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AN EXPERIMENT ON RISKY CHOICE AMONGST HOUSEHOLDS*

Ian Bateman and Alistair Munro

A host of experiments have examined theories of risky choice using *individuals*. However, many important economic decisions are taken within multi-adult *households*. This paper reports on the first economic experiment designed to test theories of household choice. We use established couples and face them individually and jointly with decisions involving monetary payoffs. We find that joint choices typically are more risk averse than those made by individuals. Meanwhile, choices made by couples exhibit the same kinds of departures from expected utility theory (e.g. the common ratio and common consequence effects) as are regularly recorded with individuals.

The expected utility-maximising household is one of the most common models employed to understand economic behaviour. This *standard model*, which is used to investigate saving, insurance decisions, labour supply etc., involves two important assumptions. First, that the household acts as if it has a single set of preferences and, second, that these preferences conform to the axioms of expected utility theory (EUT). The first of these assumptions has received scrutiny (Browning and Chiappori, 1998) but very little attention has been paid to the second assumption for households as opposed to individuals. In fact though there is copious experimental evidence on how individuals choose, to date there has been very little experimental investigation into how multi-adult households or couples make their decisions. For instance, in Starmer's (2000) extended survey of the field of risky choice, there is no discussion of evidence on household as opposed to individual behaviour and though there is an interesting body of work by psychologists on this issue (see Corfman and Lehmann (1987) for example), the questions asked provide little insight into the applicability of economists' models of choice.

This paper therefore presents results of an experiment designed to investigate the following issue: to what extent do the decisions made by couples and the decisions made separately by individuals who are part of a couple conform to the standard model? In outline the experiment is as follows: we use a sample of established couples[1] and present them with tasks of the kind depicted in Figure 1, all of which involve binary choices between lotteries. In Section 1 of the experiment the subjects are separated and face choices separately; in Section 2 they remain apart and must predict their partner's answers from Section 1; in Section 3 they rejoin their partner and make choices as a couple. There is some overlap in the tasks faced in each section. Each lottery has possible monetary payoffs for each

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[1] Meaning that the couple are in a relationship of at least one year's standing and live together.

Question 2

Option A

For numbers:	1–50	51–100
You receive	£20	£0
Your partner receives	£0	£20

Option B

For numbers:	1–50	51–100
You receive	£20	£40
Your partner receives	£0	£20

I choose(*tick one*): Option A ☐ Option B ☐

Fig. 1. *A Typical Question from Section 1 of the Experiment*

individual within the couple[2] and these payoffs may be different. A random lottery device is used to provide incentives. We use the results of the choices to compare whether couples have similar revealed preferences to individuals. In particular we test whether couples' joint choices show the same a pattern of anomalies that has been regularly reported in individual choices.

Before presenting the experiment in detail it is worth making two points. First, it could reasonably be supposed that the results of individual choice experiments should carry over into household decision making. However, leaving aside the issue of differences in subject pool, the decision-making environment of the household might eliminate some anomalies commonly observed in individual choice. For instance, with two people scrutinising options rather than one, the kind of editing and framing effects which underlie Kahneman and Tversky's (1979) explanation of the Allais paradox might not apply. Conversely, even if individuals separately have preferences which satisfy EUT, the rule used to aggregate preferences within the household might produce choices for the household at variance with EUT. So, the existing theory and experimental evidence on individual choice does not therefore imply much about how households make choices in risky situations and in particular, whether households conform to the standard model.

Secondly, in the standard model of household choice referred to above, the household is assumed to be unitary – that is, the household is modelled as a single agent with a single set of preferences – either because there are no public goods local to the household and all members share the same preferences or because the structure of incentives within the household align individual preferences with those of the decision-maker, as in, for instance, the 'rotten kid theorem', Becker (1974). Empirical testing (Lundberg *et al.*, 1997; Alderman *et al.*, 1995) gives results largely hostile to the unitary model, particularly its prediction of income pooling (IP) which is the property that household behaviour may respond to changes in aggregate household income but not to who in the household earns that income. This has prompted a large number of alternative household models but nevertheless IP remains a convenient assumption in many contexts. For the experiment we design a mix of tests, some of which are conditional on households

