

Cooperation: the power of a single word?  
Some experimental evidence on wording and gender effects  
in a Game of Chicken

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**Abstract:** Framing has been widely shown to affect decision making. In this paper, we investigate experimentally whether, and to what extent, cooperative behaviour in a Game of Chicken may be impacted by a very basic change in the labelling of the strategies. Our within-subject experimental design involves two treatments. The only difference between them is that we introduce either a socially-oriented wording ('I cooperate'/'I do not cooperate') or colours (Red/Blue) to designate strategies. The level of cooperation appears to be higher in the socially-oriented context, but only when the uncertainty as regards the type of the partner is manipulated, and especially among females.

**JEL classification:** C72, C92

**Keywords:** social dilemma, Game of Chicken, cooperation, label framing effects, wording effects, gender effects

## 1. Introduction

A huge body of experimental evidence suggests that, in both individual and interactive decision settings, the way people make their decisions is strongly influenced by the ‘surface structure’ of the decision problem<sup>1</sup> (e.g. Frisch, 1993; Tversky and Kahneman, 1981; Wagenaar et al., 1988). The way a given decision problem/choice situation is presented has been shown to strongly influence behaviour, even though the essential features of the decision problem remain the same. This is the so-called framing effect.

Two kinds of framing effects have been identified and empirically documented, depending on whether frame manipulation is meant to change reference points or only consists in changes in wording. The first kind of framing is referred to as ‘valence’ framing; it mainly refers to the positive or negative presentation of the informational background (see for instance Andreoni, 1995; Cookson, 2000; de Heus et al., 2010; Fleishman, 1988; Fujimoto and Park, 2010; Goerg and Walkowitz, 2005; Iturbe-Ormaetxe et al., 2011; Levin et al., 1998; Park, 2000; Petrinovich and O’Neil, 1996). The second kind of framing, called ‘label’ framing, has to do with wording and labelling and has sometimes been considered as a ‘pure framing effect’ (Elliott et al., 1998). For instance, the intensity of cooperative behaviour has been shown to strongly depend on the game’s title (see for instance Cronk, 2007; Dufwenberg et al., 2011 and the references therein) and game’s characterization (Cookson, 2000; Rege and Telle, 2004; Zhong et al., 2007), as well as on the labelling of players’ strategies (see for instance Rege and Telle, 2004) and players’ type (see for instance Burnham et al., 2000; Rege and Telle, 2004). In this paper, we are interested in how a change in the labelling of the strategies is likely to affect cooperative behaviour.

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<sup>1</sup> From a normative point of view, only the ‘deep structure’ of the decision problem should influence decision making.

To avoid confounding framing effects and better control the data, interactive decision making has often been investigated using context-free experimental designs that “*typically remove informational cues that might provide richer meaning to the game*” (Zhong et al., 2007, p. 432). In particular, defective/cooperative strategies are usually designated using a neutral wording, using such labels as “*A and B; C and D; X and Y; red, blue, yellow, or white; up and down; or left and right.*” (p. 433-434)

On the other hand, real life usually involves explicit decision settings, which may impair the external validity of data collected using a context-free experimental design. A number of experimental studies have investigated the influence of ‘valence’ and ‘label’ framing on cooperative behaviour, be it by comparing behaviour in a context-free setting with behaviour in a context-rich setting, or by comparing behaviour in different context-rich settings (e.g. depending on whether the focus is made on either cooperation or competition, sharing money or earning money for oneself, and so on; see for instance Rege and Telle, 2004 and Zhong et al., 2007 and the references therein). Most of the time, the level of cooperation appears to be higher when frame manipulation is intended to put the subjects in a socially-oriented mood.

Decision making in interactive settings in general, and especially cooperative behaviour, has also been shown to be gender-dependent, even though the direction of the evidence remains unclear<sup>2</sup>. However, even though men may exhibit a more cooperative (or contributive) behaviour than women (e.g. Schwierien and Sutter, 2008), the opposite pattern seems to be more frequent (e.g. Gächter et al., 2004; see also Fujimoto and Park, 2010 for

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<sup>2</sup> The results seem to be highly sensitive to both the game under investigation and the very features of the experimental design (see Ortmann and Tichy, 1999 and the references therein). For instance, they seem to depend on whether the choice situation involves risk or not (Croson and Buchan, 1999; Eckel and Grossman, 2008a). Moreover, men seem to be more sensitive to the price of altruism than women, meaning that they are more (resp. less) generous than women when altruism has a low (resp. high) cost (Andreoni and Vesterlund, 2001).

additional references and Eckel and Grossman, 2008a and Croson and Gneezy, 2009 for comprehensive reviews).

Several explanations have been raised to account for this pattern of behaviour. In particular, women have been supposed: (i) to be more socially-oriented (e.g. Eckel and Grossman, 1998), more concerned with fairness (Andreoni and Vesterlund, 2001) and more prone to feel guilt (Harvey et al., 1997) than men, (ii) to feel less comfortable than men in a competitive environment (e.g. Gneezy et al., 2003; Niederle and Vesterlund, 2007), (iii) to be more risk averse than men in interactive settings (e.g. Eckel and Grossman, 2008b; see also Croson and Gneezy, 2009 and the references therein), (iv) not to use the same rules and heuristics as men when making their decisions (e.g. Conrath, 1972).

There is also some empirical evidence regarding the *combined* effects of framing and gender on decision making. Most of the time, women appear to be more sensitive to changes in ‘valence’ framing than men (see for instance Fagley and Miller, 1990 for individual decision making under risk; Fujimoto and Park, 2010 for public goods provision). In particular, Fujimoto and Park (2010) find that a guilt-inducing context (a negative frame as opposed to a positive one) may enhance women’s propensity to cooperate, while it has no effect on men. Now, as regards the gender-dependency of ‘label’ framing effects, it seems that women tend to cooperate more than men when the frame manipulation results in a socially-oriented context, which is more liable to activate their higher sensitivity to above-mentioned social and moral concerns (e.g. Andreoni and Vesterlund, 2001; Eckel and Grossman, 1998; Harvey et al., 1997; see however Elliott et al., 1998 for a study showing a gender-neutral institutional framing effect).

Our experiment aims at investigating whether and to what extent cooperative behaviour might be affected by some basic change in the labelling of the strategies, and whether such a

'label' framing effect might be gender-dependent or not. The main originality of our design is twofold.

First, by contrast with most existing experimental studies, ours involves a Game of Chicken payoff structure. The Game of Chicken aims at capturing a kind of social dilemma that has not been much investigated in the literature **while it offers some interesting properties from both a theoretical and empirical point of view (see de Heus and al., 2010 for instance).** As in the Prisoner's Dilemma Game (PDG), each partner appears to benefit more from bilateral cooperation than from bilateral defection<sup>3</sup>. But, contrary to what happens in the PDG, if the agent expects her partner to defect, she will have interest to cooperate, and she will be declared the "chicken" of the game. Therefore, in the Game of Chicken, two pure equilibria exist (corresponding to unilateral cooperation and unilateral defection respectively), with no dominating strategy. The Game of Chicken thus appears to be a realistic description of strategic interactions, and it is particularly suitable for describing relations between individuals, firms, institutions, social groups, political parties and countries<sup>4</sup>. Besides, due to its payoff structure, the Game of Chicken **looks more appropriate than the PDG for capturing the decision maker's intrinsic propensity to cooperate (see Butler et al., 2011, pp. 1104-1105 for a nice review), thus for studying cooperative vs. defective behaviour (Thaler and Camerer, 2003)<sup>5</sup>. In particular, it is worth noting that, in the Game of Chicken, cooperation is expected to increase as risk aversion grows, while the opposite holds in PDG. For all these reasons, the**

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<sup>3</sup> However, such a cooperative behaviour is costly, so it will make no sense for a "self-interested" individual to consent an effort toward cooperation if she expects her partner to cooperate.

<sup>4</sup> For instance, it has been used to describe military or political conflict (Snyder, 1971; Stone, 2001), as well as negotiations over environmental conventions (Carraro and Siniscalco, 1993; Ward, 1993); it can also be used to describe interactions on the labour market (Cason and Sharma, 2007).

<sup>5</sup> In the PDG, a subject will not cooperate unless she has some intrinsic propensity to cooperate and is sufficiently confident that her fellow player will cooperate too (since defection is a dominant strategy). So risk aversion should lead to defection. This implies that the *greed* motive for defection (the desire to maximize one's gains) cannot be disentangled from the *fear* motive for defection (due to the risk that the partner defects while I cooperate) – either of which may lead to defection. In the Game of Chicken, the fear motive for defection is negative, meaning that risk aversion should lead to cooperation. So the only motive for defection in the Game of Chicken is greed.

