Do Spouses Cooperate? And if Not: Why?

FRANÇOIS COCHARD, HÉLÈNE COUPRIE

AND ASTRID HOPFENSITZ

DO SPOUSES COOPERATE? AND IF NOT: WHY?

FRANÇOIS COCHARD[†]   *HELENE COUPRIE[‡]*   *ASTRID HOPFENSITZ[*]*

December 2009

ABSTRACT:

Models of household economics require an understanding of economic interactions in families. Social ties, repetition and reduced strategic uncertainty make social dilemmas in couples a very special case that needs to be empirically studied.

In this paper we present results from a large economic experiment with 100 maritally living couples. Participants made decisions in a social dilemma with their partner and with a stranger. We predict behavior in this task with individual and couples' socio-demographic variables, efficiency preferences and couples' marital satisfaction. As opposed to models explaining behavior amongst strangers, the regressions on couples' decisions highlight clear patterns concerning cooperation behavior which could inspire future household decision-making models.

JEL: C72 - Noncooperative Games; C91 - Laboratory, Individual Behavior; D13 - Household Production and Intra-household Allocation

_____

[†] fcochard@univ-fcomte.fr, Université de Franche-Comté (CRESE), France;

[‡] helene.couprie@u-cergy.fr, Université de Cergy-Pontoise, THEMA, F-95000 Cergy-Pontoise, France

[*] astrid.hopfensitz@univ-tlse1.fr, Toulouse School of Economics (GREMAQ), France

1. INTRODUCTION

Behavior in social dilemmas has received much attention since the first discussion of the prisoners' dilemma by Flood and Dresher in 1950 (Poundstone, 1992). The focus has been mostly on explaining why cooperation does exist and persist in anonymous, non-repeated interactions for which opportunism is predicted. However, the other extreme, namely non-anonymous and repeated dilemmas played by friends and families, has so far received little attention. Given that households form a large and important part of the economy, intra-family behaviors need to be incorporated into economic models. Models of family economics have received an increased interest since Becker (1981); however the theory of household decision-making is still far from an accurate representation of reality. This is mainly due to a lack of evidence concerning the validity of the underlying assumptions of the models, especially those concerning individual egoism and efficiency. Experimental economics has helped uncover many of the principles concerning strategic interactions between individuals. Since experiments are usually done with participants anonymous to each other, results from such studies can only be partially applied to households. Family ties will most likely lead to strategies distinct from those applied to strangers. This paper experimentally studies the effect of such ties on economic behavior in couples. We thus combine two important contributions to the literature: we investigate the underlying assumptions of household models and extend results from experimental economics to the very special subject pool of couples.

Strategic interactions in pair wise social dilemmas have been extensively studied in experimental economics and psychology (Suleiman et al., 2004). Partners in such experiments are usually participants that meet for the first time in the experimental environment. Nevertheless cooperation is observed even among unknown strangers. However it is most likely that interacting with a partner that is personally known and to which exists a strong social tie (van Winden et al., 2008) will induce a variety of additional effects. Naturally interactions with friends and family are always repeated, thus concerns for reputation and reciprocity might increase cooperation levels. From the Folk Theorem we know that cooperation can be sustained in repeated games. In families and with friends, cooperation might be also enhanced by other factors. Friends might be able to predict their behaviors, therefore reducing the strategic uncertainty of a game. Further, friends and family are most

likely weighted more strongly than strangers in a utility function including other regarding preferences (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). Taken together we would expect strong cooperation and coordination between players that know each other.

In couples' real decision-making process, a variety of games exists where behavior cannot be observed by the partner. Examples include situations where earnings or effort can be hidden from the partner. Incomplete information concerning salary primes, monetary presents or pay raises can lead to dilemma situations in the couple. Revealing the increase and investing in the couples common good can lead to efficiency increases whereas an individual incentive exists to use the extra money for private consumption. Similarly investment in the family (job change, moving and the decision to have children) depends on the trust that the partner will be cooperative in the future. This cooperation cannot be enforced by a contract and thus represents a situation of limited commitment. The question is thus whether strategies employed in repeated, public interactions will necessarily spill over to one-shot interactions for couples where actions are not observed. Our aim is to investigate the question whether couples do cooperate in an anonymous one-shot setting and to identify which variables can predict whether couples will cooperate or not. This will enhance our understanding of behavior of couples in anonymous social dilemmas played in the family.

Some of the aspects characterizing couples have already been experimentally studied. To test effects of joint group membership, participants are sometimes given more or less time to get to know each other and to familiarize. In psychology the minimal group paradigm (Tajfel et al., 1971) has been used to show that randomly grouped participants favor members of their own group over member of other groups, even if groups had been randomly created in the laboratory. More recent experiments on in-group versus out-group favoritism have investigated this paradigm with natural groups, e.g. officers from different platoons in the Swiss army (Goette et al., 2006) or from small indigenous groups in Papua New Guinea (Bernhard et al., 2006). However even though in these experiments group membership was known, the concrete identity of the partner was still unknown to players. Some experiments further allowed face-to-face contact and communication before the experiment (Bochet et al., 2006; Bohnet and Frey, 1999). These studies show that identifiability of the partner increases cooperation. Only a few studies explicitly investigated the social ties that participants had formed outside the laboratory (Reuben and van Winden, 2008). We will go even one step

further. Not only do the partners known with whom they are playing and know this person from outside the laboratory, but this person is also the partner with whom they share bed and board.

Only few studies have previously used couples to study behavior in economically relevant tasks. De Palma et al. (forthcoming) investigate the link between the individuals' and the couple's attitude toward risk. Bateman and Munro (2005) test various features of household decision making, including Pareto-optimality and income pooling. However their focus is on decisions in a risky environment, using an experiment involving choices between lotteries. Ashraf (2009) investigates spouses' saving decisions under various conditions. We are only aware of two studies dealing with family behaviour in social dilemma games. Peters et al. (2004) study the behaviour of family members in a public good game. Contributions within the family are higher than with strangers, however still below full cooperation, at approximately 84%. Iversen et al. (2006) find that couples in rural Uganda, fail to achieve the efficient outcome in a variant of a public good game. Altruism is not rejected, but there is evidence for opportunism, i.e. the tendency to hide one's initial endowment from the partner.

Many economic studies have already investigated which factors can predict behavior in anonymous non-repeated interactions (Roth, 1995). Even though the precise mechanisms are still not fully understood, a number of potentially important demographic and psychological variables have been discussed. Many studies have concentrated on gender differences in cooperation (e.g. Andreoni and Vesterlund, 2001). However the evidence from existing studies is mixed. Indeed it seems that men and women react differently to the context and framing of a situation and that therefore dependent on studies different results have been observed (Croson and Gneezy, 2008). Psychologists and economists have further worked on identifying a personality profile predictive of cooperation in social dilemmas (e.g. van Lange et al., 1997). The classification instrument proposed by van Lange et al. (1997) includes the category of 'prosocial' which seems predictive of cooperation. It is worth noting that this classification is based on a preference of choices that are joint income maximizing (i.e. 'efficient'). Thus a concern for efficiency will most likely increase the tendency to cooperate in a social dilemma. Also explicit empathy for the partner leads to higher cooperation rates (Batson and Moran, 1999). Further there have been a number of studies on the impact of education and intelligence on cooperation. It seems that intelligence has a positive impact on

(a)	D	C
D	200, 200	310, 135
C	135, 310	245, 245

(b)	D	C
D	200, 200	310, 160
C	110, 310	220, 270

FIGURE 1: (A) SYMMETRIC PRISONERS' DILEMMA; (B) ASYMMETRIC PRISONERS' DILEMMA WITH ROW PLAYER FACING HIGHER EFFORT COST

cooperation (Jones, 2008) however that training in economics has a negative impact (Frank et al., 1993). Finally there have been a number of attempts to relate risk aversion to decisions involving strategic uncertainty (Eckel and Wilson, 2004), but evidence is mixed and gives to date no clear results.

The aim of this paper is to study behavior in a social dilemma game played by spouses. We report results from a large economic experiment on 100 couples that participated in three one-shot prisoner's dilemma games. To observe cooperation levels in repeated interactions in couples we also study a bargaining task within the couple. Outcomes enable us to observe the increase in opportunism when spouses are sure that their decisions are unobserved. We will then explain this opportunism by taking into account individual and couple characteristics. Specifically we regress behavior in the prisoner's dilemma on a number of individual characteristics (gender, age, education, income), characteristics of the couple (marriage, children, differences in education level) and attitudes towards the couple (concern for efficiency in the couple, psychological harmony). As opposed to models explaining behavior amongst strangers, the regressions on couples' decisions highlight clear patterns concerning cooperation behavior which could inspire future household decision-making models.

