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COGNITIVE DIFFERENCES AND PERCEPTIONS OF RATIONALITY

Quantifying the relationship between the course and year of study and rational consistency

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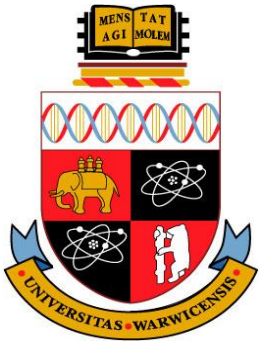
Abstract

This study aims to investigate whether economists tend to exhibit a higher degree of classically defined rationality than students based in other departments and whether potential differences, if significant, are the result of the process of learning or self-selection into studying the subject. Strongly inspired by recent studies in the area of behavioural economics, it provides an empirical contribution to the continuing debate about the impact of learning and indoctrination on individual's rationality with the use of a questionnaire based upon a number of influential alternative theories of choice, including the Prospect Theory, Transfer of Attention Exchange, Theories of Choice Cycles, Betweenness and Stochastic Dominance. Three-way coding is followed by a combination of univariate and multivariate probit analysis. The results indicate that while economics majors are most likely to adhere to the predictions of the classical theories, students of humanities tend to conform to the alternative theories of choice. The learning effect is negligible.



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Section 1: INTRODUCTION

Rationality, the power of being able to exercise one's reason (Restivo, 1994), lies at the very core of classical theories of consumer behaviour. The scarcity of resources forces individuals to make a series of choices throughout their lives and theories of competition postulate that choosing anything but the most rational alternative will immediately be punished, subsequently pushing agents towards a crude optimisation when faced with another trade-off. A rational agent is expected to always act in accordance with his own goals and is "a maximiser, who will settle for nothing less than the best" (Simon, 1957). Multiple classical theorists attempted to mathematically model rational behaviour by assuming individual welfare maximisation and obedience of certain mathematical axioms. However, these formulations, while sometimes successful in the collective setting, have hardly captured the full rationale for individual decision making. The actual variety of personalities, circumstances and approaches makes modeling individuals as a homogeneous collective a largely unrealistic approximation.

The findings of behavioural scientists revolutionised the thinking about consumer theory by incorporating emotions, reference points and perceptions into consumer decision making. While these were generally welcomed with much enthusiasm, the subsequent debate about the impact of learning and experience on decision making process remains unsolved.

Drawn to often contradictory insights provided by existing literature, following paper investigates perceptions of rationality exhibited by University of Warwick students, with a special focus on economics majors. It embraces a potential causality between course of study and perception of rationality, and thus examines whether a potential relationship is a result of the learning effect or self-selection into studying the course. It undertakes a unique approach to merging the concepts summarised by the most recent influential studies, and applies univariate and multivariate analysis to better examine the relevant effects. Basing on previous research, economists are hypothesised to exhibit a higher degree of classically-defined rationality, with scientists choosing more rationally than arts majors. The learning effect is expected to be significant yet not necessarily large.

Section 2: LITERATURE REVIEW

The classical consumer choice theory is based upon unwavering rationality of perceptions, preferences and, finally, the process of choosing itself (McFadden, 1999). According to the very first classical notion, rational individuals maximise their ordinal utility functions which describe complete and transitive preferences. The amount of utility gained or lost due to action is assumed to perfectly mirror the extent to which an individual has achieved his or her objectives (Baron, 2000). A more recent, prescriptive model of the expected utility theory (EUT), developed by von Neumann and Morgenstern (1944), assumes the decision-making process to be based on the computation of the expected utility through summation of respective probabilities and utilities of each individual outcome. Abiding a straightforwardly defined set of axioms, discussed in Section 3, is here recognized as equivalent to rationality (Anand, 1993).

Although convenient and often successful in predicting economic behaviour, EUT has been criticised for ignoring the decision-making process itself and for putting excessive, unrealistic computational demands on consumers. Maurice Allais (1953) demonstrated that not only the substitution axiom is systematically violated, but also that consumers overweight certain prospects over risky ones, even if EV $(risky)$ > EV $(certain)$. Another early critic of EUT, Herbert Simon (1955), proposed the theory of bounded rationality which incorporated imperfect information, finite time and cognitive limitations of human mind into the classical model. He later hypothesised that apparent behavioural irrationalities may stem from heuristics, experience-based computational techniques which often lead to approximate estimates and solutions. He also postulated that using them may in fact prove favourable when choosing between slightly different alternatives in pressurised circumstances, capturing that “there is a point of diminishing returns in the expected utility of thinking itself” (Baron, 2000). These and similar studies served as a starting point for cognitive psychologists Amos Tversky and Daniel Kahneman.

In the early 70s, Kahneman and Tversky administered a questionnaire asking hypothetical questions involving monetary gambles to a variety of undergraduate students. Their findings indicate that "axioms of rational choice are often violated consistently by sophisticated as well as naive responders, and that the violations are often large and highly persistent" (Tversky and Kahneman, 1984). The four areas in which participants seemed to systematically violate the axioms underpinning EUT included nonlinearity in outcome probabilities, risk seeking in losses, loss aversion and surprising sensitivity to framing effects. These results led the researchers to

formulate an alternative descriptive model of risky choice - the renowned "Prospect Theory" (1979), described in Section 3.

Recent research in decision theory is not, however, predominantly centred around the effects investigated by Kahneman and Tversky. In 1963, Becker, DeGroot and Marschak tested for violations of betweenness, a weakened version of the independence axiom, and found out that individuals breach it systematically and often display quasi-concave preferences. Corresponding results were obtained by Coombs and Huang (1976) and Camerer and Ho (1994). Likewise, regret and similarity theories, summarized by Day and Loomes in 2009, emerged based upon empirical evidence of violations of transitivity axiom in the form of choice cycles, firstly observed in collective behavior by Marquis de Condorcet and further researched by Rubinstein (1988) and Leland (1994, 1998) with respect to individual decision making.

Many of the most current studies in decision theory research cognitive differences between groups of individuals, with many focusing purely on economic knowledge and market experience. In 1981, Marwell and Ames concluded that economics graduates tend to be more rational, self-interested and free-riding than other graduates. Carter and Irons (1991) found economists to be more guided by self-interest while taking part in the ultimatum bargaining games and Bauman and Rose (2009) reached similar conclusion while researching the relationship between academic major and donations made to social programmes. Some, including Rabin (1998) and Thaler (1981), attribute these differences to learning and indoctrination while others, including Carter and Irons (1991) and Bauman and Rose (2009), strongly emphasise the importance of self-selection, hypothesising that different perceptions of rationality are purely determined by intrinsic currents. This paper aims to provide an empirical contribution to this debate and, hopefully, resolve the conflicting views.

Section 3: THEORETICAL BACKGROUND

3.1. The Classical Tenets of Rationality

3.1.1. The Standard Economic Theory

The classical notion of an economically rational consumer, firstly proposed by Sir John Hicks, assumes maximisation of ordinal utility function under the following set of axioms:

- completeness: $\forall A, B: A \geq B, B \geq A \; or \; A = B$
- transitivity: $\forall A, B, C: if \; A \geq B \; and \; B \geq C \; then \; A \geq C$
- reflexiveness: $\forall A: A \geq A$
- continuity: $\forall A, B, C: if \; A > B \; and \; C \; is \; relatively \; close \; to \; A, \; then \; C > B$

While completeness, transitivity and reflexiveness provide consistency, the continuity axiom mathematically explains why small changes in the options available do not cause considerable shifts from the utility level.

3.1.2 The Expected Utility Theory

Despite the stability and relative success of the classical framework, economic theorists kept on looking for more robust specifications to model individual behaviour under risk and uncertainty. In 1944, von Neumann and Morgenstern (1944) incorporated individual attitudes towards risk into preferences and formulated the EUT. Here, rational agents attempt to maximise their expected utility, given expected likelihoods of each of the possible outcomes:

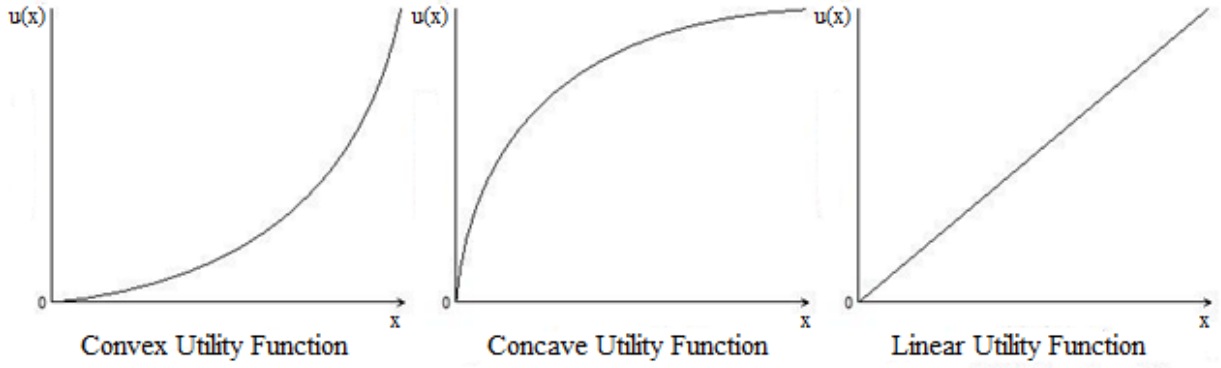
$$\forall i \qquad max \; EU = \sum w(p_i) \cdot u(x_i)$$

Furthermore, three additional axioms guiding rational conduct were specified:

- independence:$\forall A, B, C: if \; A > B \; then \; (A, p; C, (1-p)) > (B, p; C, (1-p))$
- dominance:$\forall A, B: if \; A \geq B \; in \; every \; respect \; and \; A > B \; in \; at \; least \; one \; respect, A > B$
- invariance: $\forall A, B: preference \; between \; A \; and \; B \; is \; independent \; of \; the \; method \; in \; which \; A \; and \; B \; are \; described$

Provided the utility function is well behaved and satisfies all of the abovementioned axioms, the EUT allows for linear, convex and concave specifications (Figure 1). Thus, rational agents can be risk-neutral, risk-averse or risk-loving. As long as an individual consistently goes for the *riskier* gamble of a relatively high expected value but lower probability of winning, or relatively *safe* alternatives, he or she is considered rational. This kind of behaviour is allowed for while coding the cycles of answers in Section 4 and, as will be observed later, the resulting coding mirrors the coding for pure axiomatic consistency.