[2] Bone *et al.* (1999, 2000) examines decisions made by pairs but using students paired at random, whereas we are interested in the behaviour of pre-existing decision-making units – i.e. established couples. Also, in their design, the pairs of students are given a collective payment and must decide how to divide it. Our lotteries assign payments to individuals (and our payment procedures reflect this), though this is not to deny the possibility of bargains being made or anticipated.

satisfying IP and some of which are not. One reason for having the conditional tests is that in many empirical situations it may not be possible to observe the sources of income in a household. We wish to see whether any departures from EUT are robust in the sense that they are still observable in the face of variation in the identity of the income recipient.

1. Theory

For simplicity we consider a two-person household. Let agent $i = 1,2$ receive payment m_{is} in state of the world $s = 1,\ldots,S$. A typical lottery $\boldsymbol{p}$ (or $\boldsymbol{q}$, $\boldsymbol{r}$ or $\boldsymbol{s}$) is then a vector $(p_1,\ldots,p_S)$. The standard sign, $\succeq$ denotes the weak preference relationship for the household, with strict preference denoted $\succ$ and indifference $\sim$, constructed in the usual manner.

A household obeys expected utility theory in its joint choices if there exists a strictly increasing function $w(m_{1s},m_{2s})$ such that the household ranks lotteries according to, $W(\boldsymbol{p}) \equiv \sum_{s=1}^{s=S} p_s w(m_{1s}, m_{2s})$. In other words $W(\boldsymbol{p}) \geq W(\boldsymbol{q}) \leftrightarrow \boldsymbol{p} \succeq \boldsymbol{q}$. In a similar manner it is also possible to define utility functions, W^i $(\boldsymbol{p})$ $i = 1,2$, for the two individuals. Note that the relationship between the $W^i s$ and W depends on the household aggregation rule. So the fact that the household choices conform to EUT does not imply that the $W^i s$ satisfy the axioms of EUT – or vice versa.

We shall say that the household *income pools* (IP) or that it is an *income pooler* if $w(m_{1s},m_{2s}) = w(m'_{1s},m'_{2s})$ whenever $m_{1s} + m_{2s} = m'_{1s} + m'_{2s}$ for all s.

Although w has two arguments rather than the one that is typical of individual choice, nevertheless for the household or individual which maximises $W(\cdot)$, preferences between lotteries should have the familiar properties of EUT. Figure 2 shows a standard unit probability triangle representing lotteries involving three possible values of w: w_1, w_2 and w_3, with $w_3 > w_2 > w_1$. In the Figure, the solid line connecting a and e is parallel to that between c and d.

In the unit probability triangle, EUT predicts that indifference curves are straight, parallel lines. However, individuals frequently fail to conform to the predictions of EUT in a number of ways. Possibly, three of the most robust anomalies (Starmer, 2000) are the *common ratio* effect, the *common consequence* effect

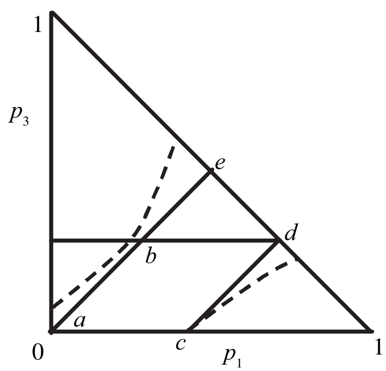

Fig. 2. *Tests of EUT in the Unit Probability Triangle*

and failure of the *betweenness* property. The common ratio effect occurs when individuals choose a out of the pair {*a*,*e*} and then *d* out of the pair {*c*,*d*}, when the lotteries, *a*, *c*, *d* and *e* are such that, as in Figure 2,

(*i*) the line between *a* and *e* is parallel to that between *c* and *d* and
(*ii*) in *e* and *d*, there is a zero probability of the intermediate outcome, w_2.