Game of Chicken can be viewed as a nice and valuable framework for investigating the impact of labelling on cooperative behaviour.

Second, our experimental design takes into account the fact that agents may exhibit heterogeneous preferences. Indeed, both in the field and in the lab, heterogeneity (in terms of social preferences) has been shown to prevail among people in interactive settings. Besides those people who tend to behave in a self-interested way, some other people appear to be motivated by considerations of “fairness” and “reciprocity”. For instance, using a Game of Chicken framework, Neugebauer et al. (2008) suggest that, even though most of the subjects (83%) tend to behave in a self-interested way and to maximize their monetary gains, some of them appear to favour reciprocity and equity. More generally, it can be drawn from empirical research that 40 to 66% of the subjects show a preference for reciprocity, while only 20 to 30% of them care about their sole monetary gains (the remaining subjects do not seem to have very clearly defined preferences) (Erlei 2008; Fehr and Gächter 2000).

To capture the reality of agent heterogeneity in some way, our experimental design was grounded on Cabon-Dhersin and Ramani (2007)’s model, which elaborates on heterogeneity by considering a population with two types of agents, namely the payoff maximizers or ‘strategic cooperators’ (who do not cooperate unless it is in their interest to do so), and the ‘unconditional cooperators’ (who always choose to cooperate). Agents do not know the type of their partner in the game, they just have some probabilistic information regarding the probability to meet a partner of one or another type (or, equivalently, regarding the proportion of each type in the population). Note that, in this model, uncertainty with regard to the partner’s behaviour is twofold: the basic kind of uncertainty as regards the partner’s behaviour is strengthened by the uncertainty as regards her type (since her behaviour now also depends on her type). So, due to heterogeneity, the model makes uncertainty as regards others’

behaviour more salient than in most usually experimentally investigated games. If risk attitude is to affect cooperative behaviour, this influence might be more salient too.

At this point, the theoretical framework on which our experiment is based may look quite involved given the modest purpose of the present study. For a better understanding, it should be emphasized that this study actually belongs to a larger experimental research sequence. Indeed, our first intention was to examine the descriptive accuracy of Cabon-Dhersin and Ramani (2007)'s model (see Cabon-Dhersin and Etchart-Vincent, 2012). Only in a second step, after considering it further (but, naturally, before designing the experimental study itself) did we decide to take advantage of decreasing marginal costs by introducing two additional sessions, using a within-subject design, allowing us to pursue two additional – but secondary – purposes. Session 2 was run to elicit the subjects' level of risk aversion in an individual-decision-making-under-risk context, so that we could investigate the connections between such 'individual' risk aversion and cooperative behaviour (through the comparison Session 1/Session 2, not reported here). Session 3 was run to elicit the subjects' level of cooperation in the same Game of Chicken as in Session 1, but using a different labelling of the strategies, so that we could investigate for labelling effects (through the comparison Session 1/Session 3, reported here)<sup>6</sup>.

In our experiment, the difference between the context-free (baseline) treatment used in Session 1 and the socially-oriented (target) treatment used in Session 3 consisted in a single change in wording between the two<sup>7</sup>. Indeed, our idea was to introduce a mild change in the

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<sup>6</sup> Of course, as pointed out by a referee, labelling/framing effects remain to be investigated in a more standard (and simpler) Game of Chicken. This is an avenue for future research. Nevertheless, we would like to emphasize that our most stimulating findings actually result from the very features of Cabon-Dhersin and Ramani (2007)'s model (and from agent heterogeneity primarily). They could not have been obtained using a more standard Game of Chicken.

<sup>7</sup> As far as 'label' framing is concerned, socially-oriented frame manipulation may be minor, and circumscribed either to a change in the game's name (as in Liberman et al., 2004 or Dufwenberg et al., 2011 for instance) or to the substitution of one sentence for another (as in Nelson et al., 1997 for instance). It may also involve a rather comprehensive socially-oriented scenario (as in Rege and Telle, 2004 for instance).



labelling of the strategies to investigate whether a *single* word could be powerful enough to alter behaviour. For that purpose, we chose to focus on the word ‘cooperation’. The cooperative/defective strategies were designated as ‘red’/‘blue’ in the context-free (baseline) treatment (as in Chaudhuri et al., 2002), and as ‘I cooperate’/‘I do not cooperate’ in the framed treatment<sup>8</sup>. All other things were held equal across the treatments (including the performance-based payment procedure) to prevent any undesirable interaction effects (Cookson, 2000) and to isolate the impact, and possibly the power, of the *single* word ‘cooperation’ on cooperative behaviour.

The word ‘cooperation’ is obviously not neutral. It strongly appeals to moral and social norms such as obedience norms, solidarity norms and fairness rules. From an evolutionary point of view, these norms may be seen as a tool designed to promote cooperation and avoid the deleterious effects of free riding among the members of a given human group (Van Vugt and Van Lange, 2006). From a descriptive point of view, these norms have actually been shown to affect behaviour toward cooperation, be it due to their normative appeal or to social mimicry (e.g. Biel and Thøgersen, 2007; Rege and Telle, 2004)<sup>9</sup>. So, though very basic, our frame manipulation may be expected to affect behaviour by activating cooperation-oriented social norms (Biel and Thøgersen, 2007).

Besides, since ‘label’ framing effects have widely shown to be gender-dependent, especially when moral and social norms are involved, we wished to investigate whether men and women’s behaviour toward cooperation would be affected the same way by our basic change in the labelling of the strategies.

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<sup>8</sup> A similar-in-spirit, but much more comprehensive, work was run in Zhong et al. (2007) using a Prisoner’s Dilemma Game.

<sup>9</sup> Note that we did not label the defective strategy as such, but only as ‘non cooperative’, to be able to focus on the positive influence of the word ‘cooperation’ and avoid that it be polluted by the negative and possibly stronger influence of the word ‘defection’. Indeed, if the moral and social norm is to cooperate, defection can be expected to induce social disapproval and even ostracism, which might appear as prohibitive costs to defection.

To sum up, our experimental design allowed us to investigate three assumptions as regards both labelling and gender effects:

**A1:** Subjects should be expected to cooperate more in the socially-oriented treatment than in the neutral setting.

**A2:** Women should be expected to cooperate more than men in the neutral setting.

**A3:** Women should be expected to be more sensitive than men to the social and moral background of the word ‘cooperation’, thus to cooperate more than men in the socially-oriented treatment.

Taken together, A2 and A3 suggest that the discrepancy between men’s and women’s behavior should be larger in the socially-oriented setting than in the neutral one.

The main results of the study are the following. First, when considering the whole set of data, the socially-oriented setting seemed to induce a slightly more cooperative behaviour than the context-free one, which brings some support to Assumption A1. Second, women did not appear to cooperate more than men in the neutral setting (which invalidates A2), but they significantly did in the socially-oriented setting (which brings some support to Assumption A3). Moreover, when examining the data at a more disaggregated level, we found some unexpected result: the existence and intensity of both ‘label’ framing and gender effects appear to be dependent on the very features of the game (namely the structure of the population and the level of the payoffs).

The remainder of the paper is organized as follows. The theoretical framework and experimental design are described in Sections 2 and 3 respectively. Section 4 reports the results, which are further discussed in Section 5. Section 6 concludes.

## 2. The theoretical framework: a Game of Chicken with heterogeneous agents

As mentioned above, our study was based on a Game of Chicken framework, and more specifically on Cabon-Dhersin and Ramani (2007)'s model involving heterogeneous agents. For a better understanding of the experimental design, it is worth saying a few words about the model and theoretical predictions. More details can be found in Cabon-Dhersin and Ramani (2007) as well as in Cabon-Dhersin and Etchart-Vincent (2012).

In the model, the population of players is assumed to be heterogeneous, thus to consist of two types of individuals, namely the payoff maximizers (or strategic cooperators, denoted SCs in the following), who do not cooperate unless it is their interest to do so<sup>10</sup>, and the unconditional cooperators (denoted UCs in the following), who always cooperate by definition. The probability for any agent to meet a SC partner (or, equivalently, the proportion of SCs in the population) is denoted  $p$ , with  $0 < p < 1$  (or  $0 < p < 100\%$ ).