Figure 1.



3.2 Violations of the Classical Theories of Choice

3.2.1 Violations of the Standard Economic Theory and the EUT

Violations of Transitivity

The theory of choice cycles postulates that individuals, when faced with a series of monetary gambles, will at some point reverse their preferences and violate the transitivity axiom

$$\forall A, B, C: if\ A \geq B\ and\ B \geq C\ then\ A \geq C.$$

Most advanced theories (Day and Loomes, 2009) differentiate between two types of behaviour – regret cycles and similarity cycles.

The regret cycle (Q18;Q19;Q20) corresponds to the *scaled up* gamble (CCU) in which the outcomes share a relatively high probability of occurrence. It postulates that the *safer* option – of lower outcome and higher probability of winning – tends to be chosen by individuals when faced with two adjacent, relatively similar prospects, as illustrated by choices Q18B and Q19B. However, Day and Loomes predict that as the prospects grow more distant from each other, the individuals start appreciating the difference in outcomes and at some point reverse to choosing the riskier option, as illustrated by Q20A. This produces an intransitive cycle $A \geq B, B \geq C, C \geq A$, where A is the safest option and C is the riskiest one.

The exact opposite behavior – the similarity cycle - is predicted to occur in a series of *scaled down* gambles (CCD) of relatively high outcomes yet lower probability of occurrence (Q21;Q22;Q23). This leads to an intransitive cycle $\geq B, B \geq A, A \geq C$.

3.2.2 Violations of the Expected Utility Theory

Violations of Independence

According to the EUT, portions of gambles should be evaluated independently of the other alternatives presented. Mathematically,

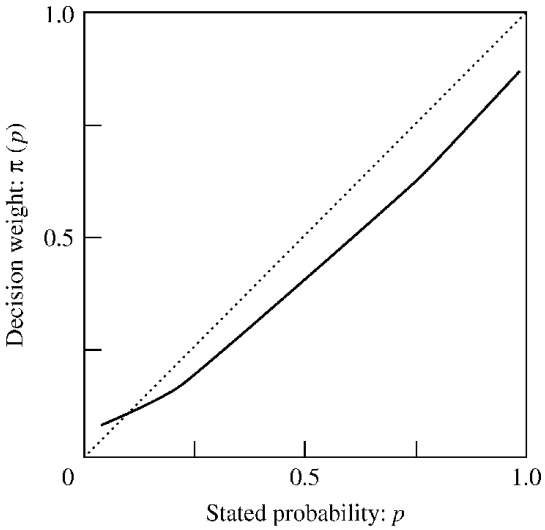
$$\forall A, B, C: if\ A > B\ then\ (A, p; C, (1-p)) > (B, p; C, (1-p)).$$

Therefore, subtracting and equal chance of winning from both prospects presented in Q1 should be inconsequential to the analysis of this gamble as a whole. Simultaneous choice of Q1A and

Q2B has been labelled the common consequence effect (CCE), also known as Allais Paradox, and is considered a result of bounded rationality (Prospect Theory, 1979). In particular, individual's choice might here be dependent upon a potentially great feeling of disappointment connected with 1% probability of not winning anything by choosing Q1B contingent on the feeling of certainty associated with Q1A.

The common ratio effect (REQ), investigated by questions Q3 and Q4, describes a similar violation. According to the EU, $\mathrm{U(B)} > U(A) \Rightarrow U(B,p) > U(A,\mathrm{p})$. However, scaling down the probabilities proved to produce a preference reversal among many of the study subjects, represented by a simultaneous choice of Q3A and Q4B. Kahneman and Tversky attribute this behaviour to the nonlinear shape of the weighting function (Figure 2) which illustrates individuals' tendency to overweight low probabilities and underweight moderate to high probabilities. Q37 and Q38 present a non-monetary variation of this problem (RENQ).

Figure 2.



Source: Kahneman and Tversky (1979, p. 283)

Ellsberg Paradox (EP), first noted by Keynes in 1921, is often cited as evidence for a potential difference between treatment of ambiguity and computable risk, and existence of *subjective probabilities*. Choosing A in Q32 implies that $\mathrm{U(R)} > \mathrm{U(B)}$. Since choosing B in Q33 implies the reverse, simultaneous choice of Q32A and Q33B violates independence.

Violations of Betweenness

Betweenness states that if an individual prefers lottery B to lottery A then the probability mixture of B and A is going to be preferred to A (Dekel, 1986). Mathematically,

$$\forall A, B\colon\ if\ U(B) > U(A) \Rightarrow U\big(B, p; A, (1-p)\big) > U(A).$$

To test for violations, this study undertakes a similar method to Camerer and Ho (1994), and introduces three lotteries L_1 and L_2 and $M = pL_1 + (1-p)L_2$ where $p \in (0,1)$. Individuals who obey the axiom will have their utility of the probability mixture M located between utilities

of L_1 and L_2 [1]. The case of $p = \frac{17}{18}$ (BET1) is investigated by questions Q25, Q26 and Q27. Since in this case, gamble M is very similar to gamble L_1, two further cases of $p = \frac{1}{18}$ (BET2) and $p = \frac{1}{2}$ (BET3) also feature in the study, and are investigated by question sets (Q25;Q28;Q29) and (Q25;Q30;Q31) respectively. The case $p = \frac{1}{2}$ is predicted to involve least violations.

Violations of Invariance

The EUT assumes that the preference between A and B is independent of the method used to describe them. Nevertheless, the framing of the question has been observed to exert considerable impact on decision-making (Kahneman and Tversky, 1979). In particular, framing the question as a gain may lead to risk aversion while negative framing may cause risk seeking behavior for the exact same individual (Fagley and Miller 1997). Violations of this kind are examined by IELA (Q10;Q11), FEQ (Q12;Q13) and FENQ (Q34;Q35).

The isolation effect (FETSG) is a form of a framing effect where different representation of probabilities leads to preference reversal among individuals who often underappreciate the common components of the prospects and over-focus on differences. Since prospects presented in Q4 and Q9 are the same, choosing (Q4B;Q9A) or (Q4A;Q9B) violates invariance.

Violations of Dominance

The maximisation of individual welfare lies at the very core of the classical theories:

$$\forall A, B: if\ A \geq B\ in\ every\ respect\ and\ A > B\ in\ at\ least\ one\ respect\ then\ A > B.$$

Q24 (SD) was formulated basing on the Transfer of Attention Exchange model (Birnbaum, 1997) which predicts a way to make individuals violate stochastic dominance. Starting with a binary gamble $G = (x, p; y, 1-p)$, firstly the upper branch of the gamble (x, p) needs to be split into $(x, p-r)$ and (x, r) and the consequence of the splinter needs to be reduced slightly, creating $G^- = (x, p-r; x^-, r; y, 1-p)$. Subsequently, when the lower branch of the gamble is split similarly and consequence on the splinter increased slightly, $G^+ = (x, p; y^+, q; y, 1-p-q)$ results. The *event-splitting effect* - a situation where individuals choose the dominated option of lower expected value - is predicted to emerge. This methodology has been used while

[1] unless $U(L_1) = U(L_2)$

constructing Q24 with $x = £960, x^{-} = £900, y^{+} = £140, y = £120$ and $p = 0.9, r = q = 0.05$.

Non-Axiomatic Violations of the EUT

The reflection effect, examined by RE3 (Q14;Q15) and RE4 (Q16;Q17) describes the preference reversal as a result of a variation in risk preference that is sensitive to gain-loss situation, and does not involve axiomatic violations (Wang and Xin, 2002). According to the Prospect Theory, the preferences within the domain of losses are the mirror image of the preferences in the gain domain so that the preference reversal takes place at point 0. Furthermore, the marginal utility and disutility of gains and losses respectively are predicted to diminish as one moves away from the reference point, with consumers being more sensitive to losses in comparison to gains, as illustrated by the "kink" at point 0. Hence, the individuals are predicted to exhibit risk-averse behaviour in the positive domain and risk-loving behaviour in the domain of losses. RE1 (Q5;Q7) and RE2 (Q6;Q8) investigate the *fourfold pattern of risk attitudes* - the notion that risk-averse behaviour in case of relatively probable gambles and risk seeking where the chance of winning is relatively small is going to be exactly reversed in the loss domain.

SECTION 4: METHODOLOGY

4.1 Questionnaire – preparation and distribution

The questionnaire (Appendix 1), inspired by the abovementioned empirical papers, includes 38 core problems presented in the form of monetary and non-monetary gambles and 14 background queries. The presence of non-monetary gambles in the questionnaire incentivised the use of sentences as opposed to graphical methods of presentation.

The questionnaire was prepared with a use of Qualtrics Software and was subsequently passed with the help of departmental administrators to first and third-year University of Warwick students based across the Faculty of Science, the Faculty of Humanities and the Department of Economics. The study subjects were incentivised by a possibility of obtaining the results of the analysis carried out on their individual answers. All the participants were informed to use their preferences and rationality, and were blocked from checking their responses to problems they had already answered. The questions were randomized for every individual, eliminating the potential survey effect, and names were collected for documentation purposes. The expected sample size was set at 180, with each subset consisting of 30 responses[2]. Since the survey was successfully completed by 196 individuals, the Kutools software was used to randomly select 30 responses for each subgroup of students. The missing observations problem was not encountered.

4.2 Questionnaire – coding

Three types of coding (Figure 3) were applied using Excel on pairs and cycles of questions. The first type of coding aims to capture the conformity to the standard economic theory. In this case, the value of 1 is assigned if the cycle of answers conforms to SET, and assigned the value of 0 otherwise. The answers are coded correspondingly with respect to the EUT and the alternative theories of choice. It is worth noting that the cycles of answers allowed under SET, which in addition to adhering to the axioms of rational choice also predicts strict individual welfare maximisation, are necessarily a subset of those allowed under EUT.