Note that in this anomaly, the safer option is chosen out of {*a*,*e*}, but then the riskier option is chosen out of {*c*,*d*}. The common consequence effect occurs when *a* is chosen out of a pair {*a*,*b*} and *d* is picked from {*c*,*d*}, where *a*, *b*, *c* and *d* are such that:

(*i*) the line between *a* and *b* is parallel to that between *c* and *d*;
(*ii*) as in Figure 2, lotteries *b* and *d* share a common consequence in the sense that they have the same probability of w_3 and the same is true for *a* and *c*.

Betweenness is the property that if, as in Figure 2, lottery *b* is a probability mixture of lotteries *a* and *e*, then the utility of *b* should between that of *a* and *e*. For example, EUT implies that individuals who choose *b* out of {*a*,*b*} in Figure 2 should choose *e* out of {*a*,*e*}, whereas often individuals choose *b* and then *a*. Indifference curves in the triangle therefore seem to be more like the broken lines depicted in Figure 2, than the straight and parallel lines implied by EUT. Now all of these anomalies are well documented in individuals. We use them to interpret the experimental test reported below where we see if couples exhibit similar patterns of revealed preferences.

2. Experimental Design

Figure 3 summarises the design. Upon entering the venue, one member of the couple was randomly allocated either a 'wave' or 'triangle' card, their partner receiving the other card. This allocation of cards was then used to separate the pair. The first two sections of the experiment were conducted with the separated partners in different rooms; pairs then rejoined each other for Section 3. Throughout the experiment the investigators used a script (available from the authors) and subjects received instructions (including a written summary) one section at a time.

In the experiment a *task* is a pair of lotteries, such as the one depicted in Figure 1, which could either be presented to an individual as a choice question (Section 1) or to an individual as a prediction question (Section 2) or to a couple as a joint choice question (Section 3). The description of each component lottery consisted of three elements: ranges of numbers were shown along the top, underneath which were shown corresponding payoffs for the subject,[3] below which were the corresponding payoffs for their partner. The numbers along the top corresponded to numbered discs in a bag of one hundred discs shown to the subjects by the experimenters.

[3] For the joint choice tasks, the triangle partner's payoffs were always shown first. We found no evidence that this order gave triangle partners more or less influence in the joint decisions.