Players are matched in pairs to play the Game of Chicken the payoff structure of which is depicted on Figure 1. Players  $i$  and  $j$  make simultaneous decisions. If both partners choose to cooperate ( $c$ ), each of them gets  $X$ . If both partners choose to defect ( $d$ ), each of them gets  $Y$ . If either  $i$  or  $j$  chooses to cooperate while her fellow partner chooses not to cooperate, the former gets  $L$ , with  $X > L > Y$ , while the latter gets  $H$  with  $H > X$ .

INSERT FIGURE 1 ABOUT HERE

In the specific case where all the players are payoff maximizers (SCs), i.e. when  $p = 1$  (or  $p = 100\%$ ), the game displays three Nash equilibria. Two of them are pure equilibria corresponding to unilateral cooperation and unilateral defection; they are given by  $(c, d)$  and  $(d, c)$  respectively. The third Nash equilibrium is a mixed-strategy one, in which each player

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<sup>10</sup> As usual, payoff maximizers are assumed to be risk neutral, thus to maximize their expected gains.

probabilistically chooses between pure strategies  $c$  and  $d$ . To be specific, she chooses  $c$  with probability  $(1-\alpha^*)$  and  $d$  with probability  $\alpha^*$ . The mixed-strategy equilibrium can also be viewed as the result, at the level of the whole population, of the aggregation of individual pure strategies, with a proportion  $(1-\alpha^*)$  of players choosing  $c$  and a proportion  $\alpha^*$  of players choosing  $d$ <sup>11</sup>. Note that, when  $p = 1$  (i.e. when 100% of the population are SCs), the equilibrium proportion of cooperative choices among the SCs  $(1-\alpha^*)$  and the equilibrium proportion of defective choices among the SCs  $\alpha^*$  are such that:

$$(1-\alpha^*) = \frac{L-Y}{(H-X)+(L-Y)} = T$$

Now, we come to the general case with two types of agents (namely the SCs and the UCs). By solving the Game of Chicken with agent heterogeneity (assuming risk neutral preferences among the SCs), we get the following symmetrical mixed-strategy Nash equilibrium:

- (i) Whenever the proportion  $p$  of SCs in the population is such that  $p > (1 - T)$ , the proportion of cooperative choices among the SCs  $(1-\alpha^*)$  is such that:

$$(1-\alpha^*) = 1 - \frac{1-T}{p} \text{ with } T = \frac{L-Y}{(H-X)+(L-Y)}.$$

- (ii) Whenever the proportion  $p$  of SCs in the population is such that  $p \leq (1 - T)$ , the proportion of cooperative choices among the SCs  $(1-\alpha^*)$  is such that  $(1-\alpha^*) = 0$ .

The SCs will always defect ( $\alpha^* = 1$ ).

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<sup>11</sup> This is one possible interpretation for mixed-strategy equilibrium (see Oechssler, 1997).

The following two testable predictions can be drawn from (i) and (ii) (for more details, see Cabon-Dhersin and Ramani, 2007).

**P1:** *When  $p > 1 - T$ , the higher the proportion of SCs in the population, the higher the proportion of cooperative choices ( $1 - \alpha^*$ ) among the SCs.*

When the proportion of SCs in the population reaches a given threshold ( $1 - T$ ), the proportion ( $1 - \alpha^*$ ) of cooperative choices among the SCs at equilibrium increases with  $p$  from 0 to  $T$ . Note that, for Prediction P1 to be testable,  $p$  must be given different values between 0% and 100%, all other things being held equal.

**P2a:** *The proportion ( $1 - \alpha^*$ ) of cooperative choices among the SCs is a decreasing function of the return from unilateral defection ( $H$ ).*

**P2b:** *The proportion ( $1 - \alpha^*$ ) of cooperative choices among the SCs is an increasing function of the return of unilateral cooperation ( $L$ ).*

Note that, for Predictions P2a and P2b to be testable,  $H$  and  $L$  must be given different values within their bounds ( $X > L > Y$  and  $H > X$ ), all other things being held equal.

The theoretical curves associated with Predictions P1 and P2a-P2b for specific (experimental) values of  $X$ ,  $Y$ ,  $H$  and  $L$  are given in Figures 2, 3 and 4 at the end of Section 4, along with the corresponding experimental curves.

### **3. The experimental design**

The experiment was run using a three-session within-subject design. As said in the introduction, only the results from Sessions 1 and 3 will be reported here. A brief summary of

the experimental design is provided in Table 1; it may help the reader better grasp the connections between the sessions and the specific aim of this paper.

INSERT TABLE 1 ABOUT HERE

Both Sessions 1 and 3 involved interactive decision making within the above-mentioned Game of Chicken framework. Remember that the experimental study primarily aimed at investigating the descriptive accuracy of Cabon-Dhersin and Ramani (2007)'s theoretical predictions (especially P1 and P2a-P2b). This was done labelling the strategies in a rather neutral way: as in Chaudhuri et al. (2002), the cooperative and defective strategies were labelled as 'red' and 'blue' respectively. The corresponding Session 1 will be denoted BR (for Blue-Red) in the following. In our study of labelling effects, BR corresponds to the baseline treatment.

Note that there is some literature suggesting that colours might actually not be neutral (e.g. Hill and Barton, 2005). Still, colours have been extensively used to designate strategies in experimental studies involving interactive decision making (see for instance Kotani et al., 2008 and the number of references given in Zhong et al., 2007). Moreover, in the pilots, the subjects were asked about their feeling regarding the use of colours 'red' and 'blue' as labels to designate the strategies in the game. They actually considered them as similar, with no specific connotation. So, we felt confident to use these colours, as well as not to test for colour effects explicitly.

Session 3 (the target treatment here) was introduced to test the influence on cooperative behaviour of a socially-oriented change in the labelling of strategies, as well as the gender dependency of this influence. So the very same design was used as in Session 1, except that the strategies were now labelled as 'I cooperate'/'I do not cooperate'. All other

features of the experimental design (including the performance-based payment scheme) were held strictly identical across the sessions, and held as neutral as possible, to prevent any confounding framing effects and better control the data. Session 3 will be denoted COOP (for Cooperation) in the following.

Note that session 2 aimed at eliciting the subjects' level of risk aversion in an individual-decision-making-under-risk context<sup>12</sup>, so it is very unlikely to have influenced behaviour in Session 3. Besides, we chose to run it between the other two sessions to prevent any memory effects across interactive sessions. For the same reason, we also deliberately chose to hold the COOP session after the BR one for *all* the subjects (thus not to test for order effects). **Indeed, we expected that the socially-oriented label would make the COOP session easier to remember (and for a longer time) than the BR session based on a (more) neutral label. To minimize such memory effects, and** because the size of our subject pool (limited by budget constraints) did not allow us to divide it into two groups to test for order effects explicitly, we chose to adopt the safer order (BR, then COOP) for all the subjects. Finally, since a month (at least) as well as a vacation separated Sessions 1 and 3, we feel rather confident about the absence of any memory effects across Sessions 1 and 3<sup>13</sup>.

Now, both Sessions 1 and 3 were based on a paper-and-pencil questionnaire including 31 choice situations. All of them involved a Game of Chicken payoff structure (as in Figure 1 above). A typical choice situation is described in the Appendix; questionnaires for both Sessions 1 and 3 are provided as extra material.

In each choice situation, the subject had to decide whether to cooperate or not, under the peculiar payoff structure under consideration (given by the unilateral defection gain  $H$  and

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<sup>12</sup> The typical task was to choose between simple lotteries involving gains.

<sup>13</sup> As pointed out by a referee, the fact that the framed treatment was carried out after the context-free treatment could induce some undesirable and confounding 'experience' effect, with subjects changing their behavior in COOP because of gained experience, not (only) because of a framing effect. Our argument against this possibility is twofold. First, we really think that, after a month, such an experience effect is unlikely to happen. Second, had such an experience effect happened, it would have led the subjects to behave in a more rational way (thus closer to theoretical predictions) in COOP, which is not consistent with what actually happened in most choice situations.

the unilateral cooperation gain  $L$ ) and the proportion of payoff maximizers (SCs) in the population. Note that neither the UCs ('unconditional cooperators') nor the SCs were labelled as such in the questionnaires. They were actually neutrally labeled as 'type (a) agents' and 'type (b) agents' respectively to prevent any undesirable labelling effects.