[2] so that distribution $\rightarrow N(\mu, \sigma^2)$

Figure 3.

	Effect	Q	Consistent with:		
			Classical Economic Theories		Alternative Theories
			SET[3]	EUT	ALT
IND	CCE	1	B/B	A/A;B/B	A/B
		2			
	REQ	3	B/B	A/A;B/B	A/B
		4			
RE	RE1	5		A/A;B/B	B/A
		7			
	RE2	6		A/A;B/B	A/B
		8			
INVARIANCE	FETSG	4	B/A	B/A;A/B	B/B
		9			
	IELA	10		A/A;B/B	B/A
		11			
	FEQ	12	A/A	A/A;B/B	A/B
		13			
RE	RE3	14		A/A;B/B	B/A
		15			
	RE4	16		A/A;B/B	B/A
		17			
TRANSITIVITY	CCU	18	A/A/A	A/A/A;B/B/B	B/B/A
		19			
		20			
	CCD	21	A/A/A	A/A/A;B/B/B	A/A/B
		22			
		23			
D	SD	24	A	A	B
BETWEENNESS	BET1	25	A/A/A	A/A/A;B/B/B	A/B/NA;B/NA/A NA/B/A;A/NA/B B/A/NA;NA/A/B
		26			
		27			
	BET2	25	A/A/A	A/A/A;B/B/B	A/B/NA;B/NA/A NA/B/A;A/NA/B B/A/NA;NA/A/B
		28			
		29			
	BET3	25	A/A/A	A/A/A;B/B/B	A/B/NA;B/NA/A NA/B/A;A/NA/B B/A/NA;NA/A/B
		30			
		31			
IND	EP	32		A/A;B/B	A/B
		33			
INV	FENQ	34		A/B;B/A	A/A
		35			
D*	PI	36		A*	B
IND	RENQ	37	A/A	A/A;B/B	B/A
		38			

* excluded from the study. Please see Appendix 2 for further details.

[3] SET does not provide a prediction if EV(A)=EV(B)

4.3 Econometric formulation

A number of approaches to analysing the data have been considered. Potentially, models such as Linear Probability Model (LPM) might have been used to quantify the rationality. However, multiple potential problems, including non-normality, heteroskedasticity and the assumption of constant marginal effects, decrease its appeal. Since the dependent variable is dichotomous after coding, the normal Cumulative Distribution Function (CDF) was considered most suitable and, subsequently, the final choice was made between using probit and logit model. Since intelligence is often attempted to be quantified using the standard normal distribution, a similar approach was deemed suitable while quantifying rationality and the probit model, where CDF is derived from normal distribution, has been chosen and implemented in STATA 11.0.

Each of the dependent variables under three types of coding attempts to quantify the probability that the cycle of answers conforms to a particular theory. Eight explanatory dummy variables were created to capture the impact of the background information provided (Appendices 3 and 4). Since a large majority (79.1%) of third-year economists have undertaken at least one module strongly related to behavioural science[4] and the rest of economics majors are required by the Department to participate in Economics 2, a module partly related to behavioural science, variable *behmod* has been excluded from the final regression to avoid high partial multicollinearity. Associations between other dependent variables do not signal further issues (Appendix 5). The final univariate specification is:

$$P(Y = 1 \mid X) = \Phi(\varphi_0 + \varphi_1 depeco + \varphi_2 depsci + \varphi_3 year3 + \varphi_4 female + \varphi_5 originoutsideUK + \varphi_6 ucas420 + \varphi_7 gambling)$$

Correlations between the dependent variables were discovered, which might suggest a potential for simultaneous determination of consistency with particular theory in different cycles of questions. Since the univariate approach assumes that the errors on all the equations are independent of each other, it will produce inconsistent coefficient estimates if the correlations do exist (Maddala 1983). Since correlations were the greatest between the dependent variables dealing with the same violation type (Appendix 6), a coherent approach to multivariate estimation was undertaken, with dependent variables being divided into six groups according the type of violation they examine (Appendix 7).

[4] as defined in Q48

The variance-covariance matrix of the cross-equation error terms was subsequently estimated and the null hypothesis of no correlation between residuals[5] was tested with a likelihood ratio test[6] at 10% significance level:

	Prob>chi^2					
	CODING TYPE					
	SET	**Estimation method**	**EUT**	**Estimation method**	**Alternative Theories**	**Estimation method**
INDEPENDENCE	0.0027	multivariate	0.1257	univariate	0.6803	univariate
INVARIANCE	0.0762	bivariate	0.5233	univariate	0.7347	univariate
TRANSITIVITY	0.0006	bivariate	0.4977	univariate	0.0000	bivariate*
BETWEENNESS	0.0000	multivariate	0.0000	multivariate	0.0000	multivariate
DOMINANCE		univariate		univariate		univariate
NON-AXIOMATIC			0.0000	multivariate	0.0000	multivariate

* re-specified, see Appendix 11

Where the null hypothesis of no correlations was rejected, multivariate analysis (Appendix 8) was used. Otherwise, univariate analysis suffices as the model in fact consists of independent probit equations. This approach ensures consistency of estimated effects.

Since STATA mvprobit software (Cappellari and Jenkins, 2003) proved limited in estimating marginal effects, estimation using mvProbit (Henningsen, 2011) was implemented in statistical software R. Since both programmes use the same GHK simulator in the maximum likelihood estimation, the coefficients estimated using both methods[7] were very comparable. Therefore, mvProbit results are reported with corresponding marginal effects. Since analysing marginal effects at the mean in probit model might result in highly unrealistic scenarios, especially if the independent variables are correlated (Bartus, 2005), the author focuses on the average marginal effects.

[5] H_0: off-diagonal elements $\rho21=\rho31=\rho41=\rho32=\rho42=\rho43=0$
[6] Wald test in bivariate cases
[7] tol = 4; dr(180)

Section 5: RESULTS ANALYSIS AND INTERPRETATION

5.1 Course of Study and Perception of Rationality

Preliminary calculations (Appendix 9) and regression analysis (Appendix 11) support the hypothesis that economists are the most likely to follow predictions of SET and EUT, and least likely to fulfill alternative predictions. Science students follow closely, with humanities students displaying least consistent responses and being most likely to act according to alternative theories. Interestingly, the differences are the largest in case of coding for SET[8], which in addition to obeying axioms of rational choice predicts strict individual welfare maximization. They converge when EUT coding is applied, and are generally least pronounced under ALT coding.

5.1.1 The Axiom of Independence

The finding that economists are, on average, more likely to approach gambles from a perspective of welfare maximisation is often mirrored in axiom-specific cases. In case of independence, economists outperformed humanities majors in all questions, in three at a statistically significant level. Science majors were also outperformed in all but one effect (CCE). In the quantitative variation of the ratio effect (REQ), investigated by Kahneman and Tversky, a majority of participants choose the risk-averse and certain option Q3A, and only 12.2% went for the highest expected value. With 64.4% of participants picking the welfare maximising option in Q4, the ratio and certainty effects proved very strong across all departments. Nevertheless, economists exhibited a higher tendency to favour the riskier prospect in Q3 (26.7%) and were significantly more likely to choose according to SET predictions in both gambles than students of arts, with 23.3% choosing B/B.

QUANTITATIVE RATIO EFFECT (REQ)									
	SET			**EUT**			**ALT**		
	Coef	z	AME "R"	Coef	z	AME	Coef	z	AME
depeco	1.534	3.004***	0.305	0.254	1.020	0.099	-0.175	-0.710	-0.069
depsci	0.794	1.564	0.138	0.104	0.440	0.040	-0.009	-0.040	-0.004

While economists did not prove significantly less likely to commit axiomatic violations in REQ, such a pattern has been observed in case of the non-monetary version of the problem (RENQ) and the common consequence effect (CCE).

[8] please note that SET gives predictions for 11 effects

NON-QUANTITATIVE RATIO EFFECT (RENQ)									
	SET			**EUT**			**ALT**		
	Coef	z	AME "R"	Coef	z	AME	Coef	z	AME
depeco	0.4312	1.446	0.148	0.674	2.510**	0.195	-0.680	-2.530**	-0.180
depsci	0.1375	0.543	0.047	0.419	1.620	0.121	-0.625	-2.280**	-0.165

5.1.2 The Axiom of Invariance

Similar conclusions follow in case of the most rarely breached axiom of invariance, with significant differences between majors found in three out of four effects. In the two-stage game (FETSG), both prospects share identical outcomes. Nevertheless, students often failed to perceive this equivalency and almost half of them violated invariance. Economists, once again, were the group most likely to opt for welfare maximising answers. Scientists follow closely while only 11.7% of arts students displayed SET-like preferences.

FRAMING EFFECT – TWO-STAGE GAME (FETSG)									
	SET			**EUT**			**ALT**		
	Coef	z	AME	Coef	z	AME	Coef	z	AME
depeco	0.580	1.920*	0.166	0.189	0.770	0.074	-0.007	-0.030	-0.003
depsci	0.391	1.360	0.109	0.262	1.110	0.102	-0.050	-0.210	-0.020

Economists also proved significantly more risk-loving than other students in case of FEQ, although very few students overall simultaneously preferred the options predicted by SET.

The findings regarding FENQ, a corresponding non-monetary problem, might lead to hesitance regarding the 1984 conclusion of Kahneman and Tversky that violations of invariance are, in this case, "pervasive and robust", and "as common among sophisticated respondents as among naïve ones". While the rate of invariance violations was indeed quite high on average (31.7%), consistency differed heavily between groups of respondents. More than three quarters of scientists and economists chose according to EUT predictions yet merely 50% of arts majors decided likewise. The rationale behind this might be a more quantitative treatment of risk by the former, and relatively lower level of attention paid to emotional load featured in the phrasing.