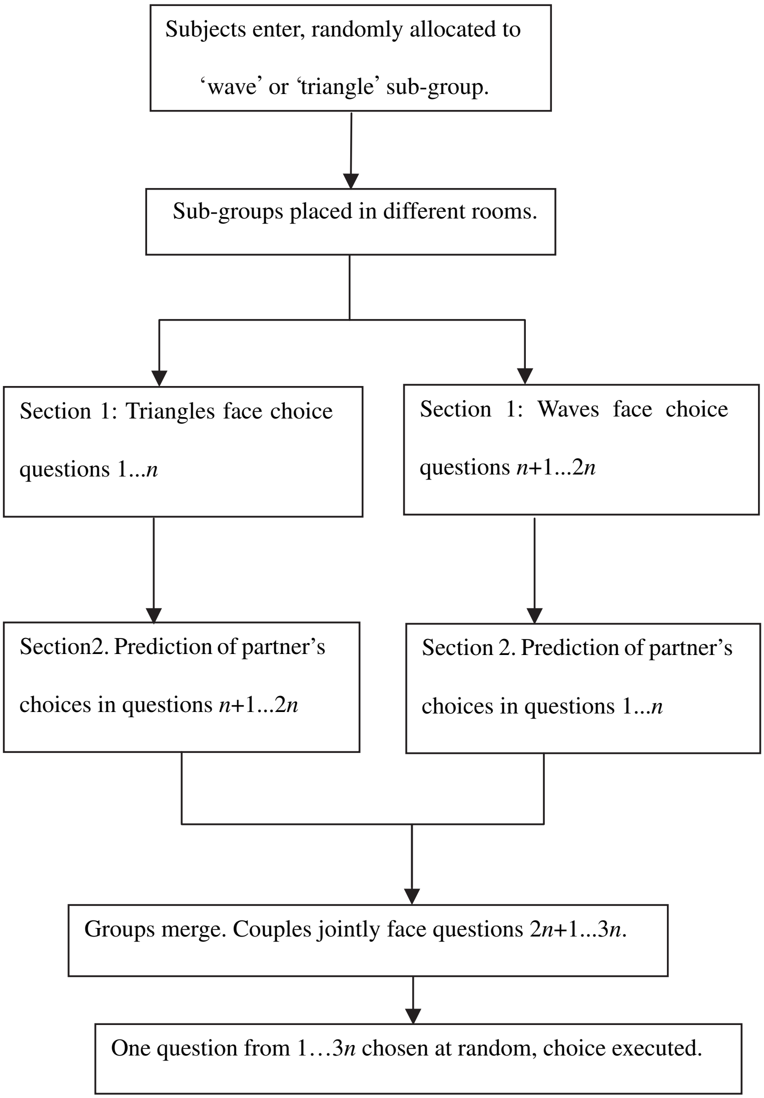

Fig. 3. *Experimental Procedure*

In Section 1 of the experiment the separated subjects had to choose one of the lotteries in each task. They were told that, at the end of the experiment, one task would be chosen at random for each couple and played out for real. If this was one of the tasks from Section 1, the subject would play out the lottery he or she chose in that task by taking a numbered disc from the bag, that number determining the resulting payoffs for them and their partner.

In Section 2, subjects (who remained separated from their partners) were asked to predict their partners' answers from Section 1. Before doing so, they were led through the relevant instructions, including those concerning incentives (see below). After making their predictions, subjects completed a short questionnaire which collected demographic details. Once this was filled in answer books were collected and subjects rejoined their partners for the final section.

In the final section, couples made choices jointly. At the start of this Section each couple selected a small envelope from a shuffled pile of envelopes placed in front of them but were told not to open it until instructed. No prompts were given as to which partner should make the selection. The pile of envelopes contained lottery ticket numbers for all questions from all sections, with one number inside each envelope. The randomly drawn number inside the envelope determined which question the couple would play out 'for real' at the end of the experiment. The subjects were given details of how the payout procedures would operate at the end of the experiment and led through the instructions for Section 3. Once all subjects had completed their tasks, we began opening the small envelopes, executing lotteries and making payoffs.

The incentive system was as follows: for lottery ticket numbers from 1 to n, the triangle partner played his or her choice for that Section 1 question and the wave partner received £0.50 for each correct prediction (in Section 2) of their partner's Section 1 answers. For numbers between $n + 1$ and $2n$, the wave partner played his or her choice from Section 1 while the triangle partner was paid £0.50 for each correct prediction (in Section 2) of their partner's Section 1 answers. For numbers from $2n + 1$ to $3n$, the couple played their joint choice for that question from Section 3 and no money was paid for predictions. This random lottery system[4] is incentive compatible if individuals are selfish (and make no binding agreements on *ex-post* trade), but it would be usual to suppose some degree of other-regarding preferences within couples. As a result, it is conceivable that an altruist might view the first two sections of the experiment as an exercise in co-ordination and possibly choose so as to maximise the predictive success of his or her partner. We aimed to guard against this possibility in three ways. First, prior to the experiment we told participants only that the experiments were aiming 'to help us understand how couples make decisions'. As a second measure the prediction questions (in Section 2) always came after the separate choice questions (in Section 1). We also saved the briefing for Section 2 until all subjects in a session had completed Section 1. So, subjects therefore had no reason to anticipate that they should answer in Section 1 so as to raise the possible payoffs of their partner. As a final measure we kept the payments for prediction to a relatively small fraction of the payments associated with the choice sections. The difference in payments meant that (for example) a risk neutral income pooler would not make an expected gain from switching choices in order to improve the predictive success of their partner.

We went to some trouble to preserve the confidentiality of the answers from sections 1 and 2. Partners were paid sequentially and separately with payments placed in envelopes. The payment process occurred in another room or in a position which masked the payments made. Subjects were not informed of their partner's answers in Section 1 of the experiment and they were not given information about the accuracy of their partner's predictions. Our main reason for

[4] Cubitt *et al.* (1998) provide evidence that random lottery schemes are a reliable means of eliciting preferences even when subjects are not EUT maximisers.

