

# DO SPOUSES COOPERATE?

## AN EXPERIMENTAL INVESTIGATION

*FRANÇOIS COCHARD*<sup>†</sup>

*HELENE COUPRIE*<sup>‡</sup>

*ASTRID HOPFENSITZ*<sup>\*</sup>

### ABSTRACT:

This study makes a significant contribution to investigations of household behavior by testing for willingness to cooperate and share income by men and women who are either in couple with each other or complete strangers. We present results from an economic experiment conducted with 100 co-habiting heterosexual couples. We compare defection behavior in the prisoner's dilemma within real couples to pairs of strangers. One out of four participants chose not to cooperate with their spouse. To understand why spouses might prefer defection, we use a novel allocation task to elicit the individual's trade-off between efficiency and equality within a couple. We further investigate the impact of socio-demographic and psychological characteristics of the couples. We find in particular that lack of preferences for joint income maximization, having children and being married lead to higher defection rates in the social dilemma.

**Keywords:** prisoner dilemma, experiment, household, cooperation, efficiency versus equality

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

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<sup>†</sup>Université de Franche-Comté (CRESE), France

<sup>‡</sup>Corresponding author: Université de Cergy-Pontoise (THEMA), 33 boulevard du port, 95011 Cergy-Pontoise Cedex, France. Phone: 0033(0)134252256. Fax: 0033(0)134256233. email: helene.couprrie@u-cergy.fr

<sup>\*</sup>Toulouse School of Economics, France

## 1. Introduction

Decisions in households are not simple. However, the view that the household decision-making process yields to efficient outcomes is widely taken for granted in the literature. While most interactions within a couple are repeated and communication is possible, many decisions in the household are taken independently and provide strong incentives to free-ride on the other. This paper investigates, for a sample of 100 true heterosexual couples living in France, whether or not they cooperate in a prisoner's dilemma, and explores why this is not always the case.

The efficiency of household decision-making processes is a central assumption in household consumption or production behavioral models. These models follow the consensual view that a household is a kind of micro-society that is able to reach, not matter how, an economic outcome that is the best possible in the Pareto meaning, i.e. it is not possible to find another allocation that could increase simultaneously the welfare of all household members (see e.g. Apps and Rees, 1988; Chiappori, 1988;). Empirically, efficiency is generally not rejected for couples from developed countries.<sup>1</sup> However, micro-econometric tests (e.g., Browning and Chiappori, 1998) require strong restrictions regarding the shape of the utility functions. For example, a common assumption is the separability of individual sub-utilities, which imposes egoistic utilities or a very specific type of altruism in the family (altruism à la Becker). Recent papers attain the rejection of efficiency in specific frameworks (Mazzocco, 2007). Del Boca and Flinn (2014) make the point that there is no general nonparametric test available, allowing one to distinguish between modes of household behavior without imposing severe restrictions on how heterogeneity is introduced in the model. Controlled laboratory experiments, which allow for the control of payoffs and environment, could shed a complementary light on this topic.

In a prisoner's dilemma game, the interaction of a couple is strictly controlled and environmental influence is limited. This situation, though artificial, represents a variety of real life situations for couples where the partner cannot observe behavior. Examples include settings where earnings or effort can be hidden from the partner. Incomplete information concerning salary bonus, monetary presents, time-use, abilities and effort can lead to conflicting situations within a couple. Revealing the individual income bonus and investing in the couple's common good can lead to efficiency increases, whereas an individual incentive exists to use the extra money, extra time, or saved effort for oneself. Similarly, investment in the family (changing job, moving or the decision to have children) depends on the expectation that today's arrangements regarding cooperation and sharing will still hold in the future. In the case where such cooperation cannot be enforced by a contract, it could be represented by a limited commitment model (Lundberg and Pollak, 1993). The simultaneous one-shot prisoner's dilemma that we propose similarly generates incentives to free-ride. As participants have the opportunity to hide their individual gains from their partner, cooperation strongly depends on trust and beliefs about the partner's actions.

The prisoner's dilemma has received much attention in the literature since its first discussion by Flood and Dresher in 1950. The focus has been mostly on explaining why cooperation does exist and persists in anonymous, non-repeated interactions for which opportunism is predicted. However, the other extreme, namely non-anonymous and repeated dilemmas played by friends

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<sup>1</sup> While most models were tested using US data (Chiappori, Fortin and Lacroix, 2002), some tests leading to the same conclusions used French data (Donni and Moreau, 2007). In developing countries, efficiency appears to be more frequently rejected (Udry, 1996).

and families, have so far received little attention. Some of the aspects characterizing couples have already been experimentally studied. To test the effects of joint group membership, participants are sometimes given more or less time to get to know each other and to familiarize. Studies from psychology and economics using minimal (Tajfel et al., 1971) or natural groups (e.g., Bernhard et al., 2006) show that participants favor members of their own group over members of other groups. However, the concrete identity of the partner is generally unknown to players in these experiments. Some experiments further allowed face-to-face contact and communication before the experiment (Bochet et al., 2006; Bohnet and Frey, 1999) and a few studies investigated actual friendship ties (Reuben and van Winden, 2008). We will go even one step further. Not only do the partners know with whom they are playing and already know them from outside of the laboratory, but this partner is also the person with whom they share bed and board.

A number of experimental studies have investigated behavior by couples in economically relevant tasks. Goerges (2014) studies bargaining behavior regarding work division by couples. She observes full cooperation in a context where information is perfect and spouses can freely bargain. However, many situations encountered by couples resemble a social dilemma with a possibility for free-riding. Oosterbeek et al. (2003) investigate the problem of limited commitments within the household. However, participants in their experiment are not actually spouses. Recent studies on real couples investigated savings decisions of spouses from the Philippines (Ashraf, 2009) and consumption and income shocks in Western Kenya (Robinson, 2008). Both studies show that inefficiencies can occur.<sup>2</sup> A similar conclusion can be drawn from public good games played by US family members (Peters et al., 2004). Contributions within the family are higher than with strangers; however, they remain well below full levels of cooperation, at approximately 84%. Iversen et al. (2006) implemented a variant of a public good game with couples in rural Uganda. Full efficiency is rejected, but altruism is not. Specifically, they find evidence for opportunism, i.e., the tendency to hide one's initial endowment from the partner. Mani (2010) investigated investment in a private versus public good. Spouses were more willing to invest in a public good when they considered themselves as having more control over the final allocation across partners. Kebede et al. (2011) observe inefficiencies in Ethiopia independent of whether husband or wife allocate the common pool. Beblo et al. (forthcoming) observes differences in the trade-off between efficiency and equality in France and Germany. While these results challenge the efficiency assumption one important question remains unanswered: which factors lead to inefficiency and is inefficiency related to opportunism as observed in studies among strangers? We will attempt to provide answers to this question by presenting results on the simple, but well studied, prisoners dilemma played by spouses and by strangers. We will relate our results to simple models based on household bargaining theory and investigate the predictive behavior of various individual and household characteristics.