The rest of the paper will be structured as follows. Section 2 will introduce the specific experimental tasks and present hypothesis concerning behavior of couples. Section 3 will specify the methods used for the experiment. Section 4 will present results and section 5 will conclude.

2. TASKS AND HYPOTHESES

Our study presented couples with three variants of a prisoner's dilemma and a bargaining task. In this section we will briefly present these tasks and present our hypotheses concerning behavioral differences of couples compared to partners not knowing each others. Spouses

further participated in a number of other tasks and answered a series of questionnaires that will be later used as explanatory variables of couples cooperation. We will present the included tasks in section 2.2.

2.1. PRISONER'S DILEMMA AND BARGAINING

Many decisions in households are taken simultaneously, independently and provide strong incentives to free-ride on the other. Examples include the possibility to hide unexpected income like salary primes or presents. Naturally most other interactions in the couple are repeated and communication is possible. We therefore presented participants with a number of prisoner dilemma games to investigate dilemmas where actions are unobservable and a bargaining task to provide a baseline of cooperation when communication is allowed.

Couples participated in a total of three prisoner dilemma games. Two of these games were symmetric and one was asymmetric (see Figure 1). In the first symmetric game spouses played with their partner, while in the second symmetric game they played with another participant of the same sex as their partner. Our predictions are that participants are more likely to cooperate when interacting with their own partner, than with a stranger.

The third game was designed to stress-test the couple's propensity to cooperate. Again participants interacted with their partner, however faced an asymmetric game (see Figure 1:B), where one of the spouses experienced a higher effort cost. By introducing inequality in the pay-off functions and changing the individual incentives to deviate from the cooperative outcome, this game introduces a tradeoff between efficiency and equity. The question is whether inequality in the pay-off functions will reduce spouses' propensity to reach the Pareto-efficient outcome. Both directions concerning intra-household inequality are explored: male disfavored and female disfavored. The symmetry of the results can reveal whether there exists a gender difference in the taste for inequality and whether or not either case is less costly at the collective level.

It should be noted that participants were guaranteed that their behavior in each of the three prisoner's dilemma would stay completely unobservable. Even though they knew with whom they were playing we stressed that participants could not deduce from their earnings the move of their partner. This was done by selecting randomly only one decision out of many for each task and giving only total earnings over a variety of tasks to participants. Thus we could

guarantee to participants that their partner would never be able to find out about their behavior.

While observations from the prisoner's dilemma give us information about cooperation in anonymous interactions in couples we still have to control for the hypothesis that couples will strongly cooperate when interactions are repeated and choices are common knowledge. We therefore presented spouses with a bargaining task for which we can observe to which degree couples arrive at the efficient or egalitarian bargaining outcome. The task was a free-form unstructured bargaining game, allowing for any kind of bargaining structure and free transfer of tokens between partners.

The game we employed is similar to other free form bargaining games (e.g. Nydegger and Owen, 1975; Gaechter and Riedel, 2005). Participants were each endowed with 10 tokens and received independently an exchange rate concerning their token to money. Two exchange rates were possible, a high rate of 0.40 euro for one token and a low rate of 0.20 euro for one token. The probability to receive either exchange rate was equal to 1/2.[1] Each participant received his exchange rate in private. Bargaining concerned the distribution of the total of 20 tokens between the two partners.

Participants were free to send any kind of written messages to their partner and had to reach an agreement in a limited time span. Particularly they could also reveal their exchange rate if they wished, however partners were unable to verify such information. Contrary to other bargaining games, the identity of the bargaining partner was known to participants, i.e. they were informed that they were playing with their spouse.

Earlier studies have investigated the complete as well as the incomplete information case of this game. Outcomes can be classified in three categories: aiming for equality; own payoff maximization; or efficiency. However efficient outcomes are usually not reached when strangers interact. Under complete information about the other partners exchange rate high levels of final payout equality are observed (Roth et al., 1981), whereas under incomplete information a stronger incentive for free riding exists. Due to the strong effects in the complete information case, we will only study the case of incomplete information for couples.

---

[1] Note that because of this random draw only about half or our couples will be endowed with different exchange rates. Due to this design feature we can draw from this game only conclusions concerning overall efficiency in couples and not deduce a measure of efficiency for each couple.

Our interest concerns whether couples will focus on equal distribution in final payoffs or on an efficient outcome that might be unequal across spouses.

2.3. INDIVIDUAL AND COUPLES CHARACTERISTICS

To explain behavior in the social dilemma a number of characteristics of the individual and the couple were collected. Specifically we measured the socio-demographic characteristics of the couple and the individual, the individual concern for efficiency and the psychological harmony in the couple.[2] We will discuss these factors in the following.

a. Efficiency

Cooperative behavior in a prisoners' dilemma might be influenced by the specific weight that is given to efficiency gains. Van Lange et al. (1999) showed that prosocial individuals are more likely to cooperate in a prisoner's dilemma. Even though this classification is correlated with efficiency it does not provide a measure of the strength of the individuals concern for efficiency. Indeed it seems likely that there is a trade-off between efficiency and equity. To control for this we presented couples an individual dictator-like distribution task. Results from this task will be used as an explanatory variable concerning cooperation in the social dilemma games.

In the efficiency task participants had to decide between two allocations of points between themselves and their partner. Each decision gave the choice between an option A which consisted of an equal split of an amount X, and an option B which consisted of the distribution of an amount αX (with $\alpha > 1$). The distribution for option B got varied across decisions (see Table 1). Participants were presented with two tasks of this type. The first with $\alpha = 1.125$, the second with $\alpha = 1.5$. Naturally option B is always efficient. However there might be a tradeoff between equity and efficiency, leading participants to prefer the equal but inefficient option.

TABLE I: DISTRIBUTION TASK

	low option (A)		high option (B)	
	share for self	*share for other*	*share for self*	*share for other*
1.	*X/2*	*X/2*	*0*	*α X*
2.	*X/2*	*X/2*	*1/6 α X*	*5/6 α X*
3.	*X/2*	*X/2*	*1/3 α X*	*2/3 α X*
4.	*X/2*	*X/2*	*1/2 α X*	*1/2 α X*
5.	*X/2*	*X/2*	*2/3 α X*	*1/3 α X*
6.	*X/2*	*X/2*	*5/6 α X*	*1/6 α X*
7.	*X/2*	*X/2*	*α X*	*0*

For strangers we would expect a choice of option B for decisions where their own share is larger than their partners (i.e. 4 to 6). Option A will be chosen when inequality very much disfavors the decision maker. At which percentage efficiency is regarded as more important than inequality will depend on the individuals' preferences (decisions 1, 2 and 3). Further, dictator games have shown that equality might be favored over complete egoism (decision 7) even in an anonymous setting. Behavior in couples might deviate in two directions from this. Due to the non-anonymity of couples' interactions, fairness and equality might have a stronger weight. However the assumption of income pooling after the experiment, could lead to a stronger preferences for efficient outcomes. Our interest is to evaluate the strength of couples' preferences for efficiency, even if this decision is not communicated to their partner.

b. Sociodemographic questionnaire

We collected individual and household data that might help explain cooperative as well as income pooling tendencies. These include information on: age, education, employment, leisure time, domestic work and variables concerning the individuals' financial situation. On the couples' level we have information on the number of year of joint life, number of children, household income and joint assets. We further asked spouses to indicate their partners' income; a measure that can be used to evaluate to which degree they are informed about the wealth of their spouse. To control for the possibility of income pooling we asked couples

whether they owned an individual and/or joint bank account.[3]

c. Psychological questionnaire

Due to the obvious importance of trust and other regarding preferences on cooperation, we also have to consider the relationship between partners. Even though social ties are expected to be strong among spouses, across couples we are likely to observe a large heterogeneity. To control for this, we asked participants to fill out a strictly anonymous personality questionnaire to measure adjustment in the couple (dyadic adjustment scale; Spanier, 1976)[4]. This 32 item questionnaire is a widely used and validated instrument to investigate happiness, harmony and trust in a couple. It has been shown to be a very good predictor of success in couple counseling and has been used in studies of unusual stress (unemployment, illness, etc) in couples (Baxter, 1988; Kinnunen and Feldt, 2004; Prouty et al., 2000). We expect that this measure will also be predictive of cooperative and trusting behavior in our economic games.[5]

3. METHODS

The experiment was conducted in June 2008 at the Toulouse School of Economics, France. Participants were recruited by newspaper reports about the ongoing study, flyers and information provided on a website. The recruitment information specified that heterosexual couples, between 25 and 65 years old were invited to participate in a study of economic decisions in couples. Couples were required to live together[6] and invited to sign up jointly for one two hour session. The announcements further specified that each participant would earn, dependent on his decisions and on chance, an amount between 20 and 60 Euros for participation.