confidentiality is as follows: Many economic theories of the household relate collective choice to individual preferences over goods. To test such theories we normally require data about individual preferences over commodities. Revealing choices to partners might instead produce information on preferences over actions. For instance, it might create incentives for individuals to choose so as to garner approval from their partners. Such motives may actually be an important source of household behaviour but they are not typically the objects of preference in economic theories of the household. So, we opted for confidentiality in our design.[5]

3. Results

Following a successful pilot session, the experiments were carried out from December 2002 to March 2003.[6] Subjects were recruited from the city of Norwich and rural Norfolk via email, through community groups and using posters. Session sizes varied from two to ten couples and were held at a variety of venues, including a village hall and the experimental economics laboratory at the University of East Anglia. In recruiting we required all individuals to be over 21, to be living with their partners and to have been together as a couple for at least one year. We asked subjects to bring evidence of their relationship and made random checks.[7] We recruited 76 couples for our experiment. Average payoffs were just under £17 per individual – more than twice the median hourly post-tax wage for a UK adult in 2003. Ages ranged from 22 to 70, with a mean of 37.3. On average couples had been together for 11 years, with a maximum of 46 and a minimum of 1. Seventy-three per cent of individuals stated that they were married to their current partner and all the couples in our sample were heterosexual. The distribution of children per couple was bimodal with peaks at zero and two and a mean of 1.1. So, without being representative of the UK adult population, the subjects were generally older and more diverse than the typical sample of university students used in choice experiments.

In what follows, the tasks are labelled. Their details can be found in the Appendix. The number identifies the task, while the letter indicates the identity of the decision maker: 'T' means a task was faced by triangle subjects in their Section 1, 'W' stands for tasks faced by wave subjects in their Section 1 and 'J' indicates tasks faced jointly by couples in Section 3.

For both joint and separate choice we included four tasks (T13, J13, W13 and W14) such as the one shown in Figure 1 where one option first-order stochastically dominates the other. For these questions the dominated option was chosen in just under 6% of observations.

[5] If one partner predicted perfectly (or scored zero), then provided she or he had perfect recall, that subject could deduce a partner's choices. No participant raised this possibility with us during the conduct of the experiment or achieved perfection in their predictions (or scored zero).

[6] The initial design had 10 questions in each section, subsequently expanded to 12. Standard statistical tests indicated that there was no significant differences between the data for the questions common to both variants and so these responses were pooled within our analysis.

[7] Evidence included passports, photos, bills to the same address and, in three cases, children.

Recall that IP (income pooling) is a feature of what we termed the standard model. We had seven tasks where one of the options dominates the other, for subjects whose choices satisfy IP (but not necessarily otherwise). In 90% of cases the choice is in conformity with IP and this accordance is stronger for the choices made jointly than for those made when the individuals are separated. Suppose we hold the null hypothesis that in all cases subjects mean to choose the IP dominating option, but make a mistake in 6% of cases (i.e. the rate of 'error' in the choices with one dominating option discussed above). With the exception of one task (T11), the pattern of choices is consistent with this null hypothesis, suggesting that IP is a reasonable assumption in the context of this experiment. We also had a number of tests of IP based on pairs of tasks which are equivalent when faced by a chooser who satisfies the IP property. That data is more mixed in the conclusions it produces; see Bateman and Munro (2003), which focuses on the IP issue. So, the evidence for IP in our data is not overwhelming and we therefore conduct tests of EUT both with and without its presence as an auxiliary assumption.

Tables 1–3 summarise our tests of EUT: figures in Table 1 are based upon the individual choice data, Table 2 draws upon the prediction tasks and Table 3 is based upon joint choices. All the comparisons shown are within subject or within couple. In the first column of these three Tables, entries labelled CR represent common ratio tests, those marked CC represent common consequence tests, while BB indicates tests of the betweenness property of EUT. The next column states whether the comparison is conditional on the assumption of the IP property. If it is, then this means that pairs of tasks can only be plotted in the same unit probability triangle if IP holds. In the two 'proportions' columns, the numbers