Understanding why spouses might defect or cooperate in a prisoner's dilemma game is a complex question. This study makes a significant contribution to investigations of household behavior by testing for willingness to cooperate and share income by men and women. An important factor is that welfare transfers outside of the laboratory cannot be prevented. This is a specific problem for couples. In experiments where players do not know each other it is assumed that individual utility

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<sup>2</sup> A number of other experimental studies concern risk related decisions by spouses (e.g., De Palma et al., 2011; Carlsson et al., 2012; Bateman and Munro, 2005; Munro et al., 2008a). Income pooling is not rejected when choices are made jointly, but does not predict individual choices (Munro et al., 2008b).

is equivalent to individual payoffs from the experiment. For couples, we have to generalize this naïve idea by interpreting our results conditional on an unobservable micro-norm describing the link between the payoff and welfare distribution in the household. This micro-norm is comparable to the sharing rule in household decision-making theories. We will use a specific distribution task to identify properties of this micro-norm. This will allow us to investigate the relationship between inefficiency and preferences for equality in the couple. Finally, we also consider the impact of socio-demographic, as well as psychological, characteristics. We will devote special attention to the impact of marriage contracts, presence of children and opportunities on the remarriage market in relation to economic theories of marriage and the family (Becker, Landes and Michael, 1977; Becker, 1981; Cigno, 1991).

In the next section we provide a brief overview of the relevant household models, and present the two experimental tasks that were used for our study: a prisoner dilemma and a distribution task. Methods are described in section 3, while results are shown in section 4. Section 5 concludes.

## **2. Household Models, Tasks and Predictions**

Contemporary models of family economics recognize that household decisions arise from interactions between several members with potentially diverging views. Overall household models can be classified under two categories:

(I) Cooperative models are widely used in the literature. While some of them are based on well-known cooperative game theory concepts (Manser and Brown, 1980; McElroy and Horney, 1981), others rely on a consensual specification (Apps and Rees, 1988; Chiappori and Ekeland, 2006). We can also include in this category the so-called ‘unitary’ models based on Samuelson’s (1956) seminal work. In unitary models, household decisions are made by a unique decision-making unit and thus cooperation in the household is not really in question. To do so, a consensus is reached within families. Samuelson defines this consensus assumption as ‘a meeting of the minds or a compromise between family members’.

(II) Non-cooperative models of the household recognize the possibility of conflicting interests in the family and of a resulting loss in aggregate family welfare. An early analysis of such conflicts was made by Grossbard- Shechtman (1976). She developed a model where the individual choice of couple formation and provision of housework services to the partner (so-called WiHo) are related to sharing arrangements which depend on quasi-wages (definitions of these concepts are explained in Grossbard, 2015). Generally, as in this original contribution, inefficiency in the family is modelled in an intertemporal setting where couples have limited ability to contract over future behavior (Lundberg and Pollak, 1993; Basu, 2001; Mazzocco, 2007).

In these models, family members interact by means of their consumption or time allocation choices. As a consequence, an individual wage, income, or experimental gain, cannot be directly translated into individual welfare. In a nutshell, family interaction changes the way an individual can derive welfare from her income since there is a mechanism involving several family members that leads to a decision about who consumes and produces what in the household. The sharing rule a concept that provides a link between individual incomes within the household and the monetary value of an individual living in a specific household. This theoretical construct can be found in various consensual models such as, for example, Samuelson (1956), Apps and Rees (1988), or Chiappori (1988). Non-cooperative models allow modeling complex decisions such as the choice of a partner on the marriage market and thus endogenize intra-household transfers

(Grossbard-Shechtman, 1984). Cooperative models are based on an axiomatization of the bargaining or sharing process. In collective models, the sharing rule is only an *ad hoc* reduced form. In general, whatever the model, sharing rules can be interpreted by experimentalists as ‘micro-norms’ defining how earnings are usually distributed among household members. Formally, we can denote a micro norm<sup>3</sup> as a function ( $\rho$ ) defining own ( $x_1$ ) and others’ ( $x_2$ ) consumption in each partner’s earnings ( $y_1$  and  $y_2$ ):  $x_1 = \rho_1(y_1, y_2)$ ;  $x_2 = \rho_2(y_1, y_2)$ .

The efficiency of household decision-making and the exclusion of type (II) household models are often taken for granted. From an empirical viewpoint, tests of efficiency rely on estimations of household demand using heavy microeconomic methods. They are based on particular specifications regarding the shape of preferences and the type of model used. The most general models for testing efficiency are rank tests of the pseudo Slutsky matrix (Browning and Chiappori, 1998). However, in practice, restrictions such as separability need to be imposed to implement such tests and their rejection power is questionable. Del Boca and Flinn (2014) also point out that there is no general satisfying nonparametric test available to distinguish between models of household behavior.

Experimental evidence helps in validating, or not, models of type I. In this paper, we choose the simple context of a prisoner’s dilemma played by spouses. A second individual decision task further allows us to investigate the consistency of choices and the reasons for non-cooperative behavior. We will now discuss the tasks that were presented to participants of our study.

## 2.1. Prisoner’s dilemma

We presented participants with two prisoner’s dilemma games in order to investigate behavior in situations where actions are unobservable. These dilemmas can be viewed as public good contribution games with a discrete investment choice.

### [FIGURE 1]

Couples participated in two identical prisoner’s dilemma games (see Figure 1). In the first game spouses played with their partner, while in the second game they played with another participant of the same sex as their partner. To test for initial confusion or other order effects, we presented 40% of the participants with a third prisoner’s dilemma, which was identical to the first game but played after the second game was played with a stranger.

As usual in these kinds of dilemmas, the cooperate/cooperate outcome is efficient but the Nash-equilibrium predicts mutual defection for two selfish individuals in a one-shot interaction (which corresponds to lower earnings for both players). In the case of couples, unitary and collective household models (I) predict that household members aim to maximize joint earnings, and hence choose cooperation, which is the efficient outcome. Defection can only occur in a non-cooperative context (household model type II); in this case, social preferences of family members within the household matter. An own-payoff maximizing agent will play ‘defect’ as a dominant strategy. A player who aims to maximize their spouse’s payoff (extreme altruism) would cooperate as a dominant strategy. An inequality averse agent will only cooperate if they anticipate that their spouse will do the same. Indeed for inequality averse players, the prisoner’s

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<sup>3</sup> This micro-norm is an easy tool that we suggest as a communication medium between household economists and experimental economists working on couples.

dilemma represents a coordination game. Finally, players aiming to maximize their joint earnings (efficiency seekers) are predicted to play ‘cooperate’, even if they expect their partner to play ‘defect’.

Interaction with an unknown other will serve as a baseline to investigate whether behavior is comparable with results from other studies where partners are not known to each other. Clearly, the relevant model for strangers is the non-cooperative model (type II). This allows us to explore whether social preferences within the couple are correlated with social preferences with respect to strangers.

Note the importance of the fact that partners will never know how their spouse played in this game and that the anonymity of actions is guaranteed. Experimental earnings were given individually and secretly. Participants were guaranteed that their behavior would stay completely unobservable in each of the prisoner’s dilemma tasks. Even though participants knew with whom they were playing, we stressed that they could not deduce from their earnings the actions of their partner. This was achieved by randomly selecting only one decision out of many for each task and giving only total earnings over a variety of tasks to participants. Naturally, it is likely that household members reveal their earnings after the experiment and spend them collectively. How these gains are going to be spent and translated into individual welfare is defined by the household’s sharing rule (or micro-norm). Recall that this micro-norm is household-specific and cannot be controlled experimentally.<sup>4</sup> The following task allows us to discriminate between the various potential explanations of defection in the prisoner’s dilemma.

## 2.2. Distribution task

The aim of this task is twofold. The first objective is to check for the consistency of individual decisions in a different and non-strategic context. The second objective is to identify, for type II households, individual motivations that can account for behavior in the prisoner’s dilemma task.