NON-QUANTITATIVE FRAMING EFFECT (FENQ)						
	EUT			**ALT**		
	Coef	z	AME	Coef	z	AME
depeco	0.833	3.120***	0.252	-0.771	-2.840***	-0.224
depsci	0.842	3.110***	0.254	-0.721	-2.690***	-0.210

5.1.2 The Axiom of Dominance

Considering the rate of violations of stochastic dominance, where 115 participants (36.1%) went for the dominated option, the Transfer of Attention Exchange (Birnbaum, 1997) proves to be a particularly successful alternative theory.

Since in both cases the subjects were presented with a 100% probability of winning, there was no incentive to deviate from choosing the highest expected value and the predictions of the EUT and SET are the same. Again, economists proved significantly more likely to choose the welfare maximising answer Q24A than arts majors. While the performance of scientists did indicate a strong trend, it did not prove significant at 10% level.

STOCHASTIC DOMINANCE (SD)			
	SET		
	Coef	z	AME
depeco	0.417	1.650*	0.153
depsci	0.351	1.450	0.129

5.1.2 The Axiom of Transitivity

In case of the *scaled up* gamble (CCU), scientists and economists proved significantly more likely to pursue welfare-maximisation. However, interestingly, in both *scaled up* and *scaled down* (CCD) cases, they were somehow less likely than arts majors to abide the axiom of transitivity, which was violated by 41.7% of all participants. Although this trend is statistically insignificant, this might suggest that these groups, despite their relatively risk-loving tendencies, are as likely to deviate from their original perceptions of outcomes and respective probabilities of occurrence as arts majors. The fact that very few people followed the exact cycles predicted by regret and similarity theories calls for prolonging the question cycles featured.

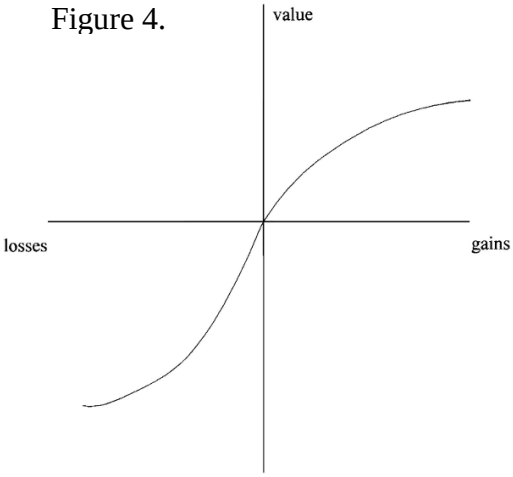
SCALED UP GAMBLE (CCU)			
	SET		
	Coef	z	AME
depeco	0.572	1.800*	0.143
depsci	0.576	1.860*	0.144

5.1.2 The Non-Axiomatic Violations of the EUT

The reflection effect proved particularly strong. In many cases, the utility function (Figure 4) and *fourfold pattern of risk*, examined by Kahneman and Tversky (1979), proved a more accurate determinant of individual decisions than the EUT itself. Evidently, participants tended

to be risk-averse in the domain of gains and risk seeking in the loss domain. According to Kahneman and Tversky, since the prospect of taking a more certain loss can be considered painful, many participants switched to choosing a risky prospect where they had some chance to avoid it. Therefore, ironically, their risk-loving tendencies are a result of loss aversion.

Figure 4.



In Q14 and Q15 (RE3), subjects tended to choose the risk-averse option in domain of gains, with 151 individuals choosing option Q14B, and exhibit risk-seeking pattern in the negative domain, with 95 individuals choosing Q15A. Economists and scientists outperformed humanities majors at 5% and 10% significance level respectively, yet the differences in case of ALT coding were not as pronounced. The differences across other question pairings were largely inconclusive.

RATIO EFFECT 3 (RE3)						
	EUT			**ALT**		
	Coef	z	AME "R"	Coef	z	AME "R"
depeco	0.614	1.970**	0.227	-0.449	-1.491	-0.166
depsci	0.492	1.922*	0.181	-0.366	-1.360	-0.135

5.1.2 The Axiom of Betweenness

Betweenness, violated by 43.3% of students across three questions, did not feature significant differences across subgroups of students. However, as expected, the rate of violations in case of $p = \frac{1}{2}$ (BET3) was almost half the rate of violations in case of $p = \frac{17}{18}$ (BET1) for all subgroups of participants. This raises a question of how the number of violations among participants changes as p grows more distant from 0 or 1, and how it impacts quasiconcavity and quasiconvexity of their preferences. This is an interesting direction for further, longer research in this specific area.

5.2 Year of Study and Perceptions of Rationality

Preliminary calculations (Appendix 10) and regression analysis unequivocally reject the hypothesis that the learning effect exists. Where the year of study was significant, its impact proved hardly conclusive, with juniors sometimes answering more consistently than seniors. While a slight increase w.r.t. EUT (2.2%) might suggest that the rate of axiomatic violations tends to decrease with academic progress, risk appetites remain constant.

	SET		EUT		ALT	
	z	AME	z	AME	z	AME
EP			-2.280**	-0.164	1.830*	0.133
RENQ					-1.720*	-0.103
FEQ	-3.050***	-0.225				
FENQ			2.500**	0.163	-2.330**	-0.149
CCU			2.140**	0.155		
CCD					-1.720*	-0.066

Nevertheless, a potential learning effect w.r.t. axiomatic violations has been observed in two instances. For FENQ and CCU, an additional regression was run to later test the five interactive dummies between each other and compare against the default[9]:

$$P(Y = 1 \mid X) = \phi(\varphi_0 + \varphi_1 depeco3 + \varphi_2 depeco1 + \varphi_3 depsci3 + \varphi_4 depsci + \varphi_5 dephum3 + \varphi_6 female + \varphi_7 originoutsideUK + \varphi_8 ucas420 + \varphi_9 gambling)$$

In case of non-monetary variation of the framing effect (FENQ) and the *scaled up* choice cycle (CCU), the rate of axiomatic violations by third year students was always lower than for their first-year departmental peers. This might indicate the existence of learning effect w.r.t. violations of transitivity and invariance. Possibly, undertaking modules outlined in Q48 could have contributed to different treatment of non-monetary gamble (FENQ) by economics seniors.

EUTFENQ	depeco1	depsci3	depsci1	dephum3	dephum1	**EUTCCU**	depeco1	depsci3	depsci1	dephum3	dephum1
depeco3	>***	>***	>***	>***	>***	depeco3	>**	>	>*	>	>
depeco1		<**	<**	>	>	depeco1		<	<	<	<
depsci3			<	>**	>**	depsci3			>	<	>
depsci1				>**	>**	depsci1				<	<
dephum3					>	dephum3					>

[9] first-year humanities majors

5.3 Other Determinants

While the impact of high academic performance and gambling experience was largely inconclusive (Appendix 12), the impact of gender and origin proved particularly interesting. All the significant *z* statistics on gender have negative coefficients when answers are coded according to the classical theories of choice and positive coefficients in case of ALT. This might indicate that perceptions of rationality differ across genders. Since the study concludes that the learning effect is insignificant and, therefore, economists most likely tend to self-select themselves into pursuing the degree, this finding might partly explain why the number of female economics students is relatively low. Examination of cognitive differences between genders might prove an interesting direction for further research.

	SET		EUT		ALT	
	z	AME	z	AME	z	AME
CCE	-2.887***	-0.202	-1.880*	-0.116		
RENQ	-2.684***	-0.219	-4.370***	-0.279	4.070***	0.238
FEQ	-4.420***	-0.325				
FENQ					1.840*	0.122
BET2	-1.956*	-0.168				

Interestingly, overseas students tend to be more *classically* rational and less likely to follow alternative prediction in some cases. These effects are particularly strong in case of non-quantitative gambles (RENQ and FENQ), which might indicate that wording is less likely to influence non-native speakers. This is hypothesised by the author to be a result of less emotional load being attached to wording in foreign language, particularly in case of FENQ.

	SET		EUT		ALT	
	z	AME	z	AME	z	AME
RENQ			1.950*	0.136	-2.000**	-0.125
FEQ					-2.110**	-0.127
FENQ			1.940*	0.151	-2.130**	-0.169

Section 6: EVALUATION AND CONCLUSION

6.1 Questionnaire - preparation and distribution

While questionnaire method has been widely applied in the field of behavioural economics, the assumption that it perfectly mimics real-life decisions is nevertheless dubious, and the importance of incentivising participants should not be undermined. Since additional funding for this study proved unavailable, subjects were incentivised by disclosure of analysis carried out on their individual answers. Under funding, a longer study could be implemented on a larger sample size, under laboratory environment and control for timing. Ideally, the experiment could be designed so that several questions, unknown to the subjects, would involve actual monetary gambles and participants would be paid their share or, at worst, leave empty-handed. This would allow for a more accurate examination of risk appetites.

Designing the questionnaire relied on individual judgment, and there is still room for potential improvements. In particular, the cycles relating to regret and similarity theories could be extended to include at least five questions since alternative prediction are hardly examinable using shorter cycles. Although non-quantitative gambles pose an interesting variation to the otherwise purely monetary-based study, they do not account for potentially subjective evaluation of expected value (Q37;Q38). In particular, it could be hypothesised that domestic students assign less of a value to travelling around the UK versus travelling around e.g. Italy. While this does not influence the analysis of purely axiomatic violations, it could potentially change the results w.r.t. other coding methods.

It is also worth noting that all the study subjects are students of highly regarded disciplines at a well accredited university. This might stand for a potential sample bias, which features in majority of empirical studies, including these carried out by Kahneman and Tversky. Furthermore, people this age rarely have broad real-life consumer experience, which might cause them more likely to engage in risky behaviour.

6.2 Econometric specification

Since all economics majors are required to participate in at least one module partly or heavily related to behavioural science[10] in their second year and students in other departments are rarely familiar with behavioural findings, accounting for familiarity with behavioural theories was,

[10] Economics 2 and Microeconomics 2 respectively

unfortunately, impossible. The investigated multicollinearity might therefore arise due to the English university system where students usually specialise in one single subject of choice.