Table 1

Tests of EUT Using Separate Choice Data

N	Type of comparison	IP assumed?	Task 1	Task 2	Proportion choosing safer option, Task 1	Proportion choosing safer option, Task 2	Probability
76	CR	No	T6	T8	0.66	0.43	0.000***
76	CR	Yes	T6	T7	0.66	0.54	0.073*
76	CR	Yes	T4	T8	0.78	0.43	0.000***
76	CR	Yes	T4	T7	0.78	0.54	0.001***
34	CR	Yes	W4	W7	0.77	0.53	0.001***
34	CR	Yes	W5	W7	0.71	0.53	0.054*
76	CC	No	T1	T8	0.50	0.43	0.190
34	CC	No	W3	W7	0.53	0.53	0.500
34	CC	Yes	T2	T8	0.53	0.32	0.055*
34	CC	Yes	W2	W7	0.71	0.47	0.028**
76	BB	No	T6	T1	0.66	0.50	0.048**
34	BB	Yes	W5	W3	0.71	0.56	0.042**
76	BB	Yes	T4	T1	0.78	0.50	0.000***

***indicates difference significant at 1% level, 1 tailed test;
**indicates significant at 5% level;
*indicates significant at 10% level.

Table 2
EUT and Prediction Data

			Comparison involves		Proportion predicting safer option		
N	Type of comparison	IP assumed?	Task 1	Task 2	Task 1	Task 2	Probability
76	CR	No	T6	T8	0.70	0.43	0.000***
76	CR	Yes	T6	T7	0.70	0.59	0.051*
76	CR	Yes	T4	T8	0.88	0.43	0.000***
76	CC	No	T1	T8	0.62	0.43	0.011**
34	CC	No	W3	W7	0.47	0.32	0.078*
34	CC	Yes	T2	T8	0.68	0.41	0.024**
34	CC	Yes	W2	W7	0.68	0.32	0.002***
76	BB	No	T6	T1	0.70	0.62	0.068*
34	BB	Yes	W5	W3	0.71	0.47	0.009***
76	BB	Yes	T4	T1	0.88	0.62	0.000***

***indicates difference significant at 1% level, 1 tailed test;
**indicates significant at 5% level;
*indicates significant at 10% level.

represent the fraction of the sample choosing the safer option.[8] According to EUT, the fraction should be the same across the relevant tasks. This is always the null hypothesis. According to the typical results of individual choice experiments the proportion in the task 2 column should be lower. This is always the alternative hypothesis. Taking all of the tables together we see only one instance of equality (the EUT prediction) compared to the remaining 32 cases all of which are in the direction of the alternative hypothesis. In the final column we report probability values for the null hypothesis that the sample proportions are equal, using a paired, one-sided z-test. A large number of these comparisons are statistically significant; in many cases at levels of significance well below 0.1%.

Table 1 summarises results for the separate choice. All the CR and BB comparisons are statistically significant at the 10% level or lower. For two CC cases where the test is not conditional on IP, the difference in responses to the two tasks is not statistically significant.[9] So, broadly speaking the evidence for a common ratio effect and for failure of the betweenness property is stronger than that for the common consequence effect. (Chew and Waller (1986) find a similar pattern in their experiment on individual choice. Later experiments have suggested that the relative strengths of the common ratio and common consequence effect are sensitive to the parameters of the experiment.) In terms of the stylised indifference curves in Figure 2, the pattern of our results suggests that the section between *a* and *b* is roughly parallel to the curve between *c* and *d* but that the indifference

[8] Rabin (2000), argues that choosing the safe option in choices of this kind is prima facie evidence against the EUT model, because it is incompatible with attitudes to risk displayed in other settings. Here, the same argument does not apply because the choice between options also typically reflects intrahousehold inequality aversion.

[9] In a between-subject CC comparison, a proportion 0.53 choose the safer option out of $\{a,b\}$ while 0.43 pick the safer option out of $\{c,d\}$. This is significant at the 10% level ($p = 0.095$).