We presented spouses with a specifically constructed distribution task. This task allows us to identify spouses strongly motivated by maximizing joint payoffs, by maximizing their own payoff, by maximizing their partner’s payoff, or by concerns for equality between partners.

### [TABLE 1]

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

Behavioral patterns in this task depend on the type of household decision-making model, characteristics of the micro-norm and individual preferences for consumption distribution (altruism, selfishness, inequality aversion or concern for efficiency). Clearly, if the family member behaves according to a type I household model, they must choose the outcome that

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<sup>4</sup> Some models develop an understanding of the sharing-rule formation (Grossbard, 2015). However, in our experiment, the micro-norm is an unobservable characteristic of the household.

maximizes joint payoffs (option B), because of the efficiency characteristic of these models.

In the case of the type II household model, individual preferences matter. In addition, the manner in which the gain will be shared after the task (i.e., the micro-norm) can also matter. This is a specificity of people who know each other and who continue interacting after the experiment, outside of the laboratory. In experiments carried out on strangers, it is usually the case that transfer cannot occur afterwards. We derive behavioral predictions of the non-cooperative model where each individual makes a decision according to their own preference ordering for two canonical sharing arrangements.<sup>5</sup> The first arrangement corresponds to the standard experimental case: each individual consumes their own earnings:  $x_i = \rho_i (y_1, y_2) = y_i$ . This micro-norm is consistent with the focal bargaining point where each individual can consume up to their own contribution to the household's income. The second sharing arrangement states that each household member receives an increasing function of household total income:  $x_i = \rho_i (y_1 + y_2)$  with  $\rho_i' > 0$ . This micro-norm includes consumption equality as a special case.<sup>6</sup>

### [TABLE II]

Hence, expected patterns in the case of type II households depend on which of the two micro-norms is used within the couple and on individual motivations (see Table II). First, if we assume that each household member receives an increasing function of total household income, we expect players to choose option B, whatever their household model and individual preferences (Table II, line 1). Second, if we assume that own consumption is equal to own earnings, then a non-cooperative individual would act differently depending on their social preferences (Table II, line 2). In this case, how individual social preferences affect behavior is the same as with strangers. An own payoff maximizing agent will choose A for decisions where their own share is smaller than their partner's (lines 1 to 3), and option B when inequality favors the decision-maker (lines 5 to 7). A player who aims to maximize their spouse's payoff (extreme altruism) would do the opposite. A pure efficiency seeking agent will always choose B, whereas a pure inequality averse agent will always choose A.<sup>7</sup> Participants who trade off efficiency and equality will choose A or B depending on the respective weights they give efficiency and equality.

To our knowledge, this task has not been tested on strangers in the literature. We use it as a consistency check of behavior in the prisoner's dilemma and, therefore, it is only implemented on spouses. It further enables us to understand why spouses may deviate from cooperation. Players that always choose option B in this task should, if they stay consistent across context, choose to cooperate in the prisoner's dilemma. Among non-cooperative household models (II), altruistic

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<sup>5</sup> We exclude direct impacts of income distribution on utility, for example, a preference for appearing income inequality averse or making symbolically equal choices (which could be called 'warm glow' inequality aversion). In our model, income distribution can influence utility because it affects welfare (consumption) distribution through the micro-norm.

<sup>6</sup> The two micro-norms can also be interpreted according to their 'income-pooling' property. The first micro-norm does not present such a property, while the second does. Models without income-pooling can be found in Browning and Chiappori (1998). More on the link between household models and income-pooling can be found in Browning, Chiappori and Lechene (2006) for type I models. For non-cooperative models (type II), there are situations where income-pooling occurs (see Warr, 1983; Grossbard-Shechtman, 1984). For readers familiar with experiments, micro-norm I corresponds to experiments on strangers who do not know each other. In experiments on couples it is problematic to assume this case to hold, even though many previous studies do so implicitly.

<sup>7</sup> Note that for line 4 any rational agent should choose B.

players are also expected to cooperate unconditionally in the prisoner's dilemma. In contrast, selfish participants are expected to defect unconditionally. Finally, inequality averse participants defect only when they have the belief that their partner will defect.

Any combination of pure individual preferences is possible. For example, the Fehr-Schmidt (1999) model assumes that individual preferences are a mix of selfishness and inequality aversion (this can also be viewed under some conditions as a mix of efficiency seeking, selfishness and inequality aversion, see Blanco et al., 2010). In the Charness and Rabin (2002) model, individual preferences are a mix of selfishness, efficiency seeking and inequality aversion. In these cases, the relative strength of one motivation against the others determines whether or not the individual is expected to cooperate in the prisoner's dilemma.

Using any combination of the pure forms, we can hence derive various patterns for individual answers. For example, the strength of selfishness or aversion to inequality against oneself will be related to the number of A choices in lines 1 to 3. The strength of altruism or aversion to inequality against the partner will be related to the number of A choices in lines 5 to 7. The occurrence of A choices around the fourth line reflects a trade-off between equality and efficiency. Under some monotonicity assumptions for preferences, and using our micro-norm  $x_i = \rho_i(y_1, y_2) = y_i$ , some regularities should appear in the patterns: at most, one switch from A to B is expected in lines 1 to 3 and one switch from B to A is expected in lines 5 to 7. Of course, we can imagine rare non-linear cases which could induce any kind of switching pattern for the answers.

### **2.3 Economic links between couples' characteristics and efficiency**

Using a socio-demographic questionnaire, we explore how couples' characteristics affect efficiency. We explore the effect using explanatory variables, such as marital status, date of marriage, bargaining variables, and the presence of children.

If we assume that households are efficient long-term relationships, with symmetric information, the Coase theorem predicts that changes in property rights affect distribution of welfare but not behavior. However, many empirical studies have shown that divorce reforms do have an influence on family behavior,<sup>8</sup> revealing the presence of inefficiencies. This might be due to characteristics of the marriage contract. Recent divorce reforms from fault to no-fault divorce in the US (Lundberg and Pollak, 2007) and France weaken the necessity of mutual consent for a married couple to separate, but not to the same extent as in a free union relationship. In France, as in the US, the separation of couples has become easier over recent decades. This has generated a transfer in the right to divorce from the partner who wants to remain within the marriage to the partner who wants to end the union. The creation of the civil union for unmarried couples ("P.A.C.S." created in 1999) has also facilitated unilateral separation. This leaves more room for various types of selfish behavior to occur. Differences in remarriage market opportunities, by generating differences in the couple's separation wishes, may also create such conditions for inefficiencies to appear.

In cases where no mutual consent is required, a limited commitment model of a spouse's behavior easily brings inefficiencies into the marriage (see for example, Pavoni, 2000).

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<sup>8</sup> For example, Parkman (1992) observes a positive effect on the labour market participation rate of married women, and Allen (1992) observes a change in the rate of divorce when a divorce reform occurs. However, depending on the empirical methodology, results may differ (Peters 1986; Peters 1992).



Sometimes, marriage can enhance efficiency, even if both spouses are selfish. This result was demonstrated by Cigno (2012) in the case of a non-cooperative model, where the possibility of divorce acts as a credible threat. Therefore, the date of marriage should matter, since mutual consent is less a requirement to obtain divorce nowadays than in the past. However, recent unions may also present better match characteristics (Rasul, 2006), thus enhancing efficiency. The overall effect of marriage duration therefore remains undetermined (Iyavarakul et al., 2009).