Each questionnaire consisted of three parts. The first one involved 11 choice situations; in each choice situation, the proportion of payoff maximizers in the population varied from 0 to 100%, with  $H$  and  $L$  being held constant and  $H = 120\text{€}$  and  $L = 70\text{€}$ . In the following, the corresponding choice situations will be called the '%-questions'. They were initially introduced in Session 1 so that we could test for Prediction P1. The second and third parts of the questionnaires involved 10 choice situations each; in each choice situation of the second (resp. third) part, the unilateral defection (resp. cooperation) gain  $H$  (resp.  $L$ ) varied from  $100\text{€}$  to  $190\text{€}$  (resp.  $50\text{€}$  to  $95\text{€}$ ), with  $L$  (resp.  $H$ ) held constant and equal to  $75\%$ , and  $L$  (resp.  $H$ ) being held constant and equal to  $160\text{€}$  (resp.  $70\text{€}$ ). In the following, the corresponding choice situations will be called the ' $H$ -questions' and ' $L$ -questions' respectively. They were initially introduced in Session 1 so that we could test for Predictions P2a and P2b. Note that, *throughout the* questionnaire, the bilateral defection (resp. cooperation) gain  $Y$  (resp.  $X$ ) was held constant and equal to  $50\text{€}$  (resp.  $100\text{€}$ ).

For a better overview of the experimental design, the stimuli associated with each subset of questions are summarized in Table 2.

INSERT TABLE 2 ABOUT HERE

Each folder started with several practice choice situations. The subjects were invited to answer them and call upon the experimenter if they had any questions. Then, they were encouraged to fill out the questionnaire at their own pace. Each folder took about 15 minutes



to be completed. After filling out the first questionnaire, the subjects were assigned a number, and invited to remember this number for the other two sessions, to ensure their anonymity.

The participants were paid 5€ for their participation and the same performance-based procedure was used in each session. At the beginning of the experiment, the subjects were made aware that, after each session, two of them would be picked out at random and invited to draw a given choice situation at random and play it out for real **against another (selected at random) participant to the experiment**. Each subject was also made aware that, if selected, her final gain would 1) depend on both her decision and the decision of her partner in the game and 2) be comprised between 50 and 190 euros<sup>14</sup>. Finally, the subjects were informed that the selection process would take place after all the subjects had participated in the session, and that the randomly selected subjects would be contacted by e-mail<sup>15</sup>. **To avoid extending the paper excessively, the interested reader is referred to** Cabon-Dhersin and Etchart-Vincent (2012) for more details about the payment procedure; the payment-instruction sheets given to the subjects are provided as extra material.

85 subjects participated in Session 1. Among them, 79 subjects took part in Session 3. The subjects whose behaviour was not fully compatible with that of a SC were excluded from the data set and some subjects had to be discarded due to erratic answers (see Cabon-Dhersin and Etchart-Vincent, 2012 for some additional information about the discarding process). Finally, we were left with a 72-subject pool (among which 36 females) in Session 1, and with a 66-subject pool (35 females) in Session 3. Unfortunately, the second pool is not completely

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<sup>14</sup> The average gain when pooling the earnings across Sessions 1 and 3 is 9.75 Euro. Only the four winning subjects actually won more than 5 Euro, but from an ex-ante perspective, the possibility of winning until 190 Euro was perceived as very attractive by the subjects.

<sup>15</sup> Since the structure of the population (the probability  $p$ ) was manipulated during the experiment, the subjects could actually not play *directly* against a real partner. This might have led them to consider the choice situations as artificial. But the pilot experiment showed us that it was not the case. Moreover, the main risk was that the subjects behave as if they were faced with a computer or a completely anonymous partner, inducing them not to activate the brain's reward circuitry underlying social preferences (Rilling et al., 2002; Butler et al., 2011), thus to under-cooperate. But the high level of cooperation observed in the experiment shows that the subjects did actually consider that they were playing with a real partner when making their decisions.

included in the first one. So, when confronting both pools, it appears that only 57 subjects (28 females) provided usable data in *both* Sessions 1 and 3. Most subjects were undergraduate and graduate students in Economics, few were undergraduates in Mathematics. All of them were aware of game theory and decision theory, but with no specific skills. All were between 22 and 28 years old.

#### **4. The results**

##### **4.1. A graphical overview of the results**

To obtain a synthetic graphical picture of both labelling and gender effects in the experiment, the data were first organized both by frame (BR vs. COOP) and gender (men in BR vs. women in BR; men in COOP vs. women in COOP), and for each subset of questions  $\%$ ,  $H$  and  $L$ . Then, the observed proportion of cooperative choices as the structure of the population varied ( $\%$ -subset) was computed for each subgroup of subjects to obtain Figure 2. Similarly, the observed proportion of cooperative choices as the unilateral defection gain ( $H$ -subset) or cooperation gain ( $L$ -subset) varied was computed for each subgroup of subjects to build Figures 3 and 4 respectively.

INSERT FIGURE 2 ABOUT HERE

INSERT FIGURE 3 ABOUT HERE

INSERT FIGURE 4 ABOUT HERE

Two main features deserve our attention. First (even though it is not the topic here), let us note the high level of cooperation that prevails among our subjects. As usually found in experimental studies, both men and women cooperated much more than predicted by theory, both in BR and in COOP<sup>16</sup>. In Figures 2 to 4, the theoretically predicted level of cooperation following Predictions P1, P2a and P2b respectively is captured through the lowest curve. The discrepancy between predicted and observed levels of cooperation is obvious. Statistical tests as well as some explanations (such as risk aversion) to the excessive prevalence of cooperative behaviour are provided in Cabon-Dhersin and Etchart-Vincent (2012) (see also Kurzban and Houser, 2005 and Van Vugt and Van Lange, 2006 for nice analyses).

Second, as regards the  $\%$ -,  $H$ - and  $L$ -subsets of data, some interesting features come to light graphically. As regards the  $\%$ -questions, the three COOP curves lie above the three BR curves, which suggests that both a labelling effect (as expected, socially-oriented labelling leads to more cooperation) and a gender effect (the increase in cooperative behaviour is stronger for women than for men) are at play. The picture is somewhat different for the  $H$ - and  $L$ -questions since the BR and COOP curves cross, suggesting that two opposite effects are actually at play depending on the value of  $H$  (resp.  $L$ ). To be more specific, when  $H$  (unilateral defection gain) varies, the level of cooperation in COOP appears to be rather similar to that observed in BR, except for high values of  $H$  (>160 Euro) where it comes to be unexpectedly *lower* in COOP than in BR. When  $L$  (unilateral cooperation gain) varies, the level of cooperation appears to be somewhat higher in COOP than in BR (in compliance with our expectation), but only for moderate and high values of  $L$ . When  $L$  is low (<65), and quite unexpectedly, the subjects appear to cooperate *less* in COOP than in BR. Moreover, this

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<sup>16</sup> When the proportion of SCs in the population is 100% (which case comes closest to the standard Game of Chicken with no agent heterogeneity setting), the proportion of cooperative choices lies between 62 and 89% (depending on both framing and gender). These figures are highly similar to those found in the (scarce) body of experimental literature involving a Game of Chicken: from 52.4% to 57.1% (depending on gender) in Conrath (1972); 73% in Wit and Wilke (1992); and from 74.5% to 87.5% (depending on framing) in de Heus et al. (2010).

twofold phenomenon appears to be gender-dependent in the counterintuitive direction: when the level of cooperation appears to be lower in COOP than in BR, most of the result is driven by women's behaviour. These somewhat surprising results are further discussed in Section 5.

Now we come to statistical tests and report three kinds of results. First, we consider the whole population (i.e. men and women are pooled) to investigate pure framing effects across the BR and COOP sessions (4.2.). Second, we investigate men's and women's cooperative behaviour separately, in each session BR and COOP, to examine whether some pure gender effect is at play (4.3.). Third, we examine whether the framing effects obtained in (4.1.) are gender-dependent or not (4.4.). In each case, the analysis is run using the whole set of data, as well as for each subset of choice situations ( $\%$ -,  $L$ -, and  $H$ -questions).

#### **4.2. 'Label' framing effects**

As regards 'label' framing effects, our expectation was that the subjects, *regardless their gender*, should be more prone to cooperation in the socially-oriented setting (COOP) than in the context-free one (BR) (Assumption A1). To investigate this point, subjects' behaviour was compared across BR and COOP.

