my actions affect others', and the responses are coded according to the scale that 4 = disagree strongly, 3 = disagree slightly, 2 = neither agree nor disagree, 1 = agree slightly and 0 = agree strongly. The scale is reversed for questions 3 and 4. The responses for all four questions 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 assumptions of economic theory, and a value of 1 indicates strong agreement. The attitude dummy variable combines the responses to the four attitude questions outlined in table 2. Responses are numbered as explained above regarding the attitude index. The attitude dummy variable has a value of 1 if the subject has a response of 3 or 4 for any of the four attitude questions, otherwise the value is zero. A value of 0 indicates weak agreement with statements regarding assumptions of economic theory, and a value of 1 indicates strong agreement. The attitude index and dummy variables are alternative measures and hence should not be used in the same regression.
[10] It is not here examined whether the sex of player 2 affects responses, for a more comprehensive discussion see Rapoport and Chammah (1965) and Ortmann and Tichy (1999).
[11] Faculties are determined by first degree subject. The faculty of arts is the default category as this has the largest probability of choosing share out of all faculties. Departments that appear in more than one faculty are not included in either faculty and are included using a separate dummy variable. The economists dummy variable represents economics students determined by first degree subject only.
[12] Motivation question 2 is not included in the estimated models as it suffers from multicollinearity with the other motivation and attitude variables.

[13] If variables representing motivations regarding inequality aversion are also added to the estimated models the dummy variable representing economics students is no longer significant. The effect of ethical motivations and attitudes are not discussed in this paper and will be discussed elsewhere.