Finally, and probably more surprisingly at first sight, the presence of non-transferable ‘public goods’ such as children might also produce inefficiencies. Such public goods limit the possibility of mutually beneficial welfare transfers within the family (Zelder, 1993). Inefficiencies can occur in case of divorce where one spouse’s gain from marriage exceeds the other spouse’s gain from divorce. Transfers among the spouses might reduce the risk of divorce but are not possible if all household consumption is public, and they are limited if a high share of household consumption is public. On the other hand, couples with children benefit from ‘couple-specific capital’ (Becker et al., 1977) that increases welfare gains from marriage, and which may reduce the occurrence of such a situation.

We will get back to these predictions when discussing our results from the prisoner’s dilemma and distribution task. Note that a theoretical prediction of efficiency would lead us to expect ‘cooperation’ in the prisoners’ dilemma and a preference for option B in the distribution task.

### 3. Methods

The experiment was conducted in June 2008 at the Toulouse School of Economics, France. Participants were recruited by newspaper reports announcing 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,<sup>9</sup> and were invited to sign up jointly for one two-hour session. The announcements further specified that each participant would earn, dependent on their decisions and on a random amount between 20 and 60 euros for their participation.

#### [TABLE III]

In total, 100 couples participated in the study. Couples were required to have been living together for at least one year, but did not need to be married. The mean age of men and women was 35 and 34 years, respectively. Partners had been living together for an average of 7.9 years, with 44% of participating couples married, and 48% with at least one child living in their household (on the individual level 47% of participants had at least one child). Our pool of volunteers shows a reasonable degree of heterogeneity in terms of age and couple characteristics. On average our participants are characterized by rather high rates of employment and a good socio-professional status. Summary statistics can be found in the online Appendix (Table C).

A total of 19 sessions were conducted, with at least four and at most six couples present. The experiment was conducted by paper and pencil in a classroom at the Toulouse School of Economics. Considerable care was taken to explain the instructions as simply as possible, and

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<sup>9</sup> A number of control questions that were part of the demographic questionnaire were used to verify whether or not participants were in a genuine relationship.

decision sheets were presented in a graphically intuitive way (see Appendix A). Computers were avoided due to the large variance in age and educational backgrounds of our participants.

Couples were seated couple by couple at six rows of tables in the laboratory. Men and women respectively were seated on the same side of the room. Partitions divided the row of tables for each couple. The layout of the room was such that participants were aware that their partners were seated on the other side of the partition. However, they were unable to see or communicate with them during the study.

Couples participated in multiple experimental parts and a questionnaire part. The timeline of the different parts of the study is described in Table III.<sup>10</sup> Instructions for each part were read aloud and explained with the aid of a video projection of the decision sheets. Participants were actively encouraged to ask questions if something was unclear. After instructions were read, a short summary of the instructions was distributed and participants were required to answer a short control question to test their comprehension. When participants had finished reading the summary, and correctly answered the control question, they were invited to mark their decisions on the decision sheets.

Initial instructions informed participants that they were about to participate in a study on decision-making in which they would have to make 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 made. Earnings from the experiment were calculated in an experimental currency that was exchanged to euros at the completion of the session (1 € = 50 FT ‘Francs Toulousains’). It was stressed that decisions were individual, private and anonymous, and that their partner in particular would have no opportunity to discover their choices. To ensure anonymity and to incentivize all choices, one decision for each individual from each part was randomly selected for payout at the conclusion of the study. Participants were only informed of their aggregate earnings and thus could not deduce from their earnings the choices made by their partner.

Part one of the study consisted of a series of prisoner’s dilemma games. Participants interacted first with their partner, then with another participant of the same sex as their partner. One of these situations was later selected for payout. The different games were presented in the same order to all participants. However, no feedback about behavior was provided, thus eliminating learning effects. For 40% of participants the game played with their partner was further repeated in order to observe changes due to familiarization with the game environment. The second experimental part used 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 selected for payout.

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<sup>10</sup> Only two experimental parts will be discussed in this paper. The parts that are not discussed include an individual and a joint risk taking task and an open bargaining task between spouses. Details on these tasks can be found in the online Appendix. Risk taking in the family has been analyzed elsewhere and is, therefore, not discussed in this paper. Bargaining concerned the exchange of tokens that had different exchange rates for different participants. The task involved the exchange of written messages but did not include face-to-face interaction. Although the exchange rates were private information, spouses could reveal them through the messages. 61 couples actually received different exchange rates, of these 52 (85%) gave more tokens to the partner with the higher exchange rate, six (9.8%) equalized earnings and three (4.92 %) equalized the number of tokens for each partner. More than 80% of spouses revealed their exchange rates to their partner. Thus, given communication, spouses’ behavior is honest and spouses show a strong preference for efficiency. This experience might, thus, exaggerate efficiency levels in the following distribution task.

When all couples had completed the experiment, a volunteer among the participants was chosen to supervise the randomization procedure in order to decide which decisions would be paid out. This required the participant tossing a dice under supervision or selecting a random number from a box containing numbered tickets. This then led to the calculation of gains and earnings. Participants were asked to respond to a final anonymous individual questionnaire, which included standard socio-demographic questions, as well as a psychological dyadic adjustment scale intended to assess the overall ‘harmony’ in the couple (Spanier, 1976; see Appendix B).<sup>11</sup> Participants were then paid one after the other in a separate room. Average earnings per participant were 38.66 euros (approx. 60 USD<sup>12</sup>), and average earnings per couple were 77.32 euros (approx. 120 USD).

## 4. Results

### 4.1. Prisoner’s dilemma

Do spouses cooperate? The mean defection in the prisoner’s dilemma games is 27.5% (Figure 2). The proportion of defection amongst spouses is significantly larger than zero, with a 95% confidence interval from 21.3% to 33.7%. When playing with an unknown randomly selected stranger of the same sex as their partner, defection rates appear, unsurprisingly, higher at 57.5%. This rate of defection with strangers is very close to what was observed by Cooper et al. (1996)<sup>13</sup> at the beginning of their series of one-shot games.<sup>14</sup>

#### [FIGURE 2]

The difference in cooperation rates between strangers and between spouses is highly significant (McNemar test,  $p < 0.001$ ).<sup>15</sup> There is no correlation between the defection rate with strangers and the defection rate with the partner (corr. coef. = 0.0509,  $p = 0.4924$ ). We further observe that 35% of spouses do not make the same choice as their partner when interacting with each other (i.e., one partner chooses cooperation while the other chooses defection). Mutual cooperation is observed for 55% of couples, while 10% of couples mutually defect (Figure 3:a). Cooperation and coordination are lower when interacting with a stranger (Figure 3:b).

We can further use our data to investigate possible gender differences in cooperation. The cooperation level in the game where spouses interact with each other is slightly higher for men but the difference is not significant (McNemar test,  $p = 0.7353$ ). However, it appears that when participants interact with strangers, women are more likely to cooperate than men (men: 36%;

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<sup>11</sup> We are aware that the answers to the psychological questionnaire may be affected by the prior experimental tasks. However, due to the multitude of tasks in our experiment, we could not control for all order effects. We intentionally presented the prisoner’s dilemma games at the beginning of the session (to avoid contamination by other tasks) and to present the game with spouses before the game with strangers. Questionnaires were only presented after the non-contextualized experimental part of the study.