In total 101 couples participated in the study. Mean age was for men: 35.3 years and for women: 33.5 years and couples had been living together for an average of 7.9 years. We

---

[3] Owning a joint or individual bank account is likely to be information about couples' income pooling behavior than the actual sharing of earnings from the experiment. Actual income pooling of experimental earnings is not observable and statements might be biased by norms, guilt feelings or by the fact that income pooling is done unconsciously (McCabe and Smith, 2001).

[4] We will use the validated French translation of the dyadic adjustment scale according to Baillargeon et al. (1986).

[5] Of the four subscales the "affective expression" subscale was suppressed for this study due to its possibly too offensive nature. The three remaining subscales are: Consensus, Satisfaction and Cohesion (see Appendix B).

[6] A number of control questions that were part of the demographic questionnaire were used to check whether participants were truly in a relationship.

conducted a total of 19 sessions, with at least 4 and at most 6 couples being present. The experiment was conducted by paper and pencil in a class room at the Toulouse School of Economics. Great care was taken to explain each part of the instructions as simple as possible and decision sheets were presented in a graphically intuitive way (see Appendix C). Computers were avoided due to the large variance in age and educational backgrounds of our participants.

Upon arrival participants were invited to a reception room that provided some refreshments and journals. When all couples had arrived, we announced that the study was about to begin and that participants should not communicate in the lab. Couples were seated couple by couple in six rows of tables in the laboratory. Men respectively women, were all seated on the same side of the room. Partitions divided the tables of a couple. The layout of the room was such that participants were well aware that their partner was seated on the other side of the partition, however they were unable to see them during the study.

Couples participated in five experimental parts and a questionnaire part. The timeline of the different parts of the study is described in Table 2. Instructions to the different parts of the experiment were always read aloud and explained by help of video projection of the decision sheets. Participants were actively encouraged to ask questions if something was not clear to them. After instructions were read, a short summary of the instructions was distributed and participants had to answer a short control question to test their understanding. When participants had finished reading the summary they were invited to mark their decision on the decision sheets.

TABLE II: TIMELINE OF EXPERIMENTAL SESSION

0)		Welcome and general instructions
1)		Prisoners dilemma games
	a.	own partner - symmetric
	b.	stranger - symmetric
	c.	own partner - asymmetric
2)		Risk aversion task
3)		Free form bargaining with written exchange of messages
4)		Distribution choices
5)		Sociodemographic questionnaire
6)		Psychological questionnaire (Marital adjustment scale)
7)		Individual private payout and good bye

Initial instructions informed participants that they were about to participate in a study on decision making in which they have to take a number of decisions. It was explained that the study would consist of a number of separate parts, each part consisting of one or more decisions to be taken. Earnings from the experiment were calculated in an experimental currency ("Francs Toulousains": FT), which were exchanged to euro at the end of the session. It was stressed that decisions were individual, private and anonymous and that especially their partner would have no opportunity to find out about their choices. To ensure anonymity and to incentivize all choices, one decision from each part was randomly selected at the end for payout. Participants were only informed about their aggregate earnings and thus could not deduce from their earnings the choices of their partner.

Part one of the study consisted of a series of prisoner dilemma games. Participants first interacted with their partner, then with another participant of the same sex as their partner and were finally exposed to the asymmetric game in which they again interacted with their partner. One of the three situations was later selected for payout. In the second part of the study participants responded to the risk aversion task from Holt and Laury (2002). One of the choices was later selected for payout. In the next part couples were bargaining over the distribution of a number of tokens. The fourth part of the experiment consisted of a number of distribution choices, in which each partner had to choose between an equal and an unequal but more efficient distribution. One of the choices from either the man or the woman was later

TABLE III: REPRESENTATIVENESS OF PARTICIPANT POOL FOR THE URBAN AREA OF TOULOUSE

Age range	population census	participants
20-29	31,62 %	43,56 %
30-39	26,40 %	32,67 %
40-49	23,58 %	11,39 %
50-59	18,40 %	12,38 %
Occupation		
Employed	65,87 %	80,20 %
Unemployed	11,21 %	7,43 %
Inactive	22,93 %	14,36 %
Socio-professional characteristics		
1 – Farmers	0,16 %	0,00 %
2 – Tradesmen, Shopkeepers and Business Owners	4,16 %	3,89 %
3 – Mangers and Secondary / University Teachers	14,48 %	23,89 %
4 – Intermediate Professions (elementary school teachers; healthcare professionals; technicians)	21,21 %	36,67 %
5 – White collar workers (police; office workers; shop assistants)	22,24 %	28,33 %
6 – Blue collar workers	13,28 %	5,56 %
7 – Retired	1,43 %	0,56 %
8 – Other inactive	23,02 %	1,11 %

selected for payout.

When all couples had finished, a volunteer among participants was chosen to supervise the randomization procedure to decide which decisions would be paid out for real. For this the participant had to roll dice under supervision or pick a random number out of a box with numbered tickets. We then proceeded to the calculation of gains and earnings. Participants were asked to regain their original seats in the laboratory and respond to a final questionnaire. Again it was stressed that answers to the questionnaire were completely anonymous and that especially their partner would have no opportunity to be informed about their answers. Participants were provided with an envelope for the questionnaire, in which they could return it once they were done. Participants that had finished were invited to wait in the reception room for final payment. Once everybody had finished, participants were paid one by one in a separate room. Average earnings per participant were about 38.66 euro (approx. 60 USD[7]) and average earnings per couple 77.32 euro (approx. 120 USD).

---

[7] Exchange rates June 2008.

4. RESULTS

In the following section we present general descriptive statistics of our data. In section 4.2. we extend this discussion and use individual and couples characteristics to explain behavior in the social dilemma.

4.1. GENERAL DESCRIPTIVE STATISTICS

DEMOGRAPHIC DATA

We collected a large number of individual and household variables to access the demographic characteristics of our sample. Participants were recruited through newspaper announcements in the city of Toulouse and our first concern is whether our participants sample can be seen as representative for the population of the urban area of Toulouse. Table 3 compares our subject pool concerning age distribution, occupation and socio-professional characteristics with data from the last population census of the urban area of Toulouse (population census INSEE, 1999). We conclude that our subject pool can be regarded as a rather representative sample of the population in this area. We have a slight bias to younger people and participants that are employed. Also farmers and blue collar workers are somewhat underrepresented in our subject pool. However these deviations seem unavoidable given the voluntary basis of the study and the selection bias of people that find participation in such a study valuable and interesting.

We summarize mean ratings for a number of individual and household variables in Table 4. Overall 44% of our participating couples were married and 40% had at least one child. Participating couples had an average of 0.65 children.

TABLE IV: OVERVIEW OF DEMOGRAPHIC VARIABLES OF PARTICIPANTS (100 COUPLES)

Household variables:	Overall mean	(std dev)				
Married (dummy)	0.44	(0.50)				
Years as couple	7.86	(8.83)				
Children (dummy)	0.40	(0.49)				
Children younger than 3 (dummy)	0.14	(0.35)				
Number of children by couple	0.65	(0.93)				
Household assets (in 1000 euros)	181.48	(317.24)				
Joint account (dummy)	0.57	(0.50)				

Individual variables:	Overall mean	(std dev)	Men	(std dev)	Women	(std dev)	Corr. in couple
Age	34.39	(9.94)	35.30	(9.99)	33.48	(9.85)	0.899
Years of study above age of 16	5.78	(4.04)	5.96	(4.18)	5.59	(3.90)	0.179
Employed (dummy)	0.80	(0.40)	0.80	(0.40)	0.80	(0.40)	0.127
Unemployed (dummy)	0.07	(0.26)	0.09	(0.29)	0.06	(0.24)	0.068
Inactive (dummy)	0.14	(0.35)	0.13	(0.34)	0.16	(0.37)	0.076
If employed: hours worked per week	36.26	(8.18)	38.54	(6.51)	33.97	(9.03)	0.057
Weekly hours of household work	7.00	(6.40)	6.27	(5.10)	7.72	(7.44)	0.201
Individual monthly net income	1499.65	(857.23)	1663.39	(954.71)	1335.92	(715.13)	0.212
Knows perfectly income of partner (dummy)	0.56	(0.50)	0.62	(0.49)	0.50	(0.50)	0.074
Overestimation of partners income (dummy)	0.07	(0.26)	0.03	(0.17)	0.12	(0.33)	0.296
Underestimation of partners income (dummy)	0.23	(0.42)	0.25	(0.43)	0.21	(0.41)	-0.124
Correct estimation of partners income (dummy)	0.70	(0.46)	0.72	(0.45)	0.67	(0.47)	0.040
Individual assets (in 1000 euros)	47.97	(112.64)	51.71	(114.48)	44.23	(111.21)	-0.011
Individual debts (in 1000 euros)	8.66	(32.82)	14.12	(44.55)	3.19	(10.92)	-0.055
Lived in couple before (dummy)	0.28	(0.45)	0.28	(0.45)	0.29	(0.46)	0.291
Individual bank account (dummy)	0.79	(0.41)	0.80	(0.40)	0.78	(0.42)	0.640