The problem of potential heteroskedasticity has been considered since the robust standard errors used may not properly account for the potential bias in the probit model. However, the extremely low power of existing tests, especially for the multivariate cases, makes heteroskedasticity practically indeterminable. Nevertheless, as suggested by Wooldridge (2002, p. 479), even if non-normality in the latent error term does exist, the inconsistent estimation of coefficients is practically irrelevant since probit frequently provides reasonable estimates of the marginal effects regardless.

6.3 Concluding remarks

The study found considerable variations in students' perceptions of rationality. Economists exhibited most risk-loving, welfare maximising attitude, and were therefore found most "classically" rational. Investigation with respect to axiomatic violations yielded less pronounced differences yet a strong trend pertained, with both economists and scientists being more mathematically consistent. The learning effect was negligible, which empirically reaffirms the suggestions of Carter and Irons (1991) and Bauman and Rose (2009) that students tend to be self-selected, with preferences for certain academic pursuits likely stemming from individual differences, biological or otherwise.

Apart from answering the core research questions, it has been found that mutually exclusive standard economic theory and alternative theories of choice tended to be similarly successful in their predictions across problems featured, and followed by 42.5% and 31.3% of students respectively. Therefore, since reaching a conclusive agreement on the relative success of either is highly unlikely, it may indeed be the incorporation of group-specific characteristics into modeling perspectives that will revolutionise our thinking about the consumer theory.

Word Count: 5147

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Section 7: Appendices

Appendix 1. The Questionnaire. *(https://wbs.qualtrics.com/SE/?SID=SV_79hiIrSaCgd4RsV)*

INSTRUCTIONS: Please take 15-20 minutes to complete the following questionnaire. There are no wrong or correct answers - please imagine that questions describe real-life situations and base your decisions on your own preferences.

Q1. Please choose between the following gambles:

A: £10,000 with a probability of 100%, nothing otherwise

B: £50,000 with a probability of 10%, £10,000 with a probability of 89%, nothing otherwise

Q2. Please choose between the following gambles:

A: £10,000 with a probability of 11%, nothing otherwise

B: £50,000 with a probability of 10%, nothing otherwise

Q3. Please choose between the following gambles:

A: £3,000 with a probability of 100%, nothing otherwise

B: £4,000 with a probability of 80%, nothing otherwise

Q4. Please choose between the following gambles:

A: £3,000 with a probability of 25%, nothing otherwise

B: £4,000 with a probability of 20%, nothing otherwise

Q5. Please choose between the following gambles:

A: £6,000 with a probability of 45%, nothing otherwise

B: £3,000 with a probability of 90%, nothing otherwise

Q6. Please choose between the following gambles:

A: £6,000 with a probability of 0.01%, nothing otherwise

B: £3,000 with a probability of 0.02%, nothing otherwise

Q7. Imagine you have to choose between two of the following (pick one):

A: -£6,000 with a probability of 45%, nothing otherwise

B: -£3,000 with a probability of 90%, nothing otherwise

Q8. Imagine you have to choose between two of the following (pick one):

A: -£6,000 with a probability of 0.01%, nothing otherwise

B: -£3,000 with a probability of 0.02%, nothing otherwise

Q9. Consider the following two-stage game. In the first stage, there is a probability of 75% to end the game without winning anything, and a probability of 25% to move into the second stage. If you reach the second stage you have a choice between:

A: £4,000 with a probability of 80%, nothing otherwise

B: £3,000 with a probability of 100%, nothing otherwise

Q10. In addition to whatever you own, you have been given £1,000. You are now asked to choose between:

A: £1,000 with a probability of 50%, nothing otherwise

B: £500 with a probability of 100%, nothing otherwise

Q11. In addition to whatever you own, you have been given £2,000. You are now asked to choose between:

A: -£1,000 with a probability of 50%, nothing otherwise

B: -£500 with a probability of 100%, nothing otherwise

Q12. Would you accept a gamble that offers 10% chance to win £95 and 90% chance to lose £5?

A: Yes B: No

Q13. Would you pay £5 to participate in a lottery that offers 10% to win £100?

A: Yes B: No

Q14. Please choose between the following gambles:

A: £6,000 with a probability of 25%, nothing otherwise

B: £4,000 with a probability of 25%, £2,000 with a probability of 25%, nothing otherwise

Q15. Imagine you have to choose between two of the following (pick one):

A: -£6,000 with a probability of 25%, nothing otherwise

B: -£4,000 with a probability of 25%, -£2,000 with a probability of 25%, nothing otherwise

Q16. Please choose between the following gambles:

A: £5,000 with a probability of 0.1%, nothing otherwise

B: £5 with a probability of 100%, nothing otherwise

Q17. Imagine you have to choose between two of the following (pick one):

A: -£5,000 with a probability of 0.1%, nothing otherwise

B: -£5 with a probability of 100%, nothing otherwise

Q18. Please choose between the following gambles:

A: £4,000 with a probability of 40%, nothing otherwise

B: £2,500 with a probability of 60%, nothing otherwise

Q19. Please choose between the following gambles:

A: £2,500 with a probability of 60%, nothing otherwise

B: £1,500 with a probability of 80%, nothing otherwise

Q20. Please choose between the following gambles:

A: £4,000 with a probability of 40%, nothing otherwise

B: £1,500 with a probability of 80%, nothing otherwise

Q21. Please choose between the following gambles:

A: £4,000 with a probability of 10%, nothing otherwise

B: £2,500 with a probability of 15%, nothing otherwise

Q22. Please choose between the following gambles:

A: £2,500 with a probability of 15%, nothing otherwise

B: £1,500 with a probability of 20%, nothing otherwise

Q23. Please choose between the following gambles:

A: £4,000 with a probability of 10%, nothing otherwise

B: £1,500 with a probability of 20%, nothing otherwise

Q24. Please choose between the following gambles:

A: £960 with a probability of 90%, £140 with a probability of 5%, £120 with a probability of 5%

B: £960 with a probability of 85%, £900 with a probability of 5%, £120 with a probability of 10%

Q25. Please choose between the following gambles:

A: £2,000 with a probability of 36%, nothing otherwise

B: £3,000 with a probability of 18%, nothing otherwise

Q26. Please choose between the following gambles:

A: £3,000 with a probability of 1%, £2,000 with a probability of 34%, nothing otherwise

B: £3,000 with a probability of 18%, nothing otherwise

Q27. Please choose between the following gambles:

A: £2,000 with a probability of 36%, nothing otherwise

B: £3,000 with a probability of 1%, £2,000 with a probability of 34%, nothing otherwise

Q28. Please choose between the following gambles:

A: £3,000 with a probability of 17%, £2,000 with a probability of 2%, nothing otherwise

B: £3,000, 18%, nothing otherwise

Q29. Please choose between the following gambles:

A: £2,000 with a probability of 36%, nothing otherwise

B: £3,000 with a probability of 17%, £2,000 with a probability of 2%, nothing otherwise

Q30. Please choose between the following gambles:

A: £3,000 with a probability of 9%, £2,000 with a probability of 18%, nothing otherwise

B: £3,000 with a probability of 18%, nothing otherwise

Q31. Please choose between the following gambles:

A: £2,000 with a probability of 36%, nothing otherwise

B: £3,000with a probability of 9%, £2,000 with a probability of 18%, nothing otherwise

Q32. An urn contains 30 red balls and 60 other balls that are either black or yellow. You don't know how many black or how many yellow balls there are, but you know that the total number of black and yellow balls equals 60. Each ball is equally likely to be drawn. You are now given a choice between two gambles:

A: You receive £100 if you draw a red ball B: You receive £100 if you draw a black ball

Q33. An urn contains 30 red balls and 60 other balls that are either black or yellow. You don't know how many black or how many yellow balls there are, but you know that the total number of black and yellow balls equals 60. Each ball is equally likely to be drawn. You are now given a choice between two gambles:

A: You receive £100 if you draw a red or yellow ball

B: You receive £100 if you draw a black or yellow ball

Q34. Imagine that an unusual disease is about to kill 600 people. Two alternative programmes are proposed to combat the disease. Which one do you prefer?

A: If this programme is adopted, there is a 1/3 chance that nobody will die and a 2/3 chance that 600 people will die

B: If this programme is adopted, 400 people will die

Q35. Imagine that an unusual disease is about to kill 600 people. Two alternative programmes are proposed to combat the disease. Which one do you prefer?

A: If this programme is adopted, 200 people will be saved

B: If this programme is adopted, there is a 1/3 chance that 600 people will be saved and a 2/3 chance that nobody will be saved

Q36. You have considered buying a regular insurance and you decide that you are indifferent between buying and not buying it (it is barely worth its cost).

Then you are informed that the insurance company offers a new option in which you pay half of the regular premium. In case of damage, there is a 50% chance that you pay the other half of the premium while the insurance company covers all the losses; and there is a 50% chance that you get back your insurance payment and suffer all the losses. Are you going to sign up for this "probabilistic insurance"?

A: Yes B: No

Q37. Which option would you prefer?

A: A three-week tour around England, France and Germany with a probability of 50%, nothing otherwise

B: One-week tour around England with a probability of 100%, nothing otherwise

Q38. Which option would you prefer?

A: A three-week tour around England, France and Germany with a probability of 5%, nothing otherwise

B: One-week tour around England with a probability of 10%, nothing otherwise

Q39. Please state your age:

Q40. Please indicate the Faculty/Department you are based in:

A: Faculty of Science B: Faculty of Arts C: Department of Economics D: Other (please indicate):

Q41. Please state your university course and major:

Q42. Identify your sex:

A: Male B: Female

Q43. Where did you graduate from high school?

A: UK B: Europe outside the UK C: North America

D: Asia and Oceania E: Africa F: South America

Q44. How many UCAS points did you achieve upon high school graduation?

A: more than 420 B: 360-420 C: 300-360 D: less than 300

If you don't know the exact conversion, please state your qualification and grades below:

Q45. Which year are you in? (please disregard the year abroad/industry placement if applicable)

A: First B: Third C: Other - please indicate:

Q46. What is your current university average? (first year students do not need to answer)

A: First Class B: Upper Second Class C: Lower Second Class D: Third Class or lower

Q47. Are you familiar with the Prospect Theory and its extensions?