<sup>12</sup> Exchange rates June 2008.

<sup>13</sup> Rates of defection are similar, despite the fact that our payoffs are different from theirs.

<sup>14</sup> Though we cannot exclude that some participants made errors, the replication of previous results for the game by strangers suggests that error rates are not higher than for other experimental subject pools. We discuss other evidence that allows us to confidently reject the hypothesis that defection is due to errors in section 4.3.1.

<sup>15</sup> All tests are, if not otherwise noted, two-sided.

women: 49%). This difference is only weakly significant (McNemar,  $p=0.0929$ ). When interpreting this result it should be remembered that various contradicting observations of gender differences concerning cooperation have been observed in past studies. This may be the result of subtle situational differences and the fact that the behavior of women is more ‘context dependent’ than that of men (Croson and Gneezy, 2008).

### [FIGURE 3]

Since the prisoner’s dilemma played with the partner was the first part of the experiment, and we did not allow for practice rounds, we might expect some confusion on the part of the participants. To test for this possible effect, we presented 40% of the participants with a third prisoner’s dilemma, which was identical to the first game. Indeed, we observed that when subjects had the opportunity to familiarize themselves with the game, cooperation levels are higher (86%).<sup>16</sup> Compared to the game played with strangers, the difference is highly significant (McNemar,  $p<0.001$ ), while the result is weakly significantly different from the first game played by spouses (McNemar,  $p=0.0990$ ). However, notably, the level of opportunism is larger than zero, with the 5% confidence interval for the proportion from 6.2% to 21.3%.

## 4.2. Distribution choice

Do spouses unilaterally and independently choose to trade efficiency for equity within the couple? The distribution task allows us to check the consistency of behavior across games and to explore individual motivations for defection (in the case of Type II household couples). The distribution task (see Table II) allows us to identify participants who have a concern for own income maximization (i.e., selfishness), joint income maximization or other-regarding preferences, such as inequality aversion or altruism (see Table IV). We observe that the majority of individuals choose to maximize the sum of the couples’ income, even though 42% do not make this choice all the time. This shows that household members do react to how payoffs are distributed within the couple, despite the possibility of sharing their gains after the experiment. This may reveal the possibility that consumption sharing after the experiment depends on earnings, or alternatively, that participants, as individuals, do not seek efficiency (see our discussion in section 2.2).

### [TABLE IV]

We further observe that the individual propensity to maximize couples’ payoff depends on the size of the efficiency gain. When alpha is low, 58% (116 out of 200) of participants always choose the efficient allocation. When alpha is high, 67% (134 out of 200) always choose the efficient allocation. This illustrates that the possible gain in efficiency matters. The willingness to pool income increases with the size of the cake that is to be shared. In other words, for some couples, there is a trade-off between efficiency gains and other kinds of motivation.

The way in which people react to intra-couple payoff inequality is also interesting. Table IV provides an overview of the different types for the two distribution tasks (see Appendix D for details on the calculation of these coefficients). As can be seen from this table, 64% of men and 52% of women aim to maximize the couple’s joint payoff. The second biggest group (30% of men and 38% of women) has presumably some sensitivity concerning an efficiency-equality

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<sup>16</sup> It is not unusual to observe such an increase due to familiarization with the game (Cooper et al., 1996).

trade-off. Some of these have overall preferences that are more favorable towards their own payoff (asymmetric-selfish) or towards the others' payoff (asymmetric-altruist). The distribution of types is not significantly different for men and women (chi-2 test:  $p = 0.405$ ).

It is interesting to note that none of our participants can be classified as either purely selfish or purely altruistic. In addition, asymmetric individuals present an average share of payoff attributed to self quite close to 50%; the average share for self is 0.451 (std.dev. = 0.032) for asymmetric-altruists, while it is 0.555 (std.dev. = 0.058) for asymmetric-selfish.<sup>17</sup>

### 4.3. Explaining behavior

Why do we observe non-cooperation in the prisoner's dilemma? Does this result make sense? Does the distribution task confirm the consistency of this result? We will respond to these questions in the following section.

#### 4.3.1 Consistency across games

Our first observation concerns participants who have been classified in the distribution task as irrational. These participants, who represent a small percentage of 8%, do not choose a payoff of 225 for themselves and 225 for their partner (respectively 300 and 300), but instead choose a payoff of 200 for themselves and 200 for their partner. Their choice is an indication of some inattention or confusion concerning the game. However, this is not significantly correlated with defection in the prisoner's dilemma game. Indeed we observe that defection rates are slightly lower for irrational participants (25.0%) than for others (28.0%). Thus, we can confidently rule out that confusion or misunderstanding is the main reason for defection in our game. In the further analysis we will exclude participants classified as irrational.

#### [FIGURE 4]

Second, own payoff maximization may be another motivation for defection. However, as we have seen previously, none of our participants can be classified as purely selfish, and thus other factors besides pure selfishness must be considered to explain the observed level of defection in our prisoner's dilemma game.<sup>18</sup> As discussed earlier (section 2.2), concerns that oppose joint income maximization may lead to any kind of behavior, dependent on preferences and beliefs.<sup>19</sup> We expect an overall higher rate of defection for subjects with such concerns. Indeed, for participants who are classified as joint income maximizers, we observe a much lower rate of defection than for the remainder of participants (Figure 4). Of the players classified as joint income maximizers, 80.17% (93 out of 116) choose to cooperate in the PD; of the others, only

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<sup>17</sup> Given the parameters used in the distribution games, the share for self is constrained to lie in the interval 0.323 (pure altruism) to 0.683 (pure selfishness).

<sup>18</sup> We also have reasons to believe that participants did not choose defection because they considered the experiment as an entertaining 'game' where cheating on other players can be considered 'amusing'. Additionally, it is often thought that the 'quarrel of lovers is the renewal of love'. However, we have strong evidence that the participants' main motivation was to earn money (answers to a debriefing questionnaire from a second experiment on a similar subject pool). Furthermore, it should be noted again that decisions remained completely private, that no feedback was provided and that no communication about choices was possible. Thus, the 'fun' of cheating was minimized.

<sup>19</sup> Unfortunately, beliefs were not measured in our study, thus, limiting our interpretations.

58.82% (40 out of 68) choose cooperation. This difference is significant (Fisher exact test,  $p=0.0022$ ).

### [FIGURE 5]

We note the same effect in observing the final outcomes in couples where either both spouses have a concern for income maximization or where at least one has preferences that deviate from income maximization. Among couples where both partners have a preference for income maximization, 66.7% reach the efficient (joint cooperation) outcome (Figure 5). Joint defection does not eventuate for any of these couples. Among couples where at least one of the partners has a concern that is not clearly identified as maximization of joint earnings, only 50% reach the efficient outcome, and only 17.4% end up with joint defection. We compare both tables of frequency using a chi-square test. The difference is significant at a 5% level ( $p=0.042$ ).

As has been observed, the knowledge of individual motivation is a good predictor of defection in the prisoner's dilemma. However, this information is not usually available in the data. In the following, we explore the links between observed socio-demographic characteristics and defection.