Table 3

Tests of EUT Using Joint Choice Data

N	Type of comparison	IP assumed?	Comparison involves		Proportion choosing safer option,		Probability
			Task 1	Task 2	Task 1	Task 2	
34	CR	Yes	J4	J7	0.94	0.59	0.000***
34	CR	Yes	J5	J7	0.88	0.59	0.000***
34	CR	No	J10	J7	0.73	0.59	0.013**
34	CC	No	J1	J7	0.71	0.59	0.110
34	CC	Yes	J2	J7	0.71	0.59	0.130
34	CC	Yes	J9	J11	0.44	0.06	0.000***
76	BB	No	J4	J1	0.94	0.64	0.000***
34	BB	Yes	J5	J1	0.88	0.71	0.006***
34	BB	Yes	J4	J2	0.94	0.71	0.002***
34	BB	Yes	J5	J2	0.88	0.71	0.016**

***indicates difference significant at 1% level, 1 tailed test;
**indicates significant at 5% level;
*indicates significant at 10% level.

curves show increasing risk aversion (i.e. become steeper) between *b* and *e*. It is worth noting that this pattern persists, even when the identity of the recipient of payoffs changes – for some of the tasks the payoffs are to the choosing agent, but for many tasks both partners might possibly receive payment and in several cases it is only the partner that might receive payments. Nevertheless the pattern of choices is consistent.

Table 2 presents the data from the prediction section of the data. These tasks are the same as those in Table 1, but it is the other partner who is doing the predicting. All the comparisons are statistically significant, even with the CC examples. So, the results suggest that prediction deviates significantly from EUT. When we look at the prediction data in detail we find that partners predict correctly in 65% of cases. This is significantly better than 50–50; it is also better than the success rate if they supposed (as a benchmark example) that their partner was a risk neutral income pooler. However, if individuals predict according to how they themselves choose and preferences are not correlated within couples then the predicted success rate is 64.7% – which is not statistically significantly different from the actual value.

The fact that, when separated, individual partners depart from the standard model in their choices does not mean that those individuals have non-EUT preferences. They may be altruists who believe that their partners have non-EUT preferences. Similarly, in the absence of common knowledge, it cannot be deduced that individuals who predict anomalous behaviour in their partners actually believe that their partners have non-EUT preferences. If, though, this was the case, then we would expect the possibilities for communication afforded by the joint decision-making responsibility of Section 3 to iron out any misunderstandings. In fact, as Table 3 shows, with and without the auxiliary assumption of IP the joint choice data exhibit the same patterns as the prediction and separate choice data. It suggests that the departure from EUT reported in Tables 1 and 2 is not due to misconceptions about the preferences of partners. Rather, it seems to be a persistent feature of choice in the context of multi-person households.

Table 4 summarises comparisons of choices made jointly (in Section 3) and when separated (in Section 1) for the tasks where one option is safer than the other and where all the trade-offs are in one partner's payoffs. Note that, when viewed by Wave and Triangle subjects, these tasks appear *reflected* in the sense that, for any given task, payoffs which belong to the self when Wave chooses belong to the partner when Triangle chooses and vice versa. Three things are particularly notable in Table 4. First, the proportions for Wave and Triangle subjects are very close – in other words subjects appear to place equal weight on their partner's payoffs as on their own and are not more or less risk averse when it is their partner who faces the risk rather than themselves. Second, perhaps surprisingly, choices made jointly are consistently more risk averse than those made separately, to the extent that, as the penultimate column shows, in three of the four cases the difference is statistically significant whichever partner is taken as the benchmark. It is not clear to us why this result occurred. For example, standard risk sharing arguments would predict joint choice would exhibit less risk aversion, since it gives opportunities for agreeing to ex-post risk sharing transfers. We can also rule out misperception of the partner's degree of risk aversion as the explanation, since there is no evidence for such a bias in the prediction data. Possibly, the result is due to the psychology of group choice, one robust feature of which (Kerr *et al.*, 1996) is that collective decisions are typically more extreme than their individual counterparts. Yet, in our case it is not clear why the safe option should be viewed as more extreme. A final possibility is suggested by anecdotal evidence from our participants, some of whom suggested a 'fear of recrimination' as a significant factor influencing joint choices. This could make some participants reluctant to be seen to be pressing for the risky option.