A: Yes B: No

Q48. Please indicate if you have taken any of the following courses:

A: EC202 Microeconomics 2	B: EC340 Topics in Applied Economics (a)
C: EC314 Topics in Economic Theory	D: × None of the above

Q49. Have you ever studied a module with economics-related content during your A-level/equivalent studies?

A: Yes B: No

Q50. Have you ever invested your money on the stock exchange or have gambled/bet in a similar fashion?

A: Yes B: No

Q51. Please state your name and surname (for documentation purposes ONLY):

Q52. Please indicate you give permission to include the responses in my study by circling:

I give permission to include my responses in the study.

Thank you for completing the survey. Your contribution is extremely valued.

Appendix 2. The case of Probabilistic Insurance.

Q36 examines the probabilistic insurance problem (Kahneman and Tversky, 1979). Since a large majority of available insurance is in fact probabilistic, it originally featured in this study thanks to its real-life dimension. Let w be the initial wealth, x a loss occurring with probability π, y the insurance premium and r the probability of premium ry being recovered. The indifference in the case of certain insurance implies:

$$\pi u(w-x)+(1-\pi)u(w)=u(w-y)$$

The probabilistic insurance is preferred only under strict concavity $u'(\cdot)>0$ and $u''(\cdot)<0$:

$$\pi r u(w-y)+\pi(1-r)u(w-x)+(1-\pi)u(w-ry)>u(w-y)$$

While often assumed in finance-related analyses, concavity was not implied by von Neuman and Morgenstern in the original 1944 formulation, which, in fact, allows for differing shapes of well-behaved utility functions (Section 3.1.2). Since both Q36A and Q36B are consistent under this type of coding, the question was excluded.

Appendix 3. Descriptions and justification of the independent variables featured.

Variable (dummy)	Description (if the variable takes the value of 1)	Justification
depeco	based in the Department of Economics	aims to capture the effect of being a student based in the Department of Economics
depsci	based in the Faculty of Science	aims to capture the effect of being a student based in the Faculty of Science
year3	third-year student	aims to capture the learning effect
female	female	aims to capture the effect of gender
outsideUK	has completed high school outside the UK	aims to capture an impact of being an overseas student
ucas420	achieved at least 420 UCAS points	aims to capture an impact of over-average academic performance; the study does not include lower categories outlined in Q44 since the large majority (94.4%) of people achieved more than 360 points
behmod	has undertaken at least 1 behavioural economics-related course	aimed to account for familiarity with behavioural theories of choice; excluded due to multicollinearity issues
gambling	possesses some gambling or stock exchange experience	aims to account for the potential impact of market experience or experience with monetary gambles

Appendix 4. Summary statistics.

Variable	Observations	Mean	St. Dev.	Min	Max
depeco	180	.333	0.473	0	1
depsci	180	.333	0.473	0	1
year3	180	.500	0.501	0	1
female	180	.389	0.490	0	1
outsideUK	180	.306	0.464	0	1
ucas420	180	.761	0.428	0	1
gambling	180	.222	0.417	0	1

Appendix 5. Correlations between remaining independent variables.

	depeco	depsci	year3	female	outsideUK	ucas420	gambling
depeco	1.0000						
depsci	-0.5000 (0.0000)	1.0000					
year3	0.0000 (1.0000)	0.0000 (1.0000)	1.0000				
female	-0.0322 (0.6675)	-0.1048 (0.1617)	0.1140 (0.1277)	1.0000			
outsideUK	0.1961 (0.0083)	-0.0853 (0.2550)	-0.0844 (0.2598)	0.1636 (0.0282)	1.0000		
ucas420	0.1474 (0.0483)	-0.0461 (0.5392)	-0.0651 (0.3849)	-0.1411 (0.0589)	0.0039 (0.9583)	1.0000	
gambling	0.2457 (0.0009)	-0.0378 (0.6144)	0.0000 (1.0000)	-0.1523 (0.0413)	-0.0355 (0.6365)	0.0801 (0.2852)	1.0000

Appendix 7. Dependent variables divided into six groups according the type of violation.

INDEPENDENCE				INVARIANCE				TRANSITIVITY	
CCE	REQ	EP	RENQ	FETSG	IELA	FEQ	FENQ	CCU	CCD
Q1 Q2	Q3 Q4	Q32 Q33	Q37 Q38	Q4 Q9	Q10 Q11	Q12 Q13	Q34 Q35	Q18 Q19 Q20	Q21 Q22 Q23

BETWEENNESS			DOM	NON-AXIOMATIC VIOLATIONS - RE			
BET1	BET2	BET3	SD	RE1	RE2	RE3	RE4
Q25 Q26 Q27	Q25 Q28 Q29	Q25 Q30 Q31	Q24	Q5 Q7	Q6 Q8	Q14 Q15	Q16 Q17

Appendix 8. A brief introduction of the multivariate model.

Multivariate probit model in case of *M=4*:

$$y^*_{im} = \varphi'_m X_{im} + \varepsilon_{im}, m = 1,2,3,4$$

where: $y_{im} = 1$ if $y^*_{im} > 0$ and 0 otherwise

$$\varepsilon_{im}, m = 1,2,3,4$$

where error terms are distributed as multivariate normal, each with a mean of zero, and variance-covariance matrix V where V has values of 1 on the leading diagonal and correlations $\rho_{jk} = \rho_{kj}$ as off-diagonal elements.

Appendix 12. The findings regarding the effect of variables *ucas420* and *gambling*.

ucas420	SET		EUT		ALT	
	z	AME	z	AME	z	AME
CCE	-2.106**	-0.173			1.700*	0.121
RENQ	-2.449**	-0.220	-2.400**	-0.184		
FEQ	-1.720*	-0.152				
RE4			1.895*	0.177	1.760*	0.175
BET1	2.618***	0.225			-1.681*	-0.149
BET3	1.724*	0.142			-2.062**	-0.170
CCU	1.760*	0.109	2.210**	0.195		

gambling	SET		EUT		ALT	
	z	AME	z	AME	z	AME
FEQ					-1.890*	-0.148
FENQ			-2.490**	-0.209	2.020**	0.165
RE2			1.745*	0.201	-1.835*	-0.202
RE3			-1.831*	-0.189		
BET3					-1.666*	-0.136
CCD	2.120**	0.198	2.300**	0.215		

Appendix 6. Correlations between dependent variables

INDEPENDENCE			
	SETCCE	**SETREQ**	**SETRENQ**
SETCCE	1.0000		
SETREQ	0.0758 (0.3119)	1.0000	
SETRENQ	0.3083 (0.0000)	0.1355 (0.0698)	1.0000

BETWEENNESS			
	SETBET1	**SETBET2**	**SETBET3**
SETBET1	1.0000		
SETBET2	0.2702 (0.0002)	1.0000	
SETBET3	0.3976 (0.0000)	0.3633 (0.0000)	1.0000

INVARIANCE			
	SETFETSG	**SETFEQ**	
SETFETSG	1.0000		
SETFEQ	0.1405 (0.0599)	1.0000	

TRANSITIVITY		
	SETCCU	**SETCCD**
SETCCU	1.0000	
SETCCD	0.2235 (0.0026)	1.0000

INDEPENDENCE				
	EUTCCE	**EUTREQ**	**EUTEP**	**EUTRENQ**
EUTCCE	1.0000			
EUTREQ	-0.0452 (0.5466)	1.0000		
EUTEP	0.1153 (0.1234)	-0.0025 (0.9729)	1.0000	
EUTRENQ	0.1336 (0.0737)	0.1363 (0.0681)	-0.0097 (0.8969)	1.0000

INVARIANCE				
	EUTFETSG	**EUTIELA**	**EUTFEQ**	**EUTFENQ**
EUT FETSG	1.0000			
EUT IELA	-0.0700 (0.3502)	1.0000		
EUT FEQ	-0.0675 (0.3677)	0.0435 (0.5620)	1.0000	
EUT FENQ	0.0912 (0.2235)	0.0701 (0.3495)	0.1378 (0.0652)	1.0000

TRANSITIVITY		
	EUTCCU	**EUTCCD**
EUTCCU	1.0000	
EUTCCD	0.0695 (0.3536)	1.0000

BETWEENNESS			
	EUTBET1	**EUTBET2**	**EUTBET3**
EUTBET1	1.0000		
EUTBET2	0.2155 (0.0037)	1.0000	
EUTBET3	0.3214 (0.0000)	0.3093 (0.0000)	1.0000

NON-AXIOMATIC VIOLATIONS				
	EUTRE1	**EUTRE2**	**EUTRE3**	**EUTRE4**
EUTRE1	1.0000			
EUTRE2	0.2238 (0.0025)	1.0000		
EUTRE3	0.3963 (0.0000)	0.2015 (0.0067)	1.0000	
EUTRE4	0.2189 (0.0032)	0.2677 (0.0003)	0.1743 (0.0193)	1.0000

BETWEENNESS			
	ALTBET1	**ALTBET2**	**ALTBET3**
ALTBET1	1.0000		
ALTBET2	0.2155 (0.0037)	1.0000	
ALTBET3	0.3214 (0.0000)	0.3093 (0.0000)	1.0000

TRANSITIVITY		
	ALTCCU	**ALTCCD**
ALTCCU	1.0000	
ALTCCD	-0.0528 (0.4815)	1.0000

INDEPENDENCE				
	ALTCCE	**ALTREQ**	**ALTEP**	**ALTRENQ**
ALTCCE	1.0000			
ALTREQ	0.0056 (0.9409)	1.0000		
ALTEP	0.1227 (0.1008)	-0.0040 (0.9578)	1.0000	
ALTRENQ	0.1034 (0.1671)	0.0265 (0.7244)	-0.0508 (0.4986)	1.0000

INVARIANCE				
	ALTFETSG	**ALTIELA**	**ALTFEQ**	**ALTFENQ**
ALT FETSG	1.0000			
ALT IELA	-0.0498 (0.5069)	1.0000		
ALT FEQ	-0.0540 (0.4713)	0.0148 (0.8438)	1.0000	
ALT FENQ	-0.0305 (0.6841)	0.0914 (0.2221)	0.0703 (0.3484)	1.0000

NON-AXIOMATIC VIOLATIONS				
	ALTRE1	**ALTRE2**	**ALTRE3**	**ALTRE4**
ALTRE1	1.0000			
ALTRE2	0.1242 (0.0966)	1.0000		
ALTRE3	0.4181 (0.0000)	0.0802 (0.2847)	1.0000	
ALTRE4	0.1747 (0.0190)	-0.0800 (0.2857)	0.0413 (0.5823)	1.0000

Appendix 9. Preliminary calculations with respect to course of study.