First, each cooperative (resp. defective) choice was coded as 1 (resp. 0), which allowed us to compute a global score (of cooperation) obtained by each subject to the *whole set of 31 questions*, in BR as well as in COOP. For each subject, these two scores were thus comprised between 0 and 31, with 0 meaning no cooperation at all and 31 indicating systematic cooperation. Comparing the 57 BR/COOP individual scores, a paired  $t_{56}$ -test shows that the subjects tended to cooperate slightly more in COOP than in BR ( $t_{56} = 1.915$ ,  $p = 0.061$ ). A two-sided Wilcoxon test gives a similar result ( $p = 0,064$ ).

Now, if we compare the sub-scores obtained in BR and COOP by each subject and for each *subset* of data (i.e. for the 11 %-questions as well as for the 10 *H*-questions and 10 *L*-questions), behaviour appeared not to be affected by labelling when only the structure of the payoffs varied ( $t_{56} = -0.085$ ,  $p = 0.932$  and  $t_{56} = 0.391$ ,  $p = 0.697$  for the *H*- and *L*-questions respectively<sup>17</sup>). By contrast, when the proportion of payoff maximizers in the population varied (%-questions), the subjects tended to cooperate much more in COOP than in BR ( $t_{56} = 3.659$ ,  $p = 0.001$ <sup>18</sup>). So, ‘label’ framing seems to have affected the way the subjects dealt with the probability to meet a payoff maximizer (thus a potential defector), but not the way they dealt with their payoff opportunities.

The fact that, *when considering the whole set of questions*, the subjects tended to be slightly more prone to cooperation in the socially-oriented treatment (all other things being equal) than in the context-free treatment brings some support to Assumption A1. But this overall result actually hides somewhat contrasting and unexpected results at the disaggregate level, depending on whether the given choice situation induced the subjects to focus on outcomes (their payoff opportunities) or on probability (the chance to meet a partner of one or another type).

### 4.3. Gender effects

As regards gender effects, our expectation was that women should *always* be more prone to cooperation than men, meaning that they should cooperate more than men both in BR and in COOP (Assumptions A2 and A3). To investigate this point, men’s behaviour was compared with women’s behaviour in each setting BR and COOP.

When comparing the scores obtained in BR by the 36 males and 36 females using *t*-tests, no significant difference arises ( $t = 0.328$ ,  $p = 0.744$ ). Now, when investigating for

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<sup>17</sup> Two-sided Wilcoxon tests give similar results, with  $p = 0,863$  for the *H*-questions and  $p = 0,348$  for the *L*-questions.

<sup>18</sup> A two-sided Wilcoxon test gives a similar result, with  $p = 0,000$  for the %-questions.

gender differences for each subset of questions (%-, *H*- and *L*-questions), no difference arises either between men and women for any subset ( $t = 0.620, p = 0.537$ ;  $t = -1.131, p = 0.262$  and  $t = 1.188, p = 0.239$  respectively). The same pattern prevails in COOP: the 31 males and 35 females appeared to behave similarly, be it on the whole set of questions ( $t = 1.226, p = 0.225$ ) or in each subset %, *H* and *L* ( $t = 1.452, p = 0.152$ ;  $t = 0.873, p = 0.386$  and  $t = 0.501, p = 0.618$  respectively). Non parametric Mann-Whitney tests give similar results, in both BR (with  $p = 0.592, p = 0.608, p = 0.234$  and  $p = 0.213$  for the whole set of questions and %-, *H*- and *L*-questions respectively) and COOP (with  $p = 0.302, p = 0.149, p = 0.437$  and  $p = 0.951$  for the whole set of questions and %-, *H*- and *L*- questions respectively)<sup>19</sup>.

The results do not support either of our research hypotheses that women should cooperate more than men in general, and/or that they should be more sensitive to the expected power of the word ‘cooperation’. Neither A2 nor A3 seem to be supported by our data. Still, some more careful investigation is needed. Indeed, our subjects appeared to be more cooperative in COOP than in BR. So, even though women did not appear to cooperate more than men in each setting BR and COOP, it could still be the case that both men and women cooperated more in COOP than in BR. So it is now necessary to compare the scores obtained in each treatment BR and COOP by the 28 women (resp. 29 men) who took part in both Sessions 1 and 3.

#### **4.4. Combination of ‘label’ framing and gender effects**

As regards the gender-dependency of ‘label’ framing effects, our expectation was that women should be more sensitive than men to the socially-oriented wording, meaning that they should cooperate more than men in the socially-oriented treatment, but not necessarily in BR

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<sup>19</sup> Similar results obtain using Mann-Whitney tests when the subject pool is restricted to those 57 subjects (among which 28 women) who took part in both sessions BR and COOP.

(Assumption A3). To investigate this point, men's (resp. women's) behaviour in BR was compared with their behaviour in COOP.

Two-sided Wilcoxon tests show that men did not behave differently in BR and COOP ( $p = 0.474$ ), while females did ( $p = 0.003$ ), showing significantly greater disposition to cooperate in COOP. When looking at disaggregated data, males appeared to behave the same way whatever the labelling of strategies in both the  $H$ - and  $L$ -subsets (with  $p = 0.385$  and  $p = 0.362$  respectively), but not in the  $\%$ -subset ( $p = 0.011$ ). A similar pattern prevails among women, with  $p = 0.001$  for the  $\%$ -subset and  $p = 0.142$  and  $p = 0.448$  for the  $H$ - and  $L$ -subsets respectively.

The data suggest that there was no 'label' framing effect for either men or women when only the payoff opportunities changed ( $H$ - and  $L$ -questions). By contrast, some framing effect seemed to be at play for both men and women when the probability to meet a payoff maximizer was manipulated ( $\%$ -questions), and this effect seemed to be stronger for women. As a result, the labelling effect disappeared at the aggregate level (i.e. when pooling the data over the 3 subsets of data  $\%$ ,  $H$  and  $L$ ) for men, while it remained significant for women.

At this point, it should be noted that we did not specifically plan to investigate the influence of the structure of the choice situation on labelling and gender effects; neither did we expect to find the above-mentioned contrasting results. Remember that the three subsets of data ( $\%$ ,  $H$  and  $L$ ) were generated in Session 1 for the purpose of investigating the descriptive accuracy of theoretical predictions P1 and P2a-P2b (see above, Section 2), so they had to be replicated in Session 3 for the sake of experimental control. However, although these unexpected results may look incidental, they appear to offer some promising insights into the way framing matters<sup>20</sup>.

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<sup>20</sup> These results are interesting from a methodological point of view too. Indeed, the theoretical model under consideration, as well as our experimental design, may look quite involved given the modest purpose of the study reported in this paper (even though it should be viewed as a part a larger research project). However, we think these unexpected results, which obviously could have not been obtained using a standard Game of

## 5. Discussion

### 5.1 Methodological discussion

As shown before, the overall labelling effect statistically appears to be rather weak in the present study. Some experimental features may help understand why.

First, the degree of frame manipulation was low, and the fact that we did not label the defective strategy as such may have mitigated the positive connotation of the word ‘cooperation’. Insofar as ‘not to cooperate’ looks socially less reprehensible than ‘to defect’, maybe the positive image of ‘cooperation’ would have been enhanced if it had been opposed to ‘defection’ rather than to ‘non cooperation’. In this respect, the social and moral appeal of the word ‘cooperation’ may have been somewhat dampened by our experimental design.

Second, frames have proved to be culture-dependent. It may be the case that, for our sample of students, the word ‘cooperation’ has less moral and social appeal than we expected<sup>21</sup>. For both these reasons, it would be worthwhile replicating the experiment using a different pool of subjects and labelling strategies even more explicitly (such as ‘I cooperate/ ‘I defect’).

Even though not very strong, the labelling effect observed in this study suggests that the word ‘cooperation’ actually has some power to enhance cooperation, probably because it encompasses a social norm and encourages the compliance with this norm (Cialdini et al., 1990; Cronk, 2007). Two channels of influence can be identified. First, due to its moral/social background, this word has some normative appeal that may play a role in prompting people to cooperate. In this respect, using labelling to make the social nature of strategies explicit (as

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Chicken, bring some *a posteriori* support to our research strategy (of using a non-standard Game of Chicken to investigate ‘label’ framing effects).

<sup>21</sup> For instance, the word ‘community’ is usually viewed as positive in most Western countries. But, using a German sample of subjects, Dufwenberg et al. (2011) find that titling the public goods game as a ‘community game’ reduces cooperation instead of enhancing it as expected. They hypothesize that this could be due to the German recent history. They replicate their study with a Swiss sample to control for this historical bias and the expected results obtain. So, framing effects may not be robust to the selection of the sample.



we did in the COOP session) rather than implicit (as in the BR session) may have induced a ‘perception shift’, with subjects getting governed by social motivations and norms instead of payoff-maximizing considerations<sup>22</sup>.