#### 4.3.2 Socio-demographic variables

Who is more likely to defect? Even if classification based on the distribution task allows us to understand motivations behind defection in the prisoner's dilemma, such information will rarely be available in household data. Hence, in this part, we identify the links between a couple's characteristics and the propensity to defect. We use variables from the socio-economic questionnaire to confirm the effect of variations in the property right to divorce (marriage and duration of relationship effects), non-transferable goods that are union-specific (children), psychological characteristics of the couple, and remarriage opportunities on efficiency behavior. These effects are separately tested using a bivariate probit model of defection in the prisoner's dilemma.<sup>20</sup> This approach allows us to control for the correlation of unobservable variables between partners within each couple. Indeed, even in the absence of communication, the decision of a couple to defect should be considered as joint; moreover unobserved characteristics common to the couple might also explain the defection of both members. Test statistics shown in the tables are parametric. Whenever test results appear robust to a non-parametric bootstrap test, this is mentioned in the text. In any case, regression results must be taken as exploratory and their external validity should be considered with caution.

We first investigate the effect of marriage and parenthood on defection. As discussed in section 2.3, marital status, duration of relationship and the presence of a child may have an impact on the efficiency of a couple's decision-making. Many economic models aim at studying the link between marriage and efficiency (e.g. Cigno, 1991, 2012; Rasul, 2006). The date of marriage influences the importance of the mutual consent requirement to divorce, as well as the balance of outside opportunities. In the past, for married couples, the right to divorce was favorable to the one who did not want to separate since mutual consent was the rule. Nowadays, married couples

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<sup>20</sup> Regressions are based on behavior in the first prisoner's dilemma task played by couples. Individuals previously identified as 'irrational' are excluded. We, therefore, exclude from the bivariate analysis all couples where at least one spouse is irrational. Recall that 16 subjects were classified as irrational. As there is one couple in which both man and woman are irrational, we are left with a total of 85 valid observations for men and women.

and non-married couples, present a greater balance towards the partner who wants to separate. Hence, married or not, recently formed couples had, at the time they started living together, an easier access to unilateral break-up than older couples. This could induce a different selection process across generations that may better explain match characteristics and an increase of efficiency for young couples (Rasul, 2006).<sup>21</sup> Apart from this, the effect of the duration of the relationship may be due to marital satisfaction. The effect of time on marital satisfaction is, however, a matter of debate (see, for example, van Laningham, Johnson and Amato, 2001).

The effect of children cannot be separated from the effect of the marriage contract. This is not only because both variables are correlated. Zelder (1993) shows that divorce reforms may increase inefficiencies for couples having children. Inefficiencies arise when a couple divorces where one partner's utility of marriage is greater than the other's utility from divorce. Such inefficiencies can, according to Zelder, be avoided when transfers of some goods are possible between the spouses, such that they do not divorce. However, children can be perceived as a non-transferable good that constrains intra-household welfare transfers, which, thus, creates a favorable ground upon which inefficiencies may occur. According to this argument, unmarried couples with children would be inefficient, whereas couples under mutual consent and without children would not. The more standard counter-argument suggests that couples with children benefit from a 'couple-specific capital' (Becker et al., 1977) that increases welfare gain in marriage, and reduces the occurrence of such a situation.

Finally, regarding marriage and children, a selection process may occur. We might suspect that couples who marry and have children have unobserved characteristics in favor of increased couple's welfare, as compared to other couples. This last argument is naïve if we consider the sociological literature. This claims that marriage leads to increased dissatisfaction with the relationship because married couples share household tasks in a more traditional way (Stafford et al., 1977; South and Spitze, 1994). The presence of children worsens the situation as mothers are more involved in childcare (Glenn and McLanahan, 1982; Nomaguchi and Milkie, 2003).<sup>22</sup> Therefore, we expect that being married and having children increases the probability of defection for women by decreasing the benefits of the union for them.

#### [TABLE V]

What does the bivariate probit of defection in the prisoner's dilemma task (see Table V) reveal about these theories? If unmarried women with children do defect more than unmarried women without children, which follows Zelder's point of view, it appears that married women with children tend to defect even more, and this does not support Zelder's theory. Surprisingly, whether we control for an age effect or not, the duration of the relationship is not significant. The fact that marriage with children appears significant only for women is in line with the sociological view. Specifically, that the increase in child care tasks for women increases their dissatisfaction<sup>23</sup> and, thus, enhances their focus on their own self-interest. Note that the joint

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<sup>21</sup> Ideally, we should investigate the interaction of the duration of the relationship and the date of marriage. Unfortunately, the date of marriage is not available in our data.

<sup>22</sup> Note that measures of subjective wellbeing suggest that women's happiness in the US has declined both in absolute and relative terms over the last 35 years (Stevenson and Wolfers, 2009).

<sup>23</sup> We checked the impact of an additional psychological variable of harmony in the couple. Surprisingly, it did not affect the results. Thus, if the sociological effect is mediated by satisfaction, we cannot observe this with the psychological scale we have chosen.

effect of marriage and children remains statistically significant and is robust to bootstrap test statistics when the psychological explanatory variables are introduced.

We saw that being a joint income maximizer in the distribution task is associated with a high propensity to cooperate in the prisoner's dilemma task. We also found that cooperation in the prisoner's dilemma is highly correlated with children and marriage for women. We will, thus, consider whether these variables have an impact on behavior in the distribution task. Indeed, we find that for women, having children and being married is negatively correlated with being a joint income maximizer in the distribution task (correlation coefficient  $\rho = -0.2068$ ;  $p = 0.0505$ ). This main result from our experimental analysis is related to specific household models such as the one developed by Grossbard-Shechtman (1984). In her model, women who do more housework feel more entitled to a bigger share of the pay-off since they may be used to it in the contract they have with their husband who pays them quasi-wages. Related to this theory, it is thus not surprising to find that married women with children behave this way in the experiment. Interestingly, other empirical results find similar effects, such as Woolley (2003) who found that women who are in the labor force don't have more control over the couple's bank accounts than women who are not.

#### [TABLE VI]

We will next consider the effect of remarriage opportunities on defection. Inefficiencies could occur when the separation wishes by partners are not the same: one would gain from divorce, the other would lose. Remarriage opportunities can be linked to differences in spouses' characteristics related to age, education, income, assets and earlier couple experience.<sup>24</sup> Table VI presents results concerning these variables. Age and a large age difference lead to more selfish behavior for men. Education as such does not increase opportunism; however, relatively higher education increases opportunism for men. Women are neither affected by differences in age nor education. Higher income and individual assets have no statistical significant impact on the defection probability, contrary to the economic intuition. However, this may be due to noise in our measure of income. The effect of previous couple experience is interesting. The impact for men and women goes in opposite directions. A woman who has a previous couple experience in couple with a man who does not have tends to deviate less. A man who has a previous couple experience in couple with a man who does not have tends to deviate more. This is only possible if previous experience influences remarriage market opportunities differently for men and women. One possible interpretation is as follows: women who have 'more' couple experience cooperate more since they have reduced remarriage market opportunities; whereas men who have 'more' couple experience defect more since they have increased remarriage market opportunities.<sup>25</sup> This effect is also confirmed by the positive age effect observed for males. Finally, it should be noted

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<sup>24</sup> These variables are usually considered as variables that could potentially affect the balance of bargaining power in the family.

<sup>25</sup> This may also be due to a selection effect in leading more experienced women to select cooperative partners. However, it seems questionable why more experienced men should select non-cooperative partners. In light of the Grossbard-Shechtman model (1984), this kind of result could be due to the fact that women with previous marriages have more housework experience; they want a better contract and more cooperation in their next marriage. Men are the employers and, if they were married before, they may have learned how to pay less for housework services provided by the wife when they remarry; or they may also be worse employers.



that robustness checks regarding the validity of these tests for a small sample size do not provide satisfactory results. Again, evidence in favor of the economic explanation of defection is weak.