COURSE	RE1		RE2		RE3		RE4		FETSG			IELA		FEQ			FENQ	
	EUT	ALT	EUT	ALT	EUT	ALT	EUT	ALT	SET	EUT	ALT	EUT	ALT	SET	EUT	ALT	EUT	ALT
Overall	46.1%	52.2%	50.6%	38.9%	46.1%	45.0%	47.2%	22.8%	18.9%	50.6%	45.6%	59.4%	30.6%	33.3%	72.2%	15.6%	68.3%	28.3%
Economics	45.0%	55.0%	53.3%	40.0%	53.3%	40.0%	50.0%	16.7%	25.0%	50.0%	46.7%	56.7%	33.3%	50.0%	78.3%	6.7%	76.7%	20.0%
Science	41.7%	53.3%	53.3%	33.3%	50.0%	43.3%	48.3%	28.3%	20.0%	55.0%	45.0%	63.3%	25.0%	28.3%	71.7%	15.0%	78.3%	20.0%
Humanities	51.7%	48.3%	45.0%	43.3%	35.0%	51.7%	43.3%	23.3%	11.7%	46.7%	45.0%	58.3%	33.3%	21.7%	66.7%	25.0%	50.0%	45.0%

COURSE	CCE			REQ			EP		RENQ			CCU			CD		
	SET	EUT	ALT	SET	EUT	ALT	EUT	ALT	SET	EUT	ALT	SET	EUT	ALT	SET	EUT	ALT
Overall	72.8%	78.3%	20.0%	12.2%	44.4%	52.2%	38.9%	54.4%	59.4%	70.6%	24.4%	16.1%	54.4%	2.8%	53.9%	62.2%	8.9%
Economics	76.7%	83.3%	16.7%	23.3%	48.3%	48.3%	43.3%	50.0%	68.3%	80.0%	16.7%	20.0%	56.7%	3.3%	53.3%	56.7%	11.7%
Science	81.7%	85.0%	15.0%	10.0%	43.3%	55.0%	30.0%	65.0%	60.0%	75.0%	16.7%	20.0%	50.0%	5.0%	55.0%	65.0%	6.7%
Humanities	60.0%	66.7%	28.3%	3.3%	41.7%	53.3%	43.3%	48.3%	50.0%	56.7%	40.0%	8.3%	56.7%	0.0%	53.3%	65.0%	8.3%

COURSE	BET1			BET2			BET3			SD
	SET	EUT	ALT	SET	EUT	ALT	EUT	ALT	SET	SET
Overall	37.8%	39.4%	60.6%	59.4%	61.7%	38.3%	67.2%	68.9%	31.1%	36.1%
Economics	35.0%	36.7%	63.3%	61.7%	63.3%	36.7%	71.7%	71.7%	28.3%	40.0%
Science	41.7%	43.3%	56.7%	60.0%	63.3%	36.7%	65.0%	66.7%	33.3%	40.0%
Humanities	36.7%	38.3%	61.7%	56.7%	58.3%	41.7%	65.0%	68.3%	31.7%	28.3%

Appendix 10. Preliminary calculations with respect to year of study.

YEAR		INDEPENDENCE					INVARIANCE			TRANSITIVITY		BETWEENNESS			DOM	NON-AXIOMATIC VIOLATIONS				TOTAL
		CCE	REQ	EP	RENQ	FETSG	IELA	FEQ	FENQ	CCU	CCD	BET1	BET2	BET3	SD	RE1	RE2	RE3	RE4	
SET	First Year	70.0%	15.6%		55.6%	18.9%		44.4%		14.4%	54.4%	35.6%	56.7%	65.6%	37.8%					42.6%
	Third Year	75.6%	8.9%		63.3%	18.9%		22.2%		17.8%	53.3%	40.0%	62.2%	68.9%	34.4%					42.3%
EUT	First Year	78.9%	44.4%	46.7%	68.9%	46.7%	60.0%	70.0%	61.1%	46.7%	61.1%	37.8%	60.0%	68.9%	37.8%	42.2%	55.6%	41.1%	47.8%	54.2%
	Third Year	77.8%	44.4%	31.1%	72.2%	54.4%	58.9%	74.4%	75.6%	62.2%	63.3%	41.1%	63.3%	68.9%	34.4%	50.0%	45.6%	51.1%	46.7%	56.4%
ALT	First Year	20.0%	51.1%	47.8%	27.8%	47.8%	30.0%	16.7%	34.4%	2.2%	12.2%	62.2%	40.0%	31.1%	62.2%	55.6%	33.3%	46.7%	20.0%	35.6%
	Third Year	20.0%	53.3%	61.1%	21.1%	43.3%	31.1%	14.4%	22.2%	3.3%	5.6%	58.9%	36.7%	31.1%	65.6%	48.9%	44.4%	43.3%	25.6%	35.0%

Appendix 11. Regression Analysis - Results

COMMON CONSEQUENCE EFFECT (CCE)									
	SET			EUT			ALT		
	Coef	z	AME "R"	Coef	z	AME	Coef	z	AME
depeco	0.416	1.379	0.116	0.492	1.760*	0.133	-0.334	-1.190	-0.088
depsci	0.636	2.287**	0.174	0.554	2.050**	0.149	-0.421	-1.550	-0.111
year3	0.211	0.905	0.061	-0.009	-0.040	-0.003	-0.024	-0.110	-0.006
female	-0.661	-2.887***	-0.202	-0.431	-1.880*	-0.116	0.340	1.470	0.090
outsideUK	0.249	0.854	0.070	0.021	0.090	0.006	-0.137	-0.560	-0.036
ucas420	-0.667	-2.106**	-0.173	-0.461	-1.720	-0.124	0.459	1.700*	0.121
gambling	0.326	0.995	0.090	0.350	1.210	0.094	-0.330	-1.130	-0.087
QUANTITATIVE RATIO EFFECT (REQ)									
	SET			EUT			ALT		
	Coef	z	AME "R"	Coef	z	AME	Coef	z	AME
depeco	1.534	3.004***	0.305	0.254	1.020	0.099	-0.175	-0.710	-0.069
depsci	0.7940	1.564	0.138	0.104	0.440	0.040	-0.009	-0.040	-0.004
year3	-0.4946	-1.342	-0.079	-0.028	-0.150	-0.011	0.083	0.440	0.033
female	-0.1189	-0.313	-0.019	0.242	1.200	0.095	-0.248	-1.230	-0.097
outsideUK	-0.1439	-0.436	-0.022	-0.055	-0.250	-0.021	-0.094	-0.440	-0.037
ucas420	0.2399	0.554	0.036	0.024	0.110	0.009	0.101	0.450	0.040
gambling	-0.4923	-1.356	-0.070	-0.175	-0.730	-0.068	0.083	0.350	0.033
ELLSBERG PARADOX (EP)									
	SET			EUT			ALT		
				Coef	z	AME	Coef	z	AME
depeco				0.092	0.360	0.034	-0.046	-0.180	-0.017
depsci				-0.318	-1.300	-0.116	0.402	1.660*	0.150
year3				-0.447	-2.280**	-0.164	0.356	1.830*	0.133
female				0.160	0.770	0.059	-0.016	-0.080	-0.006
outsideUK				-0.017	-0.080	-0.006	-0.250	-1.170	-0.093
ucas420				-0.131	-0.570	-0.048	0.307	1.360	0.115
gambling				-0.225	-0.890	-0.083	0.352	1.410	0.131
NON-QUANTITATIVE RATIO EFFECT (RENQ)									
	SET			EUT			ALT		
	Coef	z	AME "R"	Coef	Z	AME	Coef	z	AME
depeco	0.4312	1.446	0.148	0.674	2.510**	0.195	-0.680	-2.530**	-0.180
depsci	0.1375	0.543	0.047	0.419	1.620	0.121	-0.625	-2.280**	-0.165
year3	0.3016	1.327	0.104	0.262	1.210	0.076	-0.390	-1.720*	-0.103
female	-0.6168	-2.684***	-0.219	-0.965	-4.370***	-0.279	0.897	4.070***	0.238
outsideUK	0.3180	1.340	0.108	0.470	1.950*	0.136	-0.471	-2.000**	-0.125
ucas420	-0.6724	-2.449**	-0.220	-0.637	-2.400**	-0.184	0.396	1.500	0.105
gambling	0.4047	1.444	0.137	0.053	0.200	0.015	-0.068	-0.240	-0.018