Not surprisingly we observe that men report slightly more weekly hours of work (if employed) and that women report more hours of household work. Net income of men is higher than income of women. We further observe that men are on average more likely to know the income of their partner (62%) compared to women (50%). Women are more likely to overestimate their partners' income (12%) while men are more likely to underestimate their partners' income (25%). Finally men hold more assets individually but also have higher debts than women.
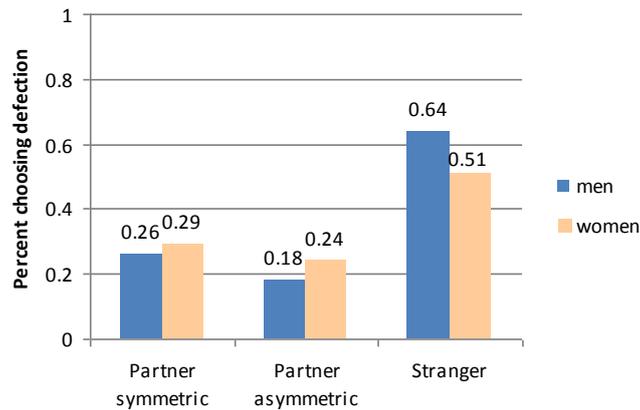
FIGURE 2: PROPORTION CHOOSING OPPORTUNISTIC MOVE IN PRISONERS' DILEMMA GAME

PRISONERS DILEMMA AND BARGAINING

Cooperation in the prisoners' dilemma that participants had to play with a randomly selected partner is 42.50 %. This rate of cooperation with strangers is very close to what was observed by Cooper et al. (1996) at the beginning of their series of one-shot games[8].

Mean cooperation in the (symmetric) prisoners' dilemmas that spouses played with each other was 73%.This difference is highly significant (sign test for matched pairs, p<0.001)[9]. However this also implies that 27% of spouses choose the opportunistic move (Figure 2).[10] This proportion is significantly larger than zero, with a 95% confidence interval from 21.3% to 33.7%. We further observe that 35% of spouses miscoordinate (i.e. one partner chooses cooperation while the other chooses defection). Mutual cooperation is observed for 55% of couples and 10% of couples mutually defect (see Figure 3). Cooperation and coordination are lower when interacting with a stranger (Figure 3:B). [11]

---

[8] Cooperation rates are similar, despite the fact that our payoffs are different from theirs.

[9] All tests are, if not otherwise noted, two-sided.

[10] Since the prisoners' dilemma played with their partner was the first part of the experiment and we did not allow for practice rounds, we might expect some confusion in participants. To test for this possible effect, we presented half of the participants with a fourth prisoners' dilemma, which was exactly identical to the first game. Indeed we observe that when subjects have had the opportunity to familiarize with the game cooperation is higher (86%). This difference is significant (Wilcoxon, p= 0.0593). However also here the level of opportunism is larger than zero, with the 5% confidence interval for the proportion from 6.2% to 21.3%.

[11] We can also use our data to investigate possible gender differences in cooperation. Cooperation levels in the parts where spouses interact with each other show slightly higher rates for men but these differences are not significant (Mann-Whitney, p > 0.299). However it seems that when participants interact with strangers, women are more likely to cooperate than men (men: 36%; women: 49%). This differences is only weakly significant (Mann-Whitney, p = 0.064). When interpreting this result it should be remembered that various contradicting

(a) spouses:	N = 100	woman	
		D	**C**
man	**D**	10 %	16 %
	C	19 %	55 %

(b) stranger:	N = 100	woman	
		D	**C**
man	**D**	31 %	33 %
	C	20 %	16 %

FIGURE 3: OUTCOMES FROM PRISONERS DILEMMA. (A) FROM COUPLES PLAYING WITH THEIR SPOUSE. (B) FROM GAME PLAYED WITH AN UNKNOWN STRANGER.

Cooperation levels in the asymmetric game can be used as a stress test of couples' true motivation to cooperate. Asymmetric games were either in the favour of the husband or the wife. We first observe that behaviour across these treatments is not significantly different (Mann-Whitney, p = 0.884). We therefore pool observations from the two treatments and observe that on average defection in the asymmetric game is actually lower than in the symmetric game (21%). This decrease is most likely due to familiarization with the task. The difference is not significant at the 5% level (Wilcoxon, p = 0.069). We conclude that asymmetry does not increase opportunism.

We can compare these observations with our results from the free-form bargaining game. Even though exchange rates were private information, an analysis of bargaining messages reveals that 82% of participants reveal their personal exchange rate in the first round of communication. Thus we can assume that most couples had full information about their partners' exchange rate. When considering couples where the two partners received different exchange rates (61 couples), 52 (85%) give more token to the partner with the higher exchange rate. Of the remaining couples six (9.8%) equalize earnings and three (4.92 %) equalize the number of tokens for each partner. Equalizing tokens can be considered as defection, which has a 95% confidence interval from 2.15% to 7.69%. Results do not depend on whether the man or the woman got the higher exchange rate. Thus as soon as we have communication between spouses behaviour is honest and spouses show a strong preference for either an efficient or equal outcome. This makes the results from the prisoner's dilemma game even more interesting. Defection in the prisoner's dilemma is therefore not due to these

---

observations of gender differences concerning cooperation have been observed. This might be due to subtle situational differences and to the fact that the behavior of women is more 'context dependent' than that of men (Croson and Gneezy, 2008).
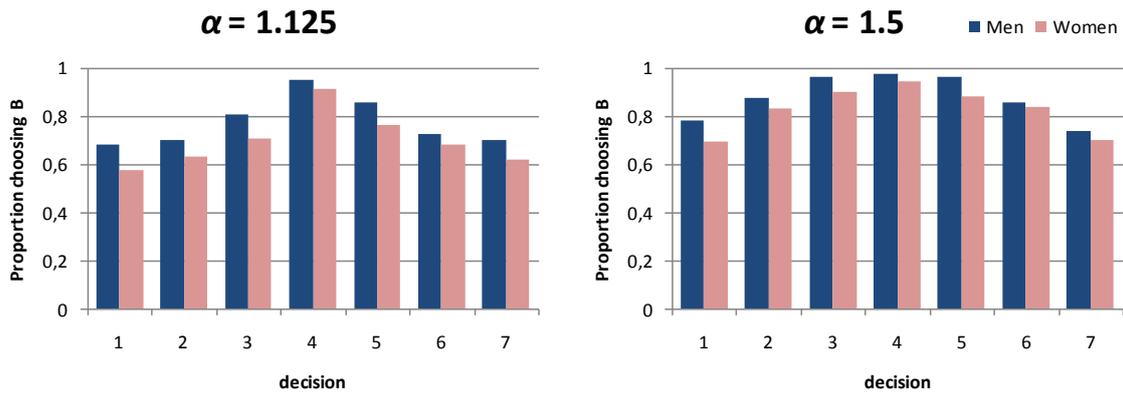
FIGURE 4: PROPORTION OF 'EFFICIENT' CHOICES BY EFFICIENCY PARAMETER (ALPHA) AND GENDER. SEE TABLE I.

couples being generally competitive, but to the fact that the decision in the social dilemma was anonymous and taken without knowledge of the partners' choice.

DISTRIBUTION CHOICE

Concern for efficiency in the couple was measured by a dictator allocation task. We summarize overall behavior in Figure 4. We observe that the majority of spouses are income poolers. When alpha is low and independent of the extent of inequality, at least 63% percent of participants choose the efficient allocation. When alpha is high, at least 72% choose the efficient allocation.[12] However preferences for efficiency also depend on the extent of inequality. The willingness to pool income therefore increases with the size of the cake which is to share and the equality of the distribution. As a coefficient of concerns for efficiency we count the number of efficient choices (a number between 0 and 6) for alpha = 1.125 and for alpha = 1.5.[13] For details on the calculation of this coefficient see Appendix A.

DYADIC ADJUSTMENT SCALE

Satisfaction with marital life was evaluated with the dyadic adjustment scale (Spanier, 1976). We report mean scores for the three subscales for men and women in Table 5. Satisfaction describes the overall satisfaction from living with the partner. Consensus measures to which

---

[12] Also on the individual level we observe that efficiency(alpha = 1.125) < efficiency(alpha = 1.5). This difference is highly significant (Wilcoxon, $p < 0.0000$).

[13] Note that men are slightly more prone to pool income (and thus to choose the unequal distribution) than women. But the difference is only marginally significant for alpha = 1.125 (Mann-Whitney, $p = 0.107$), and not significant when alpha = 1.5 ($p = 0.297$). Across partners we observe a significant correlation of the concern for efficiency (Spearman: alpha=1.125: rho = 0.228, $p = 0.0216$; alpha=1.5: rho = 0.1867, $p = 0.0615$).

TABLE V: OVERALL SCORES OF DYADIC ADJUSTMENT BY GENDER

Variable	Francophone mean from Baillargeon et al.	Overall mean (standard deviation)	Men	Women	Correlation in couple
Consensus	3.8 (0.49)	4.0741 (0.4280)	4.0502 (0.4500)	4.0981 (0.4056)	0.3392
Satisfaction	3.9 (0.58)	3.9954 (0.4900)	3.9743 (0.4891)	4.0164 (0.4924)	0.5917
Cohesion	3.3 (0.84)	3.3610 (0.6602)	3.3310 (0.5850)	3.3910 (0.7295)	0.2194

degree spouses have similar opinions, norms and beliefs. Cohesion is representing the amount of time the couple spends with each other on joint tasks. Note that the rather low correlation of these values in couples indicates that these are personal evaluations of the situation in the couple and that these do not necessarily coincide. We observe no strong gender differences concerning marital satisfaction and our sample scores only slightly higher than observations from the francophone sample studied in Baillargeon et al. (1986).

4.2. EXPLAINING OPPORTUNISM

In the previous section we showed that a large proportion of spouses cooperated in the prisoner's dilemma. The cooperation rate is significantly larger than rates generally observed between strangers. Nevertheless a significant proportion of couples decided for the opportunistic move. This opportunism among spouses might seem surprising given the strong social ties in couples. In this section we will now attempt to explain which factors predict the decision to defect in this game. We present results from a Probit regression of opportunistic behavior in the prisoner's dilemma in Table 6. [14] We will first compare the explanatory power of a model containing individual characteristics for spouses versus stranger decisions. We will then extend the model to also include couple characteristics.

The first two columns of Table 6 present regressions for the opportunistic decision in the

---

[14] To test the robustness of our results, we also carried out regressions on the restricted dataset which excludes the 23 participants that made a 'wrong' choice in the risk aversion scale (by choosing lottery A for choice number 10) or in the distribution task (by choosing option A for choice number 4). We also ran regressions on the participants' decisions in the fourth prisoners' dilemma instead of the first one (whenever available since only half of the subjects had the opportunity to participate in this game). The fourth game allowed the participants to familiarize with the game, and was exactly identical to the first. These further analyses confirm the robustness of our results.

prisoners dilemma played with a stranger and among spouses on individual variables. We observe strikingly different results for the game played among strangers compared to the game played among spouses. When playing with a stranger we observe that women and older participants are generally more cooperative. This result is in line with earlier studies, e.g. List (2004). In couples we observe however no gender effect and an inverse age effect. Namely older participants act more selfishly when playing with their spouse. Individual wealth and net income appear only weakly significant in the model.

In our next step we extend this basic model to also include a number of characteristics of the couple. We will consider variables concerning marriage, family planning, owning a joint account, previous couple's experience and education difference between spouses (Table VI, column 3). This new model shows a number of interesting effects. We observe a negative effect of owning a joint account and a positive effect of being married and parent of a child on defection. The first effect reflects the positive correlation between cooperation and income pooling among spouses. The second is related to studies on marital happiness that have reported a negative correlation between parenthood and marital satisfaction. This correlation is especially strong for mothers and has been related to more household work and marital conflict (Glenn and McLanahan, 1982; Nomaguchi and Milkie, 2003). Further we also observe that a larger difference in education levels among spouses leads to more opportunistic behavior from the better educated partner. The last observation can be linked to results suggesting that the difference in education in a couple can be seen as a cause of unbalanced bargaining power in the couple (Andreoni et al, 2003, Browning and Bonke, 2009).

TABLE VI: PROBIT REGRESSION OF OPPORTUNISTIC MOVE IN PRISONERS DILEMMA ON INDIVIDUAL AND COUPLE CHARACTERISTICS.

	(1) strangers	(2) spouses	(3) spouses	(4) spouses	(5') spouses *women*	(5") spouses *men*
					bivariate analysis	
Male	0.339[*]	-0.094	-0.075	-0.040		
	(0.184)	(0.197)	(0.207)	(0.218)		
Age	-0.019[**]	0.025[**]	-0.000	-0.003	-0.053[**]	0.045[**]
	(0.010)	(0.010)	(0.014)	(0.015)	(0.023)	(0.023)
Years of study above age of 16	0.009	0.007	-0.044	-0.021	-0.072	0.028
	(0.023)	(0.024)	(0.034)	(0.037)	(0.056)	(0.054)
Individual monthly net income (in 1000 euro)	0.087	-0.215[*]	-0.181	-0.206	-0.160	-0.340
	(0.122)	(0.129)	(0.138)	(0.146)	(0.260)	(0.230)
Individual assets (in 100000 euro)	0.069	0.156[*]	0.145	0.126	-0.046	0.286[*]
	(0.085)	(0.082)	(0.089)	(0.092)	(0.140)	(0.170)
Married			0.467[*]	0.444	0.852[**]	-0.123
			(0.265)	(0.277)	(0.421)	(0.418)
Children (dummy)			0.699[**]	0.631[**]	1.049[**]	0.310
			(0.289)	(0.300)	(0.450)	(0.465)
Partner lived in couple before			-0.274	-0.265	0.346	-0.978[**]
			(0.244)	(0.256)	(0.375)	(0.444)
Difference in education level [(a)]			0.062[**]	0.057[**]	0.094[**]	0.059
			(0.027)	(0.028)	(0.044)	(0.042)
Joint account			-0.460[*]	-0.319	0.070	-0.427
			(0.246)	(0.254)	(0.380)	(0.384)
Number of efficient choices (allocation task)				-0.177[***]	-0.273[***]	-0.172
				(0.064)	(0.420)	(0.117)
Consensus				-0.778[***]	-0.400	-1.004[**]
				(0.262)	(0.420)	(0.418)
Constant	0.473	-1.210[***]	-0.438	3.517[***]	3.587[*]	3.138
	(0.344)	(0.360)	(0.427)	(1.202)	(1.911)	(1.949)
Observations	200	200	200	200	100	100
Pseudo R^2	0.030	0.045	0.124	0.188	0.270	0.275
Log likelihood	-132.233	-112.330	-103.105	-95.506	-86.250	
LR test - Chi^2			18.45[***]	15.20[***]		

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

[(a)] individual level of education minus spouse's level of education

We finally extend our model to also include a number of variables concerning the individuals attitude in the experiment (Table VI, column 4 and 5). The variables we consider include the concern for efficiency in the couple as measured by our allocation task and the marital

satisfaction reported by each individual.[15] We present the model for all observations (column 4) and separate regressions for men and women (column 5' and 5"). These separate regressions are a bivariate probit and present a better fit. They allow controlling for correlation between error terms of the male and female equations for each household.[16] Indeed, individual characteristics explaining defection, some of them unobserved, are likely to be correlated in couples. As predicted, the concern for efficiency and greater marital satisfaction lead to cooperative behavior. While the two variables have a similar impact for men and women we observe also a number of interesting differences. The model for women is characterized by a very strong effect of being married or having children and a relatively high education level. Men are more cooperative when their partner has previously had experience with another partner. This might indicate a credible threat from the partners' side to end the relationship but might also be related to other factors. Men however react more opportunistically when wealthier. This might be related to increased bargaining power and is in line with experimental evidence showing more selfish behavior from the rich participants in repeated interactions between players with different wealth levels (Armantier, 2006). Finally the previously observed age effect is only present for men, while older women tend to be more cooperative. The inclusion of age difference into the regression was not significant. Hence, the age effect might be rather related to different individual outside options dependent on gender and age on the marriage market.

5. SUMMARY AND CONCLUSION

In this paper we presented results from a large experiment on 100 maritally living couples from the urban area of Toulouse. Spouses participated in a symmetric and an asymmetric prisoner's dilemma with their partner and in a prisoner's dilemma with an unknown partner of the same sex as their spouse. This data set enables us to observe behavior in a social dilemma in couples and contrast behavior to interactions with a stranger. We can observe overall

---

[15] To control for the effects risk aversion might have in decisions involving strategic uncertainty we also measured risk aversion (Hold and Laury, 2002). Almost 70 % of our subjects are risk-averse, 16.32 % can be classified as risk neutral and 14.21 % as risk seeking. Our results are in line with those of the literature (e.g. Holt and Laury, 2002; Harrison et al., 2007). Men seem to be slightly more risk seeking than women, however this differences is not significant (Mann-Whitney, $p = 0.28$). Risk aversion is not significant when included in the models presented in Table VI.

[16] The use of simple probits does not provide accurate statistical tests due to a biased variance-covariance matrix. To address this difficulty, we carry out a 'seemingly unrelated probit regression'. The estimated covariance between the residuals of both equations is not significant (rho = -0.0567, with a standard error of 0.321).

cooperation rates for couples and study whether couples as such are generally more or less willing to cooperate than the average population.

Our results indicate that cooperation rates in the couple are clearly higher than cooperation with an unknown other. The general cooperation rate by maritally living people with strangers is however similar to behavior usually observed for these kind of games. What is noteworthy is however that even though we observe a high concern for efficiency and equity among couples in a non-anonymous bargaining task, cooperation in the prisoner's dilemma is not at its maximum.

In the second part of this paper we used demographic and psychological variables to predict why some participants decide for opportunistic behavior with their spouse. We identified a model that can predict behavior in the games played among spouses; however the same model cannot predict behavior in the game played with an unknown other. We further observe that the model for men and women is quite different. Specifically men act: more opportunistically when older and richer. Men become more cooperative when their partner has lived with someone else before and when reporting higher consensus in the couple. By contrast women act: more opportunistic when young, being married, having a child and having a relatively higher education level. Women act more cooperative with higher concerns for efficiency.

These results lead us to two interesting conclusions, one methodological and one concerning household decisions making. The fact that we can identify a model that performs well in predicting behavior for decisions made in couples hints at a possible problem with the design of many economic experiments. Traditionally economic experiments are conducted under complete anonymity without any information about the partner. This reduction of information might seem to avoid framing the situation; however it cannot control how participants 'imagine' their partner. Thus the attempt of controlling the environment, might indeed lead to a loss of control of how the situation is perceived. Given that experiments have shown that dependent on the gender of the interaction partner very different behaviors might be elicited (Datta Gupta et al., 2005), a lack of such information might make it impossible to predict behavior. Indeed couples are very well informed about their partner, his or her preferences, income and expectations. Thus given all of this information their decision in a social dilemma can be predicted based on their own characteristics.

Finally cooperation in the couple is not at its maximum. This casts doubt on the systematic recourse to the Pareto-efficiency assumption in household decision-making models (see among others Chiappori, 1988; Bourguignon and Chiappori, 1992; Flinn, 2000). In analyzing the impact of characteristics on defection, one should note the strong negative impact of having children on women's cooperation rates. Given that these results fit very well into the literature on life satisfaction in families, it seems an important issue that should also be considered in economic models of household decision making. Gender differences in household decision making have been previously observed. Iversen et al. (2006) noted that efficiency is higher when women control the common account. More generally women are often observed to invest more into children and public goods to the family. However this cooperation might be mostly directed at the children and not at the partner. Thus presence of children can in turn lead to greater egoism in social dilemmas played solely with the partner.

References

Armantier, O. (2006). Do wealth differences affect fairness considerations? *International Economic Review*. 47(2): 391-429.

Ashraf, N. (2009). Spousal Control and Intra-Household Decision Making: An Experimental Study in the Philippines, *American Economic Review*, 99(4): 1245-1277.

Andreoni, J., Brown, E., Rischall, I. (2003). Charitable Giving by Married Couples. Who Decides and Why Does it Matter? *Journal of Human Resources.* 38(1):111-133.

Andreoni, J. and Vesterlund, L. (2001). Which is the fair sex? Gender differences in altruism. *Quarterly Journal of Economics*, 116: 293-312.

Baillargeon, J., Dubois, G. and Marineau, R. (1986). Traduction française de l'echelle d'ajustement dyadique. *Canadian Journal of Behavioral Sciences*, 18: 25-34.

Bateman, I. and Munro, A. (2005). An experiment on risky choice amongst households. *Economic Journal*, 115(502): 176-189.

Batson, C. and Moran, T. (1999). Empathy-induced altruism in a prisoner's dilemma. *European Journal of Social Psychology*, 29(7): 909-924.

Baxter, L.A. (1988). The measurement of relationships. In C. Tardy (Ed.), *A Handbook for the Study of Human Communication* (pp. 193-228). Ablex Publishing Co.

Becker, G. (1981). *A treatise of the family*. Harvard University Press, Cambridge Massachusetts.

Bernhard, H., Fischbacher, U. and Fehr, E. (2006). Parochial altruism in humans. *Nature*, 442: 912-915.

Bochet, O., Page, T. and Putterman, L. (2006). Communication and punishment in voluntary contribution experiments. *Journal of Economic Behavior and Organization*, 60: 11-26.

Bohnet, I. and Frey, B. (1999). The sound of silence in Prisoner's dilemma and dictator games. *Journal of Economic Behavior and Organization*, 38: 43-57.

Bolton, G. and Ockenfels A. (2000). ERC – A theory of equity, reciprocity, and competition, *American Economic Review,* 90: 167-193.

Boone, C., de Brabander, B. and van Witteloostuijn, A. (1999). The impact of personality on behavior in five Prisoner's Dilemma games. *Journal of Economic Psychology*, 20: 343-377.

Bourguignon, F. and Chiappori, P.-A. (1992). Collective models of household behavior: an introduction. *European Economic Review*. 36: 355-364.

Browning, M. and Bonke, J. (2009). The distribution of financial well-being and income within the household. *Review of Economics of the Household*, 7(1): 31-42

Chiappori, P.-A. (1988). Rational household labor supply. *Econometrica*, 56: 63-89.

Cooper, R., DeJong, D., Forsythe, R. and Ross, T. (1996). Cooperation without reputation: Experimental evidence from prisoner's dilemma games. *Games and Economic Behavior,* 12 (2): 187-218.

Croson, R. and Gneezy, U. (2008). Gender differences in preferences. *Journal of Economic Literature*. 47(2): 1-27.

Datta Gupta, N., Poulsen, A. and Villeval, M.C. (2005). Do (Wo)Men Prefer (Non)Competitive Jobs? *IZA Discussion Paper 1833*.

Dohmen, T., Falk, A., Huffman, D. and Sunde, U. (2006). The intergenerational Transmission of Risk and Trust Attitudes. *IZA Discussion Paper 2380*.

Dolbear, F.T. and Lave, L. (1966). Risk orientation as a predictor in the Prisoner's Dilemma. *Journal of Conflict Resolution*, 10: 506-515.

Eckel, C.C. and Wilson R.K. (2004). Is trust a risky decision? *Journal of Economic Behavior & Organization*, 55: 447-465.

Flinn, C. (2000). Modes of interaction between divorced parents. *International Economic Review*. 41:545-578.

Fehr, E. and Schmidt, K.M. (1999). A theory of fairness, competition, and cooperation, *Quarterly Journal of Economics,* 114: 817-868.

Frank, R.H., Gilovich, T. and Regan D.T. (1993). Does studying economics inhibit cooperation? *Journal of Economic Perspectives*, 7: 159-171.

Gaechter, S. and Riedl, A. (2005). Moral property rights in bargaining with infeasible claims. *Management Science*, 51: 249-263.

Glenn, N.D. and McLanahan, S. (1982). Children and Marital Happiness: A Further Specification of the Relationship. *Journal of Marriage and the Family*, 44(1): 63-72.

Goette, L., Huffman, D. and Meier, S. (2006). The impact of group membership on cooperation and norm enforcement: evidence from random assignment to real social groups. *American Economic Review*, 96: 212-216.

Harrison, G.W., Lau, M. I. and Rutström E. (2007). Estimating Risk Attitudes in Denmark: A Field Experiment. *Scandinavian Journal of Economics*, 109(2): 341-368.

Holt, C.A. and Laury, S.K. (2002). Risk Aversion and Incentive Effects. *American Economic Review*, 92: 1644-1655.

INSEE (1999). Population Census March 1999. www.recensement.insee.fr

Iversen, V., Jackson, C., Kebede, B., Munro, A. and Verschoor, A. (2006). What's love got to do with it? An experimental test of household models in East Uganda. *Discussion Papers in Economics* 06/01, Royal Holloway University of London.

Jones G. (2008). Are smarter groups more cooperative? Evidence from prisoner's dilemma experiments, 1959–2003. *Journal of Economic Behavior & Organization*, 68: 489-497.

Kinnunen, U. and Feldt T. (2004). Economic stress and marital adjustment among couples: analyses at the dyadic level. *European Journal of Social Psychology*, 34(5): 519-532.

List, J.A. (2004). Young, Selfish and Male: Field Evidence of Social Preferences. *Economic Journal*, 114: 121-149.

Nomaguchi, K.M. and Milkie, M.A. (2003). Costs and Rewards of Children: The Effects of Becoming a Parent on Adults' Lives. *Journal of Marriage and the Family*, 65(2): 356-374.

Nydegger, R. and Owen, G. (1975). Two person bargaining: an experimental test of the nash axioms. *International Journal of game theory*, 3: 239-249.

de Oliveira, A.C.M., Croson, R.T.A. and Eckel C. (2008). Are Preferences Stable Across Domains? An Experimental Investigation of Social Preferences in the Field. *CBEES Working Paper.* Nr. 2008-3.

de Palma, A., Picard, N. and Ziegelmeyer, A. (forthcoming). Individual and Couple Decision Behavior under Risk: evidence on the dynamics of power balance. *Theory and Decision*.

Peters, E. H., Ünür, A. N., Clark, J. and Schulze, W.D. (2004). Free-Riding and the Provision of Public Goods in the Family: A Laboratory Experiment. *International Economic Review*, 45(1): 283-299.

Poundstone, W. (1992). *Prisoner's dilemma: John von Neumann, game theory and the puzzle of the bomb.* Doubleday, New York.

Prouty, A., Markowski, E. M. and Barnes, H. (2000). Using the Dyadic Adjustment Scale in Marital Therapy: An Exploratory Study, *The Family Journal*, 8(3): 250-257.

Reuben, E. and van Winden, F. (2008). Social ties and coordination on negative reciprocity: The role of affect. *Journal of Public Economics*, 92: 34-53.

Roth, A. (1995) Introduction to Experimental Economics. In *The Handbook of Experimental Economics*, Eds. Kagel, J. and Roth, A. Princeton Univ. Press, Princeton, NJ.

Roth, A.E., Malouf, M.W.K. and Murnighan, J.K. (1981). Sociological versus strategic factors in bargaining. *Journal of Economic Behavior and Organization*, 2: 153-177.

Spanier, G.B. (1976). Measuring dyadic adjustment: New scales for assessing the quality of marriage and similar dyads. *Journal of Marriage and Family*, 38: 15-28.

Suleiman, R., Budescu, D.V., Fischer I. and Messick, D. M. (eds) (2004). *Contemporary Psychological Research on Social Dilemmas.* Cambridge University Press

Tajfel, H., Billig, M., Bundy, R.P. and Flament, C. (1971). Social categorization and intergroup behaviour. *European Journal of Marriage and the Family*, 38: 149-178.

Van Lange, P. A. M., Otten, W., De Bruin, E. M. N., and Joireman, J. A. (1997). Development of prosocial, individualistic, and competitive orientations: Theory and preliminary evidence. *Journal of Personality and Social Psychology*, 73: 733-746.

Van Lange, P. A. M. (1999). The Pursuit of Joint Outcomes and Equality in Outcomes: An Integrative Model of Social Value Orientation. *Journal of Personality & Social Psychology*, 77(2): 337-349.

Van Winden, F., Stallen, B. and Ridderinkhof, K.R. (2008) On the Nature, Modeling and

Neural Bases of Social Ties Daniel E. Houser and Kevin A. McCabe (eds) *Neuroeconomics*, Vol. 19, Advances in Health Economics and Health Services Research Emerald Insight Publishing.

To summarize behavior in the distribution task we investigated if behavior can be represented by a simple indicator. We assume that participants prefer B to A for choice number 4, and that for increasing inequality in their own or their partners favor they will eventually switch to A. We will use the following definition:

Definition: A subject "switches in an expected way" if:

- In choices 1 to 3, there is no switch from B to A (or from B to I, or from I to A). So the only sequences we should observe is A → B, A → I, I → B.

- In choices 5 to 7, there is no switch from A to B (or from I to B, or from A to I) the only sequences we should observe is B → A, I → A, B → I.

Definition: An "expected decision pattern" is a sequence of decisions such that:

- In choice 4, the subject chooses B.

- The subject switches in an expected way.

Indeed we observe that a large majority of participants (173 subjects or 86% of them) show an expected decision pattern. If we include the subjects who switched in an expected way but answered wrongly in only one of the two choices number 4, and subjects who answered correctly in both choices 4 but switched once in an unexpected way, we are able to take into account 92% of the subjects. Given this high percentage of participants behaving according to this expected decision pattern, we will use the number of B choices as our indicator. Note that given participants show an expected decision pattern and there is no more than one "I" in each sequence, we will lose no information from using this indicator.

To summarize behavior in the distribution task we use the following indicator. First we count for decisions 1 to 3 and 5 to 7 the number of income pooling choices (B). This number will lie between 0 and 3. We call the number of B choices when inequality is to ones' own disadvantage: efficiency_own; and name the number of B choices when inequality is to the partners' disadvantage: efficiency_other. Given these indicators we can test whether efficiency concerns are significantly different when inequality is to one's own or to one's partners disadvantage (i.e. efficiency_own = efficiency_other). And we can observe the

increase in concerns for efficiency when alpha is increased.

For the 173 participants that can be classified according to our definition, we observe that for alpha = 1.125: the average for efficiency_own is 2.25; and the average for efficiency_other is 2.35. We cannot reject the hypothesis that the two coefficients are the same (Wilcoxon, p = 0.27). When alpha = 1.5 we observe: efficiency_own = 2.65; efficiency_other = 2.64. Again we cannot reject the hypothesis that the two coefficients are the same (Wilcoxon, p = 0.48). We therefore conclude that we can pool the two coefficients into an overall measure of efficiency for each level of alpha.

APPENDIX B: DYADIC ADJUSTMENT SCALE (Spanier, 1976)

Subscales are indicated after each item: Cons = consensus subscale; Aff = affectional expression; Coh = cohesion subscale; Sat = satisfaction

Most persons have disagreements in their relationships. Please indicate below the approximate extent of agreement or disagreement between you and your partner for each item on the following list.

	Always Agree	Almost Always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree
1. Handling family finances (Cons)	5	4	3	2	1	0
2. Matters of recreation (Cons)	5	4	3	2	1	0
3. Religious matters (Cons)	5	4	3	2	1	0
4. Demonstrations of affection (Aff)	5	4	3	2	1	0
5. Friends (Cons)	5	4	3	2	1	0
6. Sex relations (Aff)	5	4	3	2	1	0
7. Conventionality (correct or proper behavior) (Cons)	5	4	3	2	1	0
8. Philosophy of life (Cons)	5	4	3	2	1	0
9. Ways of dealing with parents or in-laws (Cons)	5	4	3	2	1	0
10. Aims, goals, and things believed important (Cons)	5	4	3	2	1	0
11. Amount of time spent together (Cons)	5	4	3	2	1	0
12. Making major decisions (Cons)	5	4	3	2	1	0
13. Household tasks (Cons)	5	4	3	2	1	0
14. Leisure time interests and activities (Cons)	5	4	3	2	1	0
15. Career decisions (Cons)	5	4	3	2	1	0

	All the time	Most of the time	More often than not	Occasionally	Rarely	Never
16. How often do you discuss or have you considered divorce, separation, or terminating your relationship? (Sat)	0	1	2	3	4	5
17. How often do you or your mate leave the house after a fight? (Sat)	0	1	2	3	4	5
18. In general, how often do you think that things between you and your partner are going well? (Sat)	0	1	2	3	4	5
19. Do you confide in your mate? (Sat)	0	1	2	3	4	5
20. Do you ever regret that you married? (or lived together) (Sat)	0	1	2	3	4	5

21. How often do you and your partner quarrel? (Sat)	0	1	2	3	4	5
22. How often do you and your mate "get on each other's nerves?" (Sat)	0	1	2	3	4	5

	Every Day	Almost Every Day	Occasionally	Rarely	Never
23 Do you kiss your mate? (Sat)	4	3	2	1	0

	All of them	Most of them	Some of them	Very few of them	None of them
24. Do you and your mate engage in outside interests together? (Coh)	4	3	2	1	0

How often would you say the following events occur between you and your mate?

	Never	Less than once a month	Once or twice a month	Once or twice a week	Once a day	More often
25. Have a stimulating exchange of ideas (Coh)	0	1	2	3	4	5
26. Laugh together (Coh)	0	1	2	3	4	5
27. Calmly discuss something (Coh)	0	1	2	3	4	5
28. Work together on a project (Coh)	0	1	2	3	4	5

'These are some things about which couples sometimes agree and sometime disagree. Indicate if either item below caused differences of opinions or were problems in your relationship during the past few weeks. (Check yes or no)

|	Yes	No
29. Being too tired for sex. (Aff)	0	1
30. Not showing love. (Aff)	0	1

31. The dots on the following line represent different degrees of happiness in your relationship. The middle point, "happy." represents the degree of happiness of most relationships. Please circle the dot which best describes the degree of happiness, all things considered, of your relationship. (Sat)

Extremely Unhappy	Fairly Unhappy	A Little Unhappy	Happy	Very Happy	Extremely Happy	Perfect
0	1	2	3	4	5	6

32. Which of the following statements best describes how you feel about the future of your relationship? (Sat)

> 5. I want desperately for my relationship to succeed, and I would go to almost any length to see that it does.

> 4. I want very much for m) relationship to succeed, and I will do all I can to see that it does.

> 3. I want very much for my relationship to succeed. and I will do my fair share to see that it does.

> 2. It would be nice if my relationship succeeded, but I can't do much more than I'm doing now to help it to succeed.

> 1. It would be nice if it succeeded, but I refuse to do any more than what I am doing now to keep the relationship going.

> 0. My relationship can never succeed, and there is no more that I can do to keep the relationship going.

APPENDIX C: EXPERIMENTAL HANDOUTS, FEMALE VERSION.

1. Experimental handouts PD game:
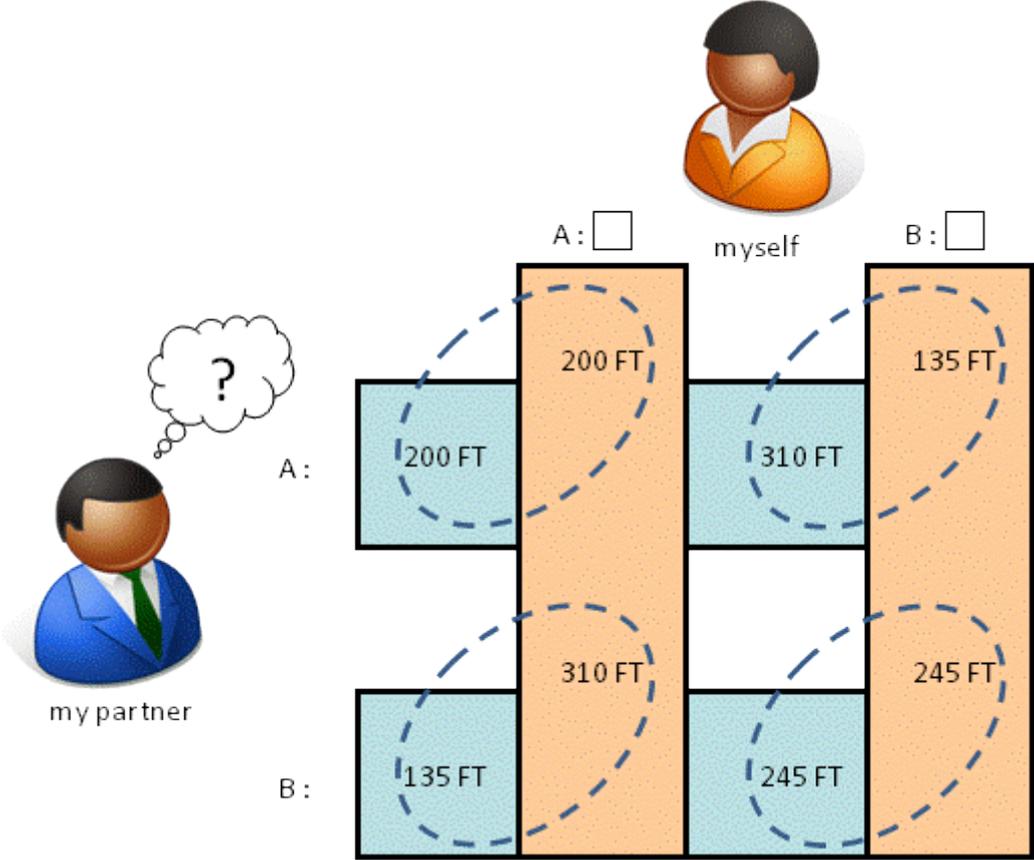
2. Experimental handouts risk aversion task:

option A :

option B :

	option A					option B				
1:	A: ☐	1 out of 10 / 200 FT	9 out of 10 / 160 FT		B: ☐	1 chance sur 10 / 385 FT	9 out of 10 / 10 FT	no preference ☐
2:	A: ☐	2 out of 10 / 200 FT	8 out of 10 / 160 FT		B: ☐	2 out of 10 / 385 FT	8 out of 10 / 10 FT	no preference ☐
3:	A: ☐	3 out of 10 / 200 FT	7 out of 10 / 160 FT		B: ☐	3 out of 10 / 385 FT	7 out of 10 / 10 FT	no preference ☐
4:	A: ☐	4 out of 10 / 200 FT	6 out of 10 / 160 FT		B: ☐	4 out of 10 / 385 FT	6 out of 10 / 10 FT	no preference ☐
5:	A: ☐	5 out of 10 / 200 FT	5 out of 10 / 160 FT		B: ☐	5 out of 10 / 385 FT	5 out of 10 / 10 FT	no preference ☐
6:	A: ☐	6 out of 10 / 200 FT	4 out of 10 / 160 FT		B: ☐	6 out of 10 / 385 FT	4 out of 10 / 10 FT	no preference ☐
7:	A: ☐	7 out of 10 / 200 FT	3 out of 10 / 160 FT		B: ☐	7 out of 10 / 385 FT	3 out of 10 / 10 FT	no preference ☐
8:	A: ☐	8 out of 10 / 200 FT	2 out of 10 / 160 FT		B: ☐	8 out of 10 / 385 FT	2 out of 10 / 10 FT	no preference ☐
9:	A: ☐	9 out of 10 / 200 FT	1 chance sur 10 / 160 FT		B: ☐	9 out of 10 / 385 FT	1 chance sur 10 / 10 FT	no preference ☐
10:	A: ☐	10 out of 10 / 200 FT	0 chance sur 10 / 160 FT		B: ☐	10 out of 10 / 385 FT	0 chance sur 10 / 10 FT	no preference ☐

35

3. Experimental handout distribution task:

	my partner (option A)		I (option A)	my partner (option B)		I (option B)	no preference
1:	200 FT	A: ☐	200 FT	0 FT	B: ☐	450 FT	☐
2:	200 FT	A: ☐	200 FT	75 FT	B: ☐	375 FT	☐
3:	200 FT	A: ☐	200 FT	150 FT	B: ☐	300 FT	☐
4:	200 FT	A: ☐	200 FT	225 FT	B: ☐	225 FT	☐
5:	200 FT	A: ☐	200 FT	300 FT	B: ☐	150 FT	☐
6:	200 FT	A: ☐	200 FT	375 FT	B: ☐	75 FT	☐
7:	200 FT	A: ☐	200 FT	450 FT	B: ☐	0 FT	☐
8:	200 FT	A: ☐	200 FT	0 FT	B: ☐	600 FT	☐
9:	200 FT	A: ☐	200 FT	100 FT	B: ☐	500 FT	☐
10:	200 FT	A: ☐	200 FT	200 FT	B: ☐	400 FT	☐
11:	200 FT	A: ☐	200 FT	300 FT	B: ☐	300 FT	☐
12:	200 FT	A: ☐	200 FT	400 FT	B: ☐	200 FT	☐
	200 FT	A: ☐	200 FT	500 FT	B: ☐	100 FT	☐
	200 FT	A: ☐	200 FT	600 FT	B: ☐	0 FT	☐