Second, the use of the word ‘cooperation’ may affect people’s beliefs and expectations as regards others’ behaviour, and finally influence one’s behaviour. A frame can be seen as a cue that helps people evaluate choice situations and make some expectations on the partner’s behaviour (Dufwenberg et al., 2011). In this respect, the word ‘cooperation’ may be seen by the subjects as a cue that their fellow partner will be in a cooperative mood (due to the perception shift mentioned above), encouraging them to reciprocate by cooperating. As pointed out by Rege and Telle (2004), *“a person’s beliefs about other people’s strategies will influence his own strategy. [...] If a framing makes a person more optimistic about other people’s adherence to a norm for cooperation, then his dominant strategy may no longer be to defect.”* (p. 1631)

## **5.2 Discussion of gender effects**

In our study, women globally appeared to be more cooperative in the socially-oriented setting, while men did not. Following Bicchieri (2006)’s theory of social norms, it may be because women believe, more than men do, that cooperation is expected from them (normative expectations) or because they believe, more than men do, that most people will cooperate in such a context (empirical expectations). Our data do not allow us to disentangle the two hypotheses, but the argument that women might be more sensitive than men to the cooperative rule because cooperation is expected from women more than from men is rather plausible.

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<sup>22</sup> Conversely, Li et al. (2009) show that the possibility of being sanctioned is responsible for a perception shift from social motivations to payoff-maximizing considerations, and that this perception shift has a neural basis: differential brain activation is observed, with an increase in parietal activity (which has been widely shown to be associated with rational behaviour).

Another possibility may be that women's and men's attitudes toward risk in interactive settings differ (see Eckel and Grossman, 2008b for instance), which may in turn affect their behaviour. A stimulating empirical result, established within standard social dilemma settings such as the PDG or the trust game, is that only when no strategic risk is involved do systematic gender effects seem to be at play (Croson and Buchan, 1999; Eckel and Grossman, 2008a)<sup>23</sup>. Since, in our study, the choice situations involved much uncertainty (regarding both the type of the partner and her behaviour depending on her type), we might expect no gender effect to be at play.

However, in a Game of Chicken, *contrary to what happens in most social dilemma games*, the risky strategy is *not* to cooperate but to deviate, which implies that risk averse people should cooperate (Butler et al., 2011; [see also note 5 supra](#)). So, *in that game*, women should actually be more inclined to cooperate than men when strategic risk is at play, both because of their initial stronger disposition for cooperation and because of their higher level of risk aversion. In other words, a significant gender effect is expected to occur. This prediction is actually supported by our experimental findings.

Similarly, if one admits that the %-questions (where the focus is made on the changing structure of the population, thus on the changing probability to meet a potential defector and on strategic risk) represent the most risky choice situations, the gender effect should be strongest for this subset of choice situations. Conversely, in the *H*- and *L*-questions, only the returns for defection/cooperation change: the focus is made on payoff opportunities, and the strategic risk stays in the background. Following our line of reasoning, the gender effect should be weakest for these two subsets of choice situations (only women's propensity to

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<sup>23</sup> This observation results from two contradictory effects. Admittedly, women tend to be more inclined to cooperation than men. But, in standard social dilemma games such as the DP or the trust game, when strategic risk is involved, cooperation appears to be a risky strategy, which implies that risk aversion should result in defection. Since women have been shown to be more risk averse than men, their natural tendency toward cooperation is likely to be counterbalanced by the conflicting consequences of their risk aversion. This is why, in Croson and Buchan (1999) as well as in Eckel and Grossman (2008a), they finally do not appear to cooperate more than men and no gender effect arises when strategic risk is involved.

cooperate is expected to be at play, with risk aversion playing no role). These two predictions are actually supported by our findings: only for the %-questions does the discrepancy between women's and men's behaviour appear to be significant.

### 5.3 Discussion of counter-intuitive results

As regards the  $H$ - and  $L$ -subsets of data, two rather unexpected features were brought to light graphically (see Section 4.1. *supra*). First, as shown in Figures 3 and 4, behaviour appears to be less cooperative in the socially-oriented setting COOP than in the neutral one BR for some specific values of unilateral defection gain  $H$  and unilateral cooperation gain  $L$  (Counterintuitive Result 1). Moreover, when such counterintuitive reversals occur (i.e. for  $H > 160$  Euro and for  $L < 65$  Euro), they appear to be counter-intuitively more pronounced for women than for men (Counterintuitive Result 2).

Counterintuitive Result 1 suggests that, in the socially-oriented setting, payoff opportunities have contrasting effects on cooperative behaviour. When the subjects do not have a strong incentive to defect (that is, when the gain of unilateral defection  $H$  is low or when the gain of unilateral cooperation  $L$  is high), they tend to cooperate even more in the socially-oriented setting COOP than in the neutral one BR. But, conversely, when they have a strong incentive to defect (that is, when the gain of unilateral defection  $H$  is high or when the gain of unilateral cooperation  $L$  is low), they tend to cooperate *even less* in the socially-oriented setting than in the neutral one. **These contrasting results suggest that the social/moral background of the word 'cooperation' actually affects behaviour toward cooperation, but only when self-interest does not strongly prescribe defection (thus, in what we call 'low-stake' choice situations). In situations where defection is unambiguously the most rational strategy, using the word 'cooperation' seems to have the opposite effect of enhancing the temptation to defect. An insightful referee suggested a nice interpretation for this result, based on the idea**

that introducing more context in the decision setting – as we did by labelling strategies in a more explicit way – amounts to making the underlying nature of decisions more explicit and the decisional setting /decisional stakes easier to grasp by the subjects. This in turn is expected to enhance the subjects’ rationality, i.e. their ability to think in terms of their self-interest and to behave in accordance with game theoretical predictions.

To sum up the point, the word ‘cooperation’ is likely to affect behaviour in two opposite ways. First, through its social/moral background, it should foster cooperative behaviour as compared to a context-free choice situation (‘social’ effect). Second, through its positive influence on the intelligibility of the choice situation, it should help the decision maker find out the most rational decision to make, which is expected to exacerbate opportunism and dampen cooperative behaviour as compared to a context-free choice situation (‘rationality’ effect).

Depending on the very features of the choice situation, either the ‘social’ or ‘rationality’ effect will prevail. In ‘low-stake’ COOP situations (i.e. when the payoff structure of the game is such that subjects have no strong interest to defect), the moral/social power of the word ‘cooperation’ (i.e. the ‘social’ effect) is expected to prevail and induce them to cooperate more than in the context-free (BR) setting. This is precisely what we observed in most choice situations. But, in ‘high-stake’ COOP situations (i.e. in situations where the most profitable decision to make is transparent, and rationality unambiguously calls for defection), the ‘social’ effect is expected to be more than counterbalanced by the opposite ‘rationality’ effect, resulting in a lower level of cooperation than in the neutral (BR) setting. This is precisely what we observed for very high (resp. low) values of defection (resp. cooperation) gain  $H$  (resp.  $L$ ).

Now, Counterintuitive Result 2 suggests that Counterintuitive Result 1 is even stronger among women than among men. This result seems to conflict with sound evidence that women tend to be more sensitive than men to a socially-oriented context, thus to the ‘social’ effect (e.g. Andreoni and Vesterlund, 2001; Eckel and Grossman, 1998; Harvey et al., 1997). However, it might be that women are also more sensitive than men to the ‘intelligibility’/‘rationality’ effect that tends to prevail over the ‘social’ effect in transparent high-stake decisional settings, so that the resulting net effect toward defection may also be stronger for women than for men. This conjecture is nicely supported by Croson and Gneezy (2009)’s demonstration based on a comprehensive meta-analysis of gender differences in terms of social preferences, showing that women tend to be more sensitive than men to the cues provided by the experimental context. This in turn causes female behaviour, as well as gender differences in terms of social preferences, to be unstable depending on the very experimental conditions. Among these, Croson and Gneezy (2009) mention (on p. 16) the size of the payoffs and the way the situation is described, which are precisely the variables considered in this experimental study.

## **6. Conclusion**

As pointed out by Houser and Xiao (2010), understanding context and framing effects is of major importance, both to better model the choice process and to better design policy measures meant to encourage cooperation.