FRAMING EFFECT – TWO-STAGE GAME (FETSG)									
	SET			EUT			ALT		
	Coef	z	AME	Coef	z	AME	Coef	z	AME
depeco	0.580	1.920*	0.166	0.189	0.770	0.074	-0.007	-0.030	-0.003
depsci	0.391	1.360	0.109	0.262	1.110	0.102	-0.050	-0.210	-0.020
year3	-0.031	-0.150	-0.008	0.180	0.940	0.070	-0.086	-0.450	-0.034
female	0.008	0.040	0.002	0.097	0.470	0.038	-0.242	-1.180	-0.094
outsideUK	-0.039	-0.160	-0.010	0.058	0.280	0.023	-0.110	-0.520	-0.043
ucas420	0.079	0.310	0.021	-0.225	-1.010	-0.088	0.158	0.710	0.062
gambling	-0.310	-1.080	-0.076	-0.268	-1.110	-0.104	0.088	0.370	0.034
ISOLATION EFFECT (IELA)									
	SET			EUT			ALT		
				Coef	z	AME	Coef	z	AME
depeco				-0.133	-0.540	-0.051	-0.018	-0.070	-0.006
depsci				0.083	0.350	0.032	-0.226	-0.920	-0.077
year3				-0.005	-0.030	-0.002	0.043	0.220	0.015
female				-0.161	-0.790	-0.061	0.165	0.780	0.057
outsideUK				-0.050	-0.230	-0.019	0.271	1.230	0.093

ucas420				0.189	0.820	0.072	0.036	0.150	0.012
gambling				0.190	0.800	0.073	-0.086	-0.350	-0.030
QUANTITATIVE FRAMING EFFECT (FEQ)									
	SET			**EUT**			**ALT**		
	Coef	z	AME	Coef	z	AME	Coef	z	AME
depeco	0.820	2.900***	0.292	0.265	0.990	0.086	-0.599	-1.790*	-0.129
depsci	0.117	0.440	0.040	0.102	0.410	0.033	-0.319	-1.170	-0.069
year3	-0.669	-3.050***	-0.225	0.208	1.010	0.067	-0.194	-0.820	-0.042
female	-1.054	-4.420***	-0.325	-0.266	-1.230	-0.086	0.116	0.470	0.025
outsideUK	0.255	1.060	0.089	0.218	0.960	0.070	-0.589	-2.110**	-0.127
ucas420	-0.426	-1.720*	-0.152	0.308	1.300	0.100	0.054	0.190	0.012
gambling	0.258	1.060	0.091	-0.032	-0.120	-0.010	-0.687	-1.890*	-0.148
NON-QUANTITATIVE FRAMING EFFECT (FENQ)									
	SET			**EUT**			**ALT**		
				Coef	z	AME	Coef	z	AME
depeco				0.833	3.120***	0.252	-0.771	-2.840***	-0.224
depsci				0.842	3.110***	0.254	-0.721	-2.690***	-0.210
year3				0.541	2.500**	0.163	-0.511	-2.330**	-0.149
female				-0.233	-1.050	-0.070	0.417	1.840*	0.122
outsideUK				0.500	1.940*	0.151	-0.579	-2.130**	-0.169
ucas420				0.378	1.530	0.114	-0.307	-1.230	-0.089
gambling				-0.692	-2.490**	-0.209	0.566	2.020**	0.165

RATIO EFFECT 1 (RE1)						
	SET	**EUT**		**ALT**		
		Coef	z	AME “R”	Coef	z	AME “R”
depeco		-0.412	-1.491	-0.154	0.373	1.300	0.142
depsci		-0.357	-1.426	-0.135	0.167	0.619	0.064
year3		0.248	1.218	0.095	-0.163	-0.774	-0.063
female		0.031	0.139	0.012	-0.103	-0.452	-0.040
outsideUK		0.353	1.481	0.136	-0.351	-1.417	-0.137
ucas420		0.081	0.327	0.031	0.024	0.091	0.009
gambling		0.278	1.012	0.107	-0.299	-1.054	-0.116
RATIO EFFECT 2 (RE2)						
	SET	**EUT**		**ALT**		
		Coef	Z	AME “R”	Coef	z	AME “R”
depeco		0.099	0.340	0.038	0.051	0.176	0.019
depsci		0.145	0.557	0.056	-0.218	-0.780	-0.080
year3		-0.264	-1.200	-0.102	0.291	1.273	0.107
female		0.066	0.275	0.025	0.029	0.123	0.011
outsideUK		-0.027	-0.114	-0.010	-0.054	-0.217	-0.020
ucas420		-0.096	-0.368	-0.037	0.320	1.170	0.115
gambling		0.520	1.745*	0.201	-0.576	-1.835*	-0.202
RATIO EFFECT 3 (RE3)						
	SET	**EUT**		**ALT**		
		Coef	z	AME “R”	Coef	z	AME “R”
depeco		0.614	1.970**	0.227	-0.449	-1.491	-0.166
depsci		0.492	1.922*	0.181	-0.366	-1.360	-0.135
year3		0.313	1.478	0.116	-0.126	-0.602	-0.048
female		-0.094	-0.418	-0.035	-0.220	-1.026	-0.083
outsideUK		0.223	0.921	0.083	-0.289	-1.167	-0.109
ucas420		0.201	0.834	0.074	-0.078	-0.307	-0.030
gambling		-0.525	-1.831*	-0.189	0.404	1.385	0.154
RATIO EFFECT 4 (RE4)						
	SET	**EUT**		**ALT**		
		Coef	z	AME “R”	Coef	z	AME “R”
depeco		0.116	0.366	0.044	0.107	0.338	0.041
depsci		0.144	0.582	0.054	0.163	0.633	0.062
year3		-0.036	-0.169	-0.014	-0.015	-0.074	-0.006
female		0.133	0.611	0.051	0.127	0.594	0.049
outsideUK		0.171	0.692	0.065	0.260	1.032	0.100

ucas420				0.479	1.895*	0.177	0.464	1.760*	0.175
gambling				-0.368	-1.296	-0.137	-0.311	-1.156	-0.118

BETWEENNESS 1 (BET1)

	SET			EUT			ALT		
	Coef	z	AME "R"	Coef	z	AME "R"	Coef	z	AME "R"
depeco	0.008	0.032	0.003	-0.060	-0.233	-0.022	0.060	0.233	0.022
depsci	0.150	0.600	0.054	0.114	0.457	0.043	0.114	-0.457	-0.043
year3	0.166	0.816	0.059	0.055	0.271	0.020	0.055	-0.271	-0.020
female	0.099	0.463	0.035	0.161	0.747	0.060	0.161	-0.747	-0.060
outsideUK	0.093	0.409	0.033	0.171	0.755	0.064	0.171	-0.755	-0.064
ucas420	0.677	2.618***	0.225	0.417	1.681	0.149	0.417	-1.681*	-0.149
gambling	-0.283	-1.081	-0.098	-0.099	-0.402	-0.036	0.099	0.402	0.036

BETWEENNESS 2 (BET2)

	SET			EUT			ALT		
	Coef	z	AME "R"	Coef	z	AME "R"	Coef	Z	AME "R"
depeco	-0.023	-0.084	-0.008	0.042	0.156	0.016	-0.042	-0.156	-0.016
depsci	0.019	0.078	0.007	0.159	0.633	0.059	-0.159	-0.633	-0.059
year3	0.200	0.947	0.075	0.142	0.677	0.053	-0.142	-0.677	-0.053
female	-0.441	-1.956*	-0.168	-0.302	-1.364	-0.115	0.302	1.364	0.115
outsideUK	0.042	0.182	0.016	0.131	0.556	0.048	-0.131	-0.556	-0.048
ucas420	-0.124	-0.514	-0.046	-0.112	-0.458	-0.042	0.112	0.458	0.042
gambling	0.402	1.436	0.146	0.309	1.119	0.113	-0.309	-1.119	-0.113

BETWEENNESS 3 (BET3)

	SET			EUT			ALT		
	Coef	z	AME "R"	Coef	z	AME "R"	Coef	Z	AME "R"
depeco	-0.091	-0.348	-0.030	-0.195	-0.759	-0.063	0.195	0.759	0.063
depsci	-0.137	-0.540	-0.046	-0.178	-0.725	-0.058	0.178	0.725	0.058
year3	0.127	0.583	0.042	0.059	0.284	0.019	-0.059	-0.284	-0.019
female	-0.259	-1.171	-0.088	-0.248	-1.135	-0.081	0.248	1.135	0.081
outsideUK	0.083	0.365	0.027	0.081	0.361	0.025	-0.081	-0.361	-0.025
ucas420	0.403	1.724*	0.142	0.492	2.062	0.170	-0.492	-2.062**	-0.170
gambling	0.463	1.540	0.144	0.459	1.666	0.136	-0.459	-1.666*	-0.136

CHOICE CYCLES - SCALED UP GAMBLE (CCU)

	SET			EUT			ALT*		
	Coef	z	AME	Coef	z	AME	Coef	z	AME
depeco	0.572	1.800*	0.143	-0.083	-0.340	-0.031	-0.012	-0.030	-0.001
depsci	0.576	1.860*	0.144	-0.213	-0.890	-0.079			
year3	0.163	0.690	0.037	0.418	2.140**	0.155	0.251	0.670	0.014
female	-0.023	-0.090	-0.005	-0.003	-0.010	-0.001	0.068	0.180	0.004
outsideUK	-0.203	-0.780	-0.044	-0.298	-1.360	-0.111	0.273	0.720	0.017
ucas420	0.566	1.760*	0.109	0.523	2.210**	0.195	0.116	0.300	0.006
gambling	0.012	0.040	0.003	0.239	1.010	0.089	0.465	1.100	0.034

CHOICE CYCLES – SCALED DOWN GAMBLE (CCD)

	SET			EUT			ALT*		
	Coef	Z	AME	Coef	z	AME	Coef	z	AME
depeco	-0.069	-0.280	-0.027	-0.355	-1.430	-0.130	0.281	1.130	0.041
depsci	0.041	0.170	0.016	-0.018	-0.070	-0.007			
year3	-0.080	-0.410	-0.032	0.033	0.160	0.012	-0.478	-1.720*	-0.066
female	0.286	1.390	0.112	0.250	1.190	0.091	0.322	1.090	0.046
outsideUK	-0.280	-1.290	-0.111	-0.108	-0.500	-0.039	0.368	1.350	0.056
ucas420	0.193	0.860	0.077	0.209	0.910	0.076	0.184	0.530	0.023
gambling	0.517	2.120**	0.198	0.587	2.300**	0.215	-0.441	-1.220	-0.050

*no humanities major fulfilled the predictions of regret theory. Model was re-specified to compare economists against the rest of students

STOCHASTIC DOMINANCE (SD)

	SET = SET					
	Coef	z	AME	outsideUK	-0.210	-0.950	-0.077
depeco	0.417	1.650*	0.153	ucas420	-0.084	-0.360	-0.031
depsci	0.351	1.450	0.129	gambling	-0.132	-0.540	-0.049
year3	-0.111	-0.570	-0.041				
female	0.049	0.240	0.018				