We have, thus, identified two effects that could potentially lead to defection within couples. The first is related to bargaining power for men (i.e., being older, more educated, wealthier and having more couple experience), and the second to characteristics of the family situation for women (i.e., being married and having children). While the first effect depends on the comparison between spouses the second may be a general impact on people's behavior. We then investigate the difference in behavior depending on whether the prisoner's dilemma task is played with the spouse or with a stranger. For this we pool observations from men and women (see Table VII).<sup>26</sup> Recall that no correlation between the decisions in the game played by spouses and the game played with a stranger, have been found, and thus, we do not expect to find the same determinants of behavior in the two games.

### [Table VII]

Many economic studies have already investigated which factors might predict behavior in anonymous non-repeated interactions (Roth, 1995). However, the cooperation behavior of individuals is generally very difficult to predict using observable covariates. Indeed, the only significant factor of defection that we find is gender. When playing with a stranger we observe that women are generally more cooperative. This result is in line with some earlier studies (e.g., List, 2004).<sup>27</sup> Within couples, however, we observe no gender effect, a weak positive effect of children and a strong positive joint effect of children and marriage on defection. This confirms the robustness of the impact of family status variables on defection in our sample. Therefore, one main result from this analysis is that cooperation behavior within the couple is predictable with couples' characteristics.

## 5. Conclusion

Many situations in households resemble social dilemmas. Naturally, we should keep in mind that a pure form resembling the prisoner's dilemma will be rarely encountered by couples in real life. However, the specific strategic context — with unobservability of spouses' actions, and private and secret gains — creates an ideal situation to free-ride, and free-riding situations do exist for couples. In face to face interactions it is possible that social norms, signaling and emotions will cause outcomes to be more efficient. Experimental payoffs may also seem low compared to the stakes couples usually bargain over (e.g., salaries). However, changing the stake size might at the same time increase concerns for equality and for efficiency. Despite these limitations concerning the external validity of our results, which are common to all experimental studies, the main interest of our study is its comparison to previous tests of household's pareto efficiency.

In this paper we present results from an experiment on 100 co-habiting couples from the urban area of Toulouse. Spouses participated in a prisoner's dilemma, a distribution task and a socio-

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<sup>26</sup> Again, individuals previously identified as 'irrational' are excluded from the regressions, leaving us with 184 observations.

<sup>27</sup> 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, depending on the study, different results have been observed (Croson and Gneezy, 2008).

demographic and psychological questionnaire. Our data further enables us to contrast behavior in couples to interactions with a stranger. Our results lead us to two noteworthy conclusions.

First, cooperation within the couple is not at its maximum. We found that approximately one out of four participants behaved non-cooperatively with their spouse. This figure corresponds to estimates by Del Boca and Flinn (2012) using a micro-econometric model for a sample of married households from the United States. This casts doubt on the systematic recourse to the Pareto-efficiency assumption in household decision-making models. Meanwhile, even under experimental conditions, about one third of the participants do not maximize joint income in a simple distribution task. For these individuals, we especially observe preferences for the equality of experimental earnings. Overall, evidence of selfishness among spouses appears weak as strong preferences for maximizing own payoffs in the distribution task are rarely observed. Defection is more probably related to intra-household payoff inequality aversion than to selfishness.

Second, the exploratory analysis of the effect of individual and couple characteristics on behavior in the prisoner's dilemma brings evidence on the validity of some household models. Having children decreases cooperation, consistent with the economic view (Zelder, 1993) that children are public non-transferable goods. However, this effect is specific to women, and is even stronger when they are married. This effect which would be puzzling in Zelder's model is reconciled using Grossbard-Shechtman's (1984) framework. The way household production is supplied and goods are distributed within the household is a key issue that allows understanding how monetary income is shared among spouses. In households where housework chores are essentially supplied by women, monetary transfers go from the husband to the wife and in this case, the monetary household income is unequally shared in favor of the female. This unequal sharing may take place in real life and therefore could induce a similar micro-norm in the experiment. This conjecture needs to be checked in a further analysis that controls for time-allocation decisions.

This study makes a significant contribution to investigations of household behavior by testing for willingness to cooperate and share income by men and women who are either in couple with each other or complete strangers. It extends the conclusions of previous studies where inefficiency within a couple is far from rare (Ashraf, 2009, Iversen et al., 2006). In addition, we contribute to the identification of the type of individual preference (most likely inequality aversion) and socio-demographic characteristics (age, marriage and parenthood) that are likely to generate inefficiencies. Results from the individual preferences analysis suggest that we should pay attention to the usual assumptions that household members behave selfishly (or caring in a Beckerian sense) since individuals appear to be intra-household income inequality averse in the experiment. Separability of individual utilities should maybe be considered with caution. Finally, the impact of socio-demographics variables on efficiency provides an interesting challenge for possible future research. Our finding that married women with children tend to defect more and whether that is related to unbalanced housework arrangements in the family is particularly worthy of further research.

**Online appendix at:**

[http://www.tse-fr.eu/images/doc/wp/bee/cochard\\_etal\\_2014\\_onlineappendix.pdf](http://www.tse-fr.eu/images/doc/wp/bee/cochard_etal_2014_onlineappendix.pdf)

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## Tables and Figures

	D	C
D	200, 200	310, 135
C	135, 310	245, 245

**FIGURE 1: PRISONER'S DILEMMA; PAYOFFS**

**TABLE I: DISTRIBUTION TASK ( $\alpha > 1$ )**

line	option (A) share for self	share for other	option (B) share for self	share for other
1	$X/2$	$X/2$	$0$	$\alpha X$
2	$X/2$	$X/2$	$1/6 \alpha X$	$5/6 \alpha X$
3	$X/2$	$X/2$	$1/3 \alpha X$	$2/3 \alpha X$
4	$X/2$	$X/2$	$1/2 \alpha X$	$1/2 \alpha X$
5	$X/2$	$X/2$	$2/3 \alpha X$	$1/3 \alpha X$
6	$X/2$	$X/2$	$5/6 \alpha X$	$1/6 \alpha X$
7	$X/2$	$X/2$	$\alpha X$	$0$

**TABLE II: PREDICTION OF DISTRIBUTION TASK PATTERNS DEPENDING ON CONSUMPTION PREFERENCES (X) OF SPOUSES**

	Selfishness $\max x_1$	extreme Altruism $\max x_2$	Efficiency seeking $\max (x_1 + x_2)$	Inequality aversion $\max\{\min\{x_1, x_2\}\}$
Model I				
Model II with $x_i = \rho_i(y_1 + y_2)$		BBB B BBB		
Model II with $x_i = \rho_i(y_1, y_2) = y_i$	AAA B BBB	BBB B AAA	BBB B BBB	AAA B AAA
	<i>Any combination of the pure forms above is possible</i>			

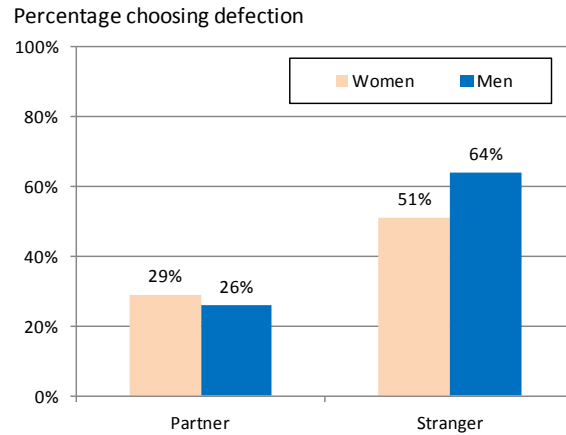
(\*) Letters refer respectively to the option chosen by the participant in the first line, second line, etc. AAA B BBB means that the individual chose A for the first 3 lines of the distribution task (see Table I) and chose B for lines 4 to 7.

**TABLE III: TIMELINE OF EXPERIMENTAL SESSION**

- Welcome and general instructions
- Prisoner's dilemma games
  - a. own partner
  - b. stranger
  - c. [repetition: own partner (sub-sample of 40 couples)]

*[other tasks - not discussed in this paper: individual risk taking, free bargaining via written messages]*

- Distribution choices
- Socio-demographic questionnaire + Psychological questionnaire (Dyadic adjustment scale)
- Individual private payout and goodbye



**FIGURE 2: INDIVIDUAL DEFECTION IN PRISONER'S DILEMMA, WITHIN COUPLES VS STRANGERS, BY GENDER**

a) Spouses				b) Strangers					
N = 100 couples		Woman		N = 100		Woman			
		D	C			D	C		
Man	D	10	16	26	Man	D	31	33	64
	C	19	55	74		C	20	16	36
		29	71	100			51	49	100

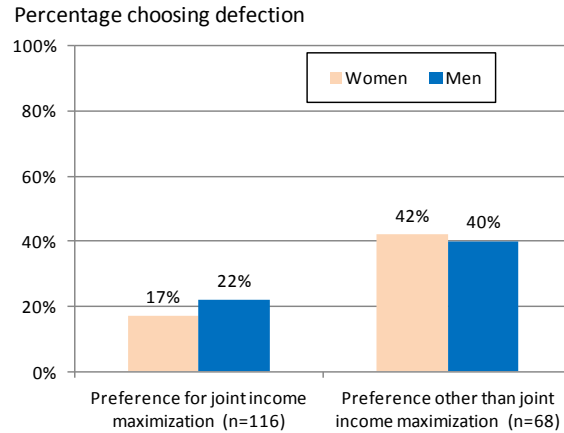
**FIGURE 3: WITHIN COUPLE AND WITHIN STRANGERS BEHAVIOR IN THE PRISONER'S DILEMMA**

**TABLE IV: CLASSIFICATION OF INDIVIDUAL BEHAVIOR IN THE DISTRIBUTION GAME**

	Men	Women
Maximizing own payoff	0	0
Maximizing couple's payoff	64	52
Sensitive to efficiency-equality trade-off (*)		
Symmetric	14	15
Asymmetric – selfish	8	14
Asymmetric – altruistic	8	9
Maximizing other's payoff	0	0
Irrational (did not select B for row 4)	6	10
Total	100	100

(\*) Note: "Sensitive to efficiency-equality trade-off" are rational spouses who choose the equal option (A) instead of the income maximizing option (B) at least once, and who are neither "maximizing own payoff" (decision pattern AAA-B-BBB) nor "maximizing other's payoff" (decision pattern BBB-B-AAA).





**FIGURE 4: DEFECTION IN THE PRISONER'S DILEMMA, DEPENDING ON CHOICE IN THE DISTRIBUTION TASK, BY GENDER**

a) both spouses choose joint income maximization N = 39 couples				b) at least one spouse does not choose to maximize joint income N = 46 couples			
		Woman				Woman	
		D	C			D	C
Man	D	0 (0%)	6 (15.4%)	Man	D	8 (17.4%)	8 (17.4%)
	C	7 (17.9%)	26 (66.7%)		C	7 (15.2%)	23 (50%)

**FIGURE 5: COUPLES' BEHAVIOR IN THE PRISONER'S DILEMMA, DEPENDING ON DECISIONS TAKEN IN THE DISTRIBUTION TASK**

**TABLE V: WHO IS OPPORTUNIST, COUPLE CHARACTERISTICS EFFECTS**

	Women	Men
Age	-0.059 (0.038)	0.055 (0.031) *
Duration of relationship	0.036 (0.041)	-0.024 (0.033)
Married without children	0.319 (0.546)	0.362 (0.487)
Not married, with children	1.049 (0.601) *	0.374 (0.529)
Married, with children	1.190 (0.480) **	0.056 (0.555)
Constant	0.412 (0.929)	-2.502 (0.853) ***
Observations	85	
Rho	0.176 (0.228)	
Log likelihood	-88.036	

*Bivariate probit model. Standard errors in parentheses . \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%*

**TABLE VI: WHO IS OPPORTUNIST, REMARRIAGE OPPORTUNITIES**

<b>a) Age</b>	Women	Men	<b>b) Education</b> (years of study)	Women	Men
Own	0.007 (0.016)	0.032 ** (0.016)	Own	-0.081 (0.050)	-0.023 (0.048)
Difference <sup>(*)</sup>	-0.004 (0.035)	0.066 * (0.037)	Difference <sup>(*)</sup>	0.058 (0.039)	0.072 * (0.041)
Constant	-0.881 (0.556)	0.265 *** (0.209)	Constant	-0.184 (0.311)	-0.582 * (0.310)
Rho	0.265 (0.209)		Rho	0.254 (0.211)	
Log likelihood	-91.572		Log likelihood	-92.496	
<b>c) Income</b> (in 1000 €)	Women	Men	<b>d) Assets</b> (in 100,000 €)	Women	Men
Own	-0.165 (0.224)	-0.218 (0.232)	Own	0.065 (0.197)	0.038 (0.247)
Difference <sup>(*)</sup>	0.000 (0.156)	0.342 (0.223)	Difference <sup>(*)</sup>	-0.010 (0.131)	0.178 (0.217)
Constant	-0.429 (0.356)	-0.419 (0.359)	Constant	-0.673 *** (0.172)	-0.715 *** (0.175)
Rho	0.231 (0.201)		Rho	0.262 (0.204)	
Log likelihood	-94.842		Log likelihood	-94.335	
<b>e) Previous couple experience</b> (dummy)	Women	Men			
Own	-0.001 (0.416)	-0.435 (0.430)			
Difference <sup>(*)</sup>	-0.623 * (0.356)	0.743 * (0.408)			
Constant	-0.673 *** (0.184)	-0.561 *** (0.180)			
Rho	0.201 (0.202)				
Log likelihood	-92.713				

*Bivariate probit models. Standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%  
(\*) Difference between own variable and spouse's variable.*

**TABLE VII: WHO IS OPPORTUNIST, POOLING MEN AND WOMEN**

	Strangers		Couples	
Male	0.392	(0.193) **	-0.012	(0.207)
Age	-0.016	(0.015)	0.006	(0.014)
Married without children	0.040	(0.330)	0.363	(0.351)
Not married, with children	-0.450	(0.333)	0.596	(0.348) *
Married, with children	0.155	(0.314)	0.733	(0.322) **
Years of study	-0.005	(0.024)	-0.016	(0.025)
Constant	0.623	(0.427)	-1.079	(0.434) **
Observations	184		184	
Log likelihood	-120.495		-101.870	

*Probit model of individual defection in the prisoner's dilemma. Standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%*