Table 4
Comparison Between Choices Made Jointly and Separately

	Proportion choosing safer option			Tests	
	Separate choice		Joint Choice		
Task	Triangle	Wave	Joint	Test of Equality	Correlation (p-value)
1	0.5	0.53	0.64	0.030**	0.053 (0.649)
4	0.78	0.77	0.94	0.000***	0.175 (0.322)
7	0.54	0.53	0.64	0.059*	0.016 (0.889)
9	0.35	0.39	0.44	0.364	−0.092 (0.611)

'Test of Equality' is the p-value associated with the test of equality between the joint choice value and the closest value from separate choice. 'Correlation' is Kendall's Tau B correlation between the separate choices; the associated p-value is for the null hypothesis that the correlation coefficient is zero.
***indicates difference significant at 1% level, 1 tailed test;
**indicates significant at 5% level;
*indicates significant at 10% level.

The final column of the Table also gives pause for thought as it shows the lack of correlation between the separate choices of the partners. These correlations are not just low, they are never even remotely significantly different from zero. We do find high levels of correlation within the choices made separately by individuals, so the data in the final column is not simply evidence of randomness. Rather it suggests that there is little correlation in risk attitudes towards monetary lotteries within couples.

4. Discussion

The fact that the preferences of two individuals separately conform to the assumptions of EUT does not imply that their collective decisions will always obey the same axioms. Conversely, depending on the household decision process, it is possible that two individuals with non-EUT preferences can produce collective choices that do satisfy the predictions of EUT. It follows that tests of whether the decisions of established couples conform to EUT are logically separate from the issue of whether individual decisions satisfy the theory. Nevertheless, in this experiment a clear result is that couples show the same anomalous patterns in their risky choices as have been frequently observed in individual choice experiments. When separated from their partners, individuals who are part of a couple also show the same patterns and predict the same patterns in their partner's choices. The results of the experiment also suggest that the results are robust in the face of changes in the identity of who in the household receives the payoffs.

In the face of individual choice anomalies many alternatives to EUT have been proposed (e.g. regret theory, prospect theory, etc.). To a significant degree, these theories have been motivated by ideas drawn from the psychology of the individual. The same ideas may not automatically apply for the household, where decisions are typically made interactively; other forces may be at work in the results found here. For instance, we found an unexpectedly high incidence of examples where joint choice was more risk averse than choices made separately. If such patterns are a feature of many households it would suggest that behavioural models of collective decision making may be quite different to their individual counterparts.

University of East Anglia and University of Western Australia
University of East Anglia

Appendix

The Tasks

		Lottery 1				Lottery 2			
		Triangle		Wave		Triangle		Wave	
Task number	Subjects	£20	£40	£20	£40	£20	£40	£20	£40
1	T, W, J	1–100	–	–	–	21–70	71–100	–	–
2	T, W, J	21–100	–	1–20	–	21–100	–	71–100	–
3	W	–	–	1–100	–	–	–	21–70	71–100

Table (*Continued*)

		Lottery 1				Lottery 2			
		Triangle		Wave		Triangle		Wave	
Task number	Subjects	£20	£40	£20	£40	£20	£40	£20	£40
4	T, W, J	1–100	–	–	–	–	–	–	41–100
5	W, J	1–50	–	51–100	–	41–100	–	41–100	–
6	T	1–100	–	–	–	–	41–100	–	–
7	T, W, J	–	–	51–100	–	–	–	–	71–100
8	T	51–100	–	–	–	–	71–100	–	–
9	T, W, J	1–100	–	1–100	–	1–100	–	21–70	71–100
10	T, W, J	–	–	1–100	–	–	1–70	–	–
11	T, J	51–100	–	1–50		1–100	–	–	71–100
12	W	31–100	–	1–30	–	–	71–100	1–100	–
13	T, W, J	1–50	–	51–100	–	1–50	51–100	51–100	–
14	W	1–70	–	21–70	71–100	71–100	–	1–70	–
15	J	–	71–100	1–70	–	1–60	61–100	–	–
16	J	–	–	21–70	71–100	1–40	–	–	71–100

Note: Task numbers do not match the order of questions, but are for reference purposes. The letters under 'Subjects' identify the groups that faced the task as a choice question. Numbers show the ranges of disc values for which the corresponding payoffs were awarded, with the numbers omitted for disc values where the payoff was zero. We also omit tasks which are not relevant for this paper.

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