Framing effects, and among them ‘label’ framing effects, have been widely investigated in the literature, in both individual and interactive settings. In this paper we chose to investigate the influence of framing on cooperative behaviour, using a peculiar variant of the Game of Chicken – a social dilemma that is much less famous than the Prisoner’s

Dilemma Game but appears to be particularly well-fitted for studying many kinds of economic interactions. Our study was based on a very basic frame manipulation, circumscribed to a variation in the labelling of the strategies in the game. In the baseline treatment, strategies were labelled using colours 'red' and 'blue'; in the target treatment, strategies were labelled with explicit reference to cooperation. The idea was to capture and isolate the very influence of the word 'cooperation' (which is a word with a rather strong social and moral background, but still is only a single word) on cooperative behaviour. Our results suggest that a slight labelling effect is actually at play on the whole set of data (when comparing the subjects' behaviour across the baseline and target treatments), but also that it is worth crossing labelling and gender effects, as well as disentangling aggregate and disaggregated effects, to get a better picture of what happens.

First, when examining men's and women's behaviour separately, it appears that women are significantly sensitive to the socially-oriented labelling of the strategies, while men are not. This result suggests that the overall framing effect is actually driven by a change in behaviour of women *only*. The slight aggregate framing effect does not mean much since it actually conceals two contradictory partial effects due to gender differences. This result implies that women's and men's cooperative behaviour should be investigated separately, and it more generally confirms that studying gender effects is of major importance.

Second, the fact that several sets of data were incidentally collected through the  $\%$ -,  $H$ - and  $L$ -questions allowed us to identify some contradictory effects, depending on the nature of the decision task involved. It seems that the overall effects of 'label' framing were actually mostly driven by the decision tasks that involved a change in the probability to meet a payoff maximizer (that is, a potentially defective partner) or, equivalently, a change in the proportion of payoff maximizers in the population. First, both men and women tended to be more cooperative in the socially-oriented treatment when the probability to meet a more-or-less

cooperative partner was at stake (%-questions). Second, this partial labelling effect appeared to be gender-dependent and stronger for women than for men, which may explain why a significant (resp. null) aggregate effect arose for women (resp. men) when pooling the data obtained from each kind of decision task.

Conversely, neither men nor women appeared to be sensitive to the labelling of strategies when only their payoff opportunities (i.e. the unilateral defection and cooperation gains  $H$  and  $L$ ) changed. However, a closer look at the data generated in the  $H$ - and  $L$ -questions shows that both the direction of the labelling effect and the direction of the gender effect actually depend on the values of  $H$  and  $L$  at stake, which suggests that the absence of any labelling and gender effects at the aggregate level (when pooling the data for all values of  $H$  and  $L$  respectively) might be a statistical artefact rather than a genuine empirical result. Moreover, those contrasting results suggest that our change in framing did not only induce a ‘social’ effect (resulting in more cooperation) as we expected, but also a ‘rationality’ effect (the increased transparency of the experimental design helping the subjects to take more rational, thus less cooperative, decisions in high-stake choice situations). Depending on the structure of the decision task, either the ‘social’ effect or the ‘rationality’ effect may prevail, resulting in either more or less cooperation as compared to the neutral decision setting.

From a methodological point of view, these somewhat unexpected effects at the disaggregated level should prompt us to cautiousness when aggregating potentially heterogeneous data to investigate overall effects, as well as when trying to interpret them. More basically, further and more systematic research is needed to identify which kind(s) of cognitive decision tasks may be sensitive to ‘label’ framing and gender effects, and which may not, as well as to identify the reasons why they do, or do not, depending on the very nature of the stimuli.

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Table 1. The three sessions of the within-subject experimental design

	Main features of the session	Aim(s) of the session
<b>Session 1</b>	<ul style="list-style-type: none"> <li>• Interactive decision making</li> <li>• Neutral framing</li> </ul> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><i>Questionnaire BR (for Blue-Red)</i> Strategy labelling using colours 'blue and 'red')</p> </div>	<ul style="list-style-type: none"> <li>• Core session of the study</li> <li>• <u>Primary purpose of the study:</u> test Cabon-Dhersin and Ramani (2007)'s model</li> </ul>
Done in Cabon-Dhersin and Etchart-Vincent (2012)		
<b>Session 2</b>	<ul style="list-style-type: none"> <li>• Individual decision making under risk</li> <li>• Choice between simple lotteries</li> </ul>	<ul style="list-style-type: none"> <li>• Additional session</li> <li>• <u>Specific purpose:</u> See whether 'individual' risk aversion is correlated with cooperative behaviour</li> <li>• <u>Method:</u> compare Sessions 1 and 2</li> </ul>
Left for another paper		
<b>Session 3</b>	<ul style="list-style-type: none"> <li>• Interactive decision making</li> <li>• Non neutral framing</li> </ul> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><i>Questionnaire COOP</i> Strategy labelling using words 'I cooperate'/'I do not cooperate'</p> </div>	<ul style="list-style-type: none"> <li>• Additional session</li> <li>• <u>Specific purpose:</u> <ul style="list-style-type: none"> <li>- See whether cooperative behaviour depends on strategy labelling (<i>framing effect</i>)</li> <li>- See whether the framing effect is gender-dependent or not (<i>gender effect</i>)</li> </ul> </li> <li>• <u>Method:</u> compare Sessions 1 and 3</li> </ul>
PURPOSE OF THIS PAPER		

Figure 1. The Game of Chicken: A typical payoff matrix ( $H > X > L > Y$ )

		Player $j$	
		$1-\alpha$ <b>c</b>	$\alpha$ <b>d</b>
Player $i$	$1-\alpha$ <b>c</b>	$X; X$	$L; H$
	$\alpha$ <b>d</b>	$H; L$	$Y; Y$

Table 2. The stimuli for each subset of questions: %, L and L

	%-Questions	<i>L</i> -Questions	<i>H</i> -Questions
Number of choice situations	11	10	10
<i>X</i>	100€	100€	100€
<i>Y</i>	50€	50€	50€
<i>H</i>	120€	160€	100€ ... 190€
<i>L</i>	70€	50€ ... 95€	70€
<i>p</i>	0% ... 100%	75%	75%



Figure 2. Proportion of cooperative choices depending on the proportion  $p$  of payoff maximizers in the population (%-questions) – Theoretical prediction P1

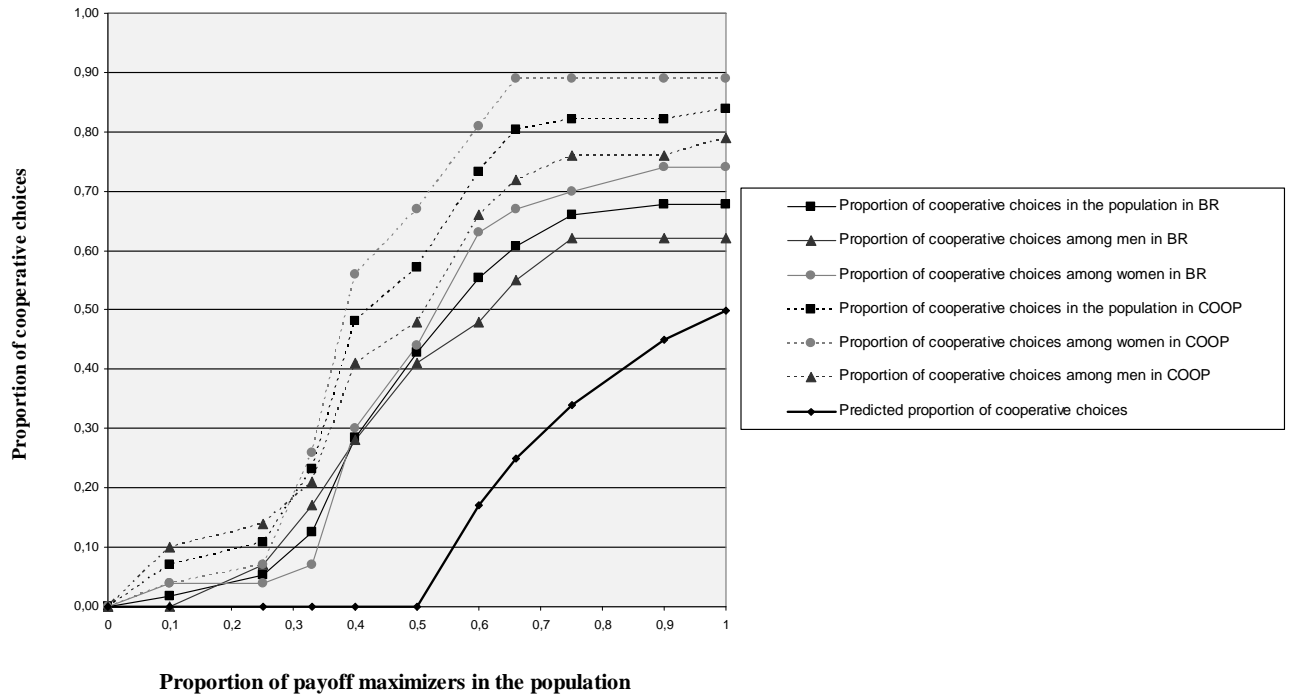


Figure 3. Proportion of cooperative choices depending on the unilateral defection gain  $H$  ( $H$ -questions) – Theoretical prediction P2a

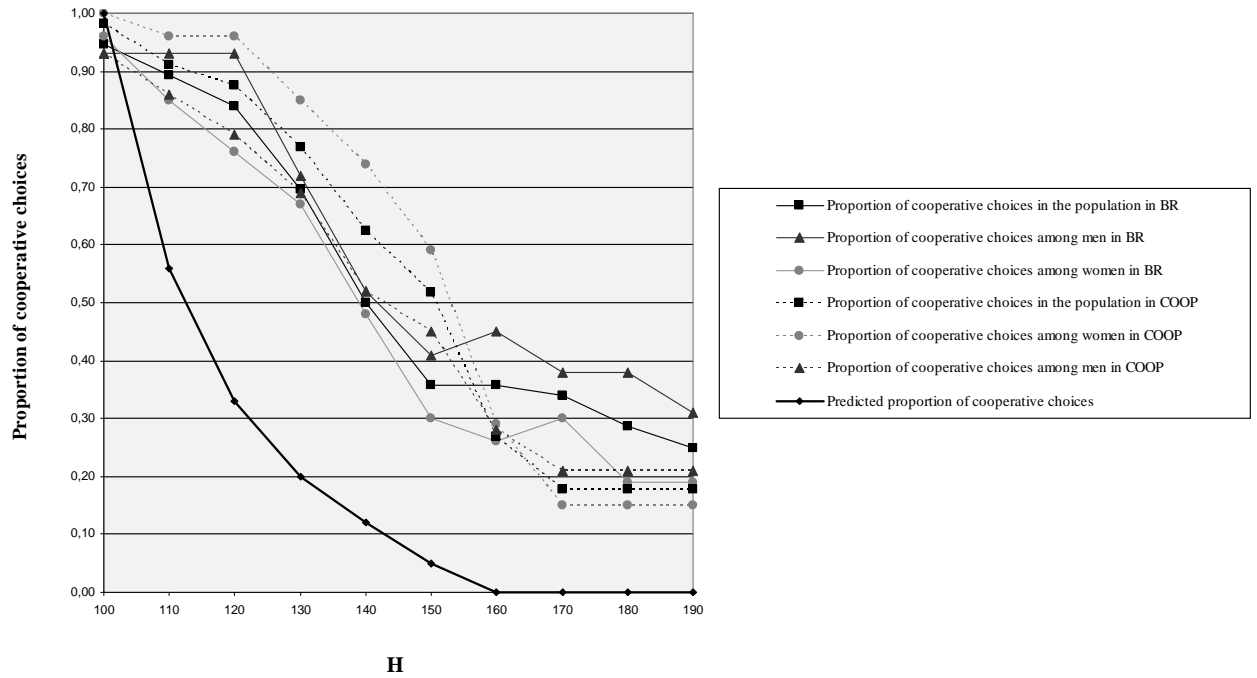
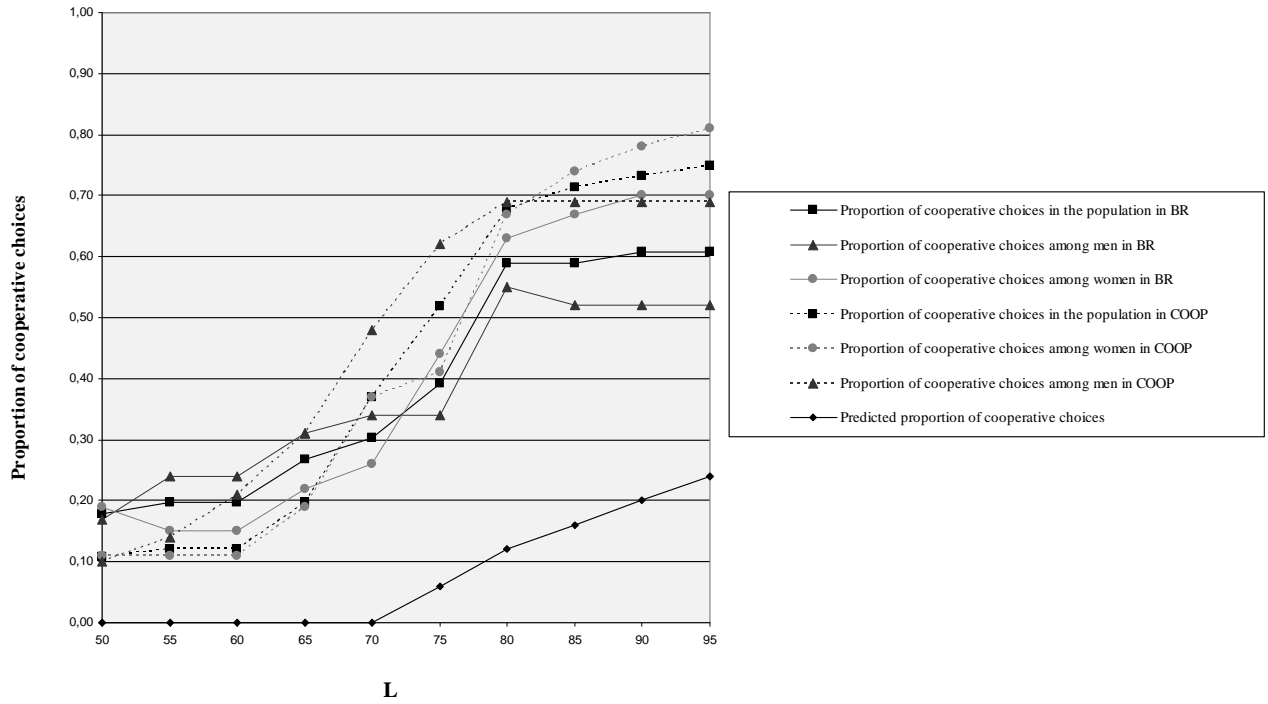


Figure 4. Proportion of cooperative choices depending on the unilateral cooperation gain  $L$  ( $L$ -questions) – Theoretical prediction P2b



## Appendix: A typical choice situation (drawn from the first part of the BR questionnaire)

[Translated from French]

You are facing a partner. Both of you have two available options: play **Red** or play **Blue**. You do not know what your partner is going to do, but your gain depends on both your own choice and his/hers.

The possible choices for you and your partner and the corresponding gains are described in the matrix below. Your gains are written in **bold**:

		The choice of my partner	
		Red	Blue
My choice	Red	<b>100 €</b> 100 € <b>70 €</b> 120 €	
	Blue	120 € <b>70 €</b> <b>50 €</b> 50 €	

### Question 1.1:

You have **100%** chances to meet a partner of **type (b)** who plays either **Red** or **Blue**, depending on his/her opportunities of gains and on what he/she **anticipates** you are going to play.

Which colour do you choose?

- Red**
- Blue**

### Question 1.2:

You have **100%** chances to meet a partner of **type (a)** who always plays **Red**.

Which colour do you choose?

- Red**
- Blue**

**Question 1.3:**

Now we come to the general case. Your partner has:

- **X%** chances to be of **type (a)**. If so, he/she always plays **Red**,  
and
- **(100 – X)%** chances to be of **type (b)**. If so, he/she plays either **Red** or **Blue**,  
depending on his/her opportunities of gains and on what he/she anticipates you are  
going to play.

**Which colour do you choose for each value of X given below?** Please tick the box that corresponds to your choice (**Red** or **Blue**) for each value.

<i>X% chances to meet a partner of type (a)</i> (who always plays <b>Red</b> )	0%	10%	25% (or 1/4)	33% (or 1/3)	40%	50%	60%	66% (or 2/3)	75% (or 3/4)	90%	100%
<b>Your choice</b> ↓											
<b>Red</b>											
<b>Blue</b>											

↑  
*Question 1.1.*

↑  
*Question 1.2.*