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Marie-Laure CABON-DHERSIN, Nathalie ETCHART-VINCENT

2010.80



**Cooperation, the power of a single word.
Some experimental evidence on wording and gender effects
in a Game of Chicken.**

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Résumé

On connaît l'importance des mots sur la perception des messages. L'impact de la terminologie employée sur la prise de décision a ainsi été largement documenté. Dans cet article, nous tentons de répondre expérimentalement à la question suivante : dans quelle mesure le comportement de coopération dans un jeu de la poule mouillée est-il affecté par un changement mineur dans la dénomination des stratégies ? Notre protocole expérimental met en jeu deux traitements (soumis aux mêmes sujets). La seule différence entre ces traitements est que l'un utilise une terminologie qui met l'accent sur l'aspect relationnel des stratégies ('je coopère'/'je ne coopère pas'), tandis que l'autre opte pour une dénomination plus neutre de ce point de vue en recourant à des couleurs (rouge/bleu). Le principal résultat de l'étude est que les sujets tendent à coopérer davantage dans le contexte « relationnel », mais seulement lorsque l'incertitude concernant le type du partenaire dans le jeu varie, et les femmes plus que les hommes.

Mots-clés : Dilemme Social, jeu de la poule mouillée, coopération, effet liés à la terminologie, effet de genre.

Codes JEL : C72, C92

Abstract:

Wording 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-code: C72, C92

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

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 problem¹ (e.g. Tversky and Kahneman, 1981; Wagenaar et al., 1988). In particular, strong wording and framing effects have been shown to be at play.

To avoid confounding 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 have been 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 framing and wording 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 the subjects are explicitly put in a socially-oriented mood.

Decision making in interactive settings has also been shown to be gender-dependent, even though the direction of the evidence remains unclear². However, even though men may exhibit a more cooperative (or contributive) behaviour than women (e.g. Schwieren and

¹ From a normative point of view, only the ‘deep structure’ of the decision problem should influence the decision maker.

² The results seem to be highly sensitive to both the game under investigation and the very features of the experimental design (Ortmann and Tichy, 1999).

Sutter, 2008), the opposite pattern seems to be more frequent (e.g. Gächter et al., 2004), be it either because women are more socially-oriented (e.g. Eckel and Grossman, 1998), because they feel less comfortable in a competitive environment (e.g. Gneezy et al., 2003), because they are more risk averse (e.g. Eckel and Grossman, 2008), or because they do not use the same rules and heuristics as men when making their decisions (e.g. Conrath, 1972).

Our experiment aims at investigating whether and to what extent cooperative behaviour might be affected by some basic change in wording, and whether such a wording 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. As in the Prisoner's Dilemma Game (PDG), each partner appears to benefit more from bilateral cooperation than from bilateral defection³. 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 countries⁴. So it may be of great interest to investigate wording and gender effects within this specific payoff structure.

Our experimental design was based on Cabon-Dhersin and Ramani (2007)'s model of a Game of Chicken with heterogeneous agents. In this model, the authors consider a population

³ 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.

⁴ For instance, it has been often used to describe military or political conflict (Snyder, 1971; Stone, 2001), as well as negotiations over environmental conventions (Carraro and Siniscalco, 1993; Ward, 1993).

with two kinds of agents, namely the payoff maximizers (who do not cooperate unless it is in their interest to do so), and the ‘unconditional cooperators’ (who always choose to cooperate). In this model, the uncertainty as regards the partner’s behaviour is twofold: the usual 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 her partner’s behaviour more salient than in most usually experimentally investigated games. Under the assumption that cooperation is a risky decision, this huge amount of uncertainty may impact the subject’s behaviour toward cooperation through her attitude toward risk. Attitude toward risk is meant to capture the way the subject deals with probabilities and consequences when facing risky prospects. To investigate the impact of a change in *probabilities* (resp. *consequences*) on the subjects’ behaviour toward cooperation, our experimental design allowed the proportion of payoff maximizers in the population (resp. the unilateral cooperation and unilateral defection payoffs) to vary. Two subsets of data were thus collected.

The second main originality of our within-subject design is that it involved both a context-free treatment and a socially-oriented treatment, with only a minor change in wording between the two. While most previous experimental studies introduced rather comprehensive socially-oriented scenarios (see for instance Rege and Telle, 2004), our aim was to investigate whether a *single* word could be powerful enough to alter behaviour. For that purpose, we chose to focus on the word ‘cooperation’, and to circumscribe the change in wording to the labelling of the strategies. To be more specific, the cooperative and defective strategies were designated as ‘red’ and ‘blue’ respectively in the context-free treatment (as in Chaudhuri et al., 2002), but as ‘I cooperate’ and ‘I do not cooperate’ respectively in the socially-oriented treatment. A similar-in-spirit, but much more comprehensive, work was run in Zhong et al. (2007) using a Prisoner’s Dilemma Game.

The word ‘cooperation’ is obviously not neutral, since it strongly appeals to moral and social norms, that have been shown to affect behaviour toward cooperation (e.g. Biel and Thøgersen, 2007; Rege and Telle, 2004)⁵. So, though very basic, this change in wording may be expected to affect behaviour. On the other hand, the fact that everything else was kept equal across the treatments (including the performance-based payment procedure) was meant to avoid any undesirable interaction effects (Cookson, 2000) and allow us to isolate the impact of the *single* word ‘cooperation’. Note that we also investigated for gender effects to see whether men and women’s behaviour toward cooperation would be affected the same way by the change in wording we introduced.

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. However, a gender effect was obviously at play: men did not appear to be sensitive to wording, while women did. Moreover, when examining the two subsets of data (those obtained with varying payoffs vs. those obtained with a varying proportion of payoff maximizers) separately, it appears that *both* male and female behaviour was affected by wording when the proportion of payoff maximizers in the population varied, while neither men nor women were sensitive to wording when only their payoff opportunities changed.

The remainder of the paper is organized as follows. Section 2 is devoted to the presentation of the experimental design. Section 3 reports the results, and Section 4 concludes.

⁵ Note that we did not label the defective strategy as such, only as ‘non cooperative’, to be able to focus on the single word ‘cooperation’ and avoid that the influence of the word ‘cooperation’ be polluted by the (maybe stronger) influence of the word ‘defection’.

1. The experimental design

The experiment was run using a three-session within-subject design. Both Sessions 1 and 3 involved interactive decision making in a Game of Chicken setting, while Session 2 involved individual decision making under risk (the subject had to make choices between simple lotteries involving gains). Only the results from Sessions 1 and 3 will be reported here.

Session 1 aimed at investigating the descriptive accuracy of Cabon-Dhersin and Ramani (2007)'s theoretical predictions as regards cooperative behaviour in a Game of Chicken with heterogeneous agents⁶. It was based on a paper-and-pencil questionnaire, that included 31 choice situations involving a Game of Chicken payoff structure (see Figure 1 for a typical payoff structure; see Appendix for a typical choice situation; see Cabon-Dhersin and Etchart-Vincent, 2009 for a broader description of the experimental design).

INSERT FIGURE 1 ABOUT HERE

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 the unilateral cooperation gain L) and given some probabilistic information about her partner in the game. Indeed, in the model as in the experimental design, the population was assumed to consist of two kinds of agents, namely the payoff maximizers (who would not choose to cooperate unless it was in their interest to do so), and the 'unconditional cooperators', who would always choose to cooperate. In each choice situation, the subject was thus given the proportion of payoff maximizers in the population. Note that this proportion can also be viewed as the probability to meet a partner of that type⁷.

⁶ The main predictions of this model concern the evolution of cooperative behaviour as the structure of the population (resp. the structure of the payoffs) changes.

⁷ More details about the model are given in Cabon-Dhersin and Etchart-Vincent (2009).

The questionnaire consisted into 3 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 $L = 70\text{€}$. The second and third ones 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€ to 190€ (resp. 50€ to 95€), with p held constant and equal to 75%, and L (resp. H) being held constant and equal to 160€ (resp. 70€). In the following, the corresponding choice situations will be called the ‘% questions’, ‘ H questions’ and ‘ L questions’ respectively. Note that, in the whole questionnaire, the bilateral defection (resp. cooperation) gain Y (resp. X) was held constant and equal to 50€ (resp. 100€).

To avoid confounding effects and better control the data, Session 1 was based on a context-free experimental design: the cooperative and defective strategies were labelled as ‘red’ and ‘blue’ respectively (as in Chaudhuri et al., 2002). There is a huge amount of 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 the number of references given in Zhong et al., 2007). Moreover, in the pilots, the subjects were asked their opinion about the use of colours ‘red’ and ‘blue’ as labels to designate the strategies in the game. They actually considered them as similar, and with no specific connotation. So, we felt confident to use these colours, as well as not to test for colour effects explicitly⁸.

Now, to see whether a minor change in the labelling of the strategies might affect the subjects’ level of cooperation, a slightly different variant of the *same* questionnaire, in which the words ‘I cooperate’/‘I do not cooperate’ were used (instead of colours) to designate

⁸ Besides, given the rather small size of our subject pool (due to budget constraints), it would have been quite hazardous to divide it into two groups to test for colour effects.

strategies, was filled out by the subjects in Session 3. In the following, the first [resp. third] questionnaire will be called BR (for ‘blue-red’) [resp. COOP (for ‘cooperation’)]. Except the labelling of the strategies, everything (including the performance-based payment scheme) was held strictly identical across the sessions, and held as neutral as possible. In particular, in both BR and COOP, the agents were neutrally labeled as either ‘type (a) agents’ (corresponding to unconditional cooperators) or ‘type (b) agents’ (corresponding to payoff maximizers).

Session 2 involved a completely different task and a month (at least) as well as a vacation separated Sessions 1 and 3, so we can be rather confident about the absence of any memory effect across Sessions 1 and 3. For that purpose (avoid any memory effect), 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, our expectation was that socially and morally connoted labels (such as the word ‘cooperation’) may be kept in mind more durably than (more) neutral labels (such as colours). Since 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.

Each folder started with several practice choice situations. The subjects were invited to answer them and call upon the experimenter if they had any question. Then, they were encouraged to fill out the questionnaire at their own pace. Each folder took about 15 minutes to be filled out. 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 (they were paid once they had answered the third questionnaire) and the same performance-based procedure was introduced *in each session* to avoid any possible hypothetical bias. At the beginning of the experiment, the subjects were made clear that, after each session, two of them would be selected at random. These two subjects would then be invited to pick out a given choice situation at

random and play it out for real. Each subject was also made aware that, if selected, her final gain would 1) depend on both her decision and the decision of some other participant and 2) be comprised between 50 and 190 euro (for more details about the payment procedure, see Cabon-Dhersin and Etchart-Vincent, 2009). Finally, the subjects were informed that the subjects' 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.

85 subjects participated in Session 1. Among them, 79 subjects took part in Session 3. Some subjects had to be discarded (see Cabon-Dhersin and Etchart-Vincent, 2009 for some details 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 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 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.

2. The results

The first noticeable result is the high level of cooperation that prevails among our subjects. Both men and women cooperated much more than predicted by theory, both in BR and in COOP. Moreover, women appeared to cooperate more than men in both BR and COOP, and all the subjects cooperated more in COOP than in BR.

Now we turn to statistical tests. We first examine the effects of wording on cooperative behaviour. The main question was whether the subjects, *whatever their sex*, would be more prone to cooperation in the socially-oriented setting (COOP) than in the

context-free one (BR). To answer this question, we ran a within-gender between-framing analysis. For that purpose, each cooperative (resp. defective) choice was coded as 1 (resp. 0). This 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. Using the 57 individual scores on the whole set of 31 choice situations, a paired t_{56} -test shows that the subjects tended to cooperate slightly more in COOP than in BR ($t_{56} = 1.915$, $p = 0.061$).

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 %, H and L questions), behaviour appeared not to be affected by wording 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). 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 ($t_{56} = 3.659$, $p = 0.001$). Non parametric Wilcoxon tests give similar results. So, wording 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.

Finally, when considering the whole set of questions, the subjects tended to be slightly more prone to cooperation in the socially-oriented session (everything else being equal) than in the context-free session. But this overall result actually hides somewhat different results at the disaggregate level, depending on whether the subjects had to deal with outcomes (their payoff opportunities) or probability (the probability to meet a payoff maximizer).

Now, what about gender effects? Two questions arise. First, we wonder whether women were *always* more prone to cooperation than men, meaning that they would cooperate

more than men in both BR and COOP. The second issue is whether women were more sensitive to the socially-oriented wording, meaning that they would cooperate more than men in COOP, but not necessarily in BR. A between-subject within-framing analysis was run to investigate both points.

When comparing the scores obtained in BR by the 36 males and 36 females using *t*-tests, no significant difference arises ($p = 0.744$). Now, when investigating for gender differences for each subset of questions (*%*, *H* and *L* questions), no difference either arises between men and women for any subset ($p = 0.537$, $p = 0.262$ and $p = 0.239$ 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 ($p = 0.225$) or in each subset *%*, *H* and *L* (with $p = 0.152$, $p = 0.386$ and $p = 0.618$ respectively). Similar results were obtained using non parametric Mann-Whitney tests, as well as when the subject pool was restricted to those 57 subjects who took part in both sessions BR and COOP.

These results suggest that women were not more prone to cooperation than men in general. They also seem to suggest that females were not more sensitive than males to the power of the word ‘cooperation’. Still, this latest point deserves some more careful investigation. 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 BR and COOP by the 28 women (resp. 29 men) who took part in both Sessions 1 and 3.

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 proneness to cooperation in COOP. Still, at a more disaggregated level, males appeared to behave the same way whatever the wording in both the *H* and *L* subsets ($p = 0.385$, $p = 0.362$), 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 questions respectively.

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

The combined effects of wording and gender in the %, H and L subsets of data are shown in Figures 2, 3 and 4 respectively.

INSERT FIGURE 2 ABOUT HERE

INSERT FIGURE 3 ABOUT HERE

INSERT FIGURE 4 ABOUT HERE

3. Discussion and conclusion

Framing effects, and among them wording effects, have been much investigated. Still, most experimental studies were based on comprehensive ‘framing’ scenarios, which may explain why strong effects were usually observed. In this study, we chose to introduce a very basic change in wording: the only difference between the context-free and socially-oriented context was the use of the word ‘cooperation’ in the latter. The idea was to capture and isolate the very influence of the word ‘cooperation’ (which can be viewed as a socially and morally strongly connoted word, but is still only a word) on cooperative behaviour. Our results suggest that a slight wording effect is actually at play, but also that it is worth crossing wording and gender effects, as well as disentangling aggregate and disaggregated effects, to get a better picture of what happens.

First, a closer look at the data at the aggregate level shows that *only* women appear to be really sensitive to the socially-oriented wording. This suggests that the slight wording effect we observed on the whole subject pool was actually driven by the change in behaviour of women. Another point is that our experimental design involved different kinds of decision tasks. Interestingly, it seems that the overall effects of wording were actually mostly driven by the decision tasks that involved a change in the probability to meet a potentially defective partner (i.e. a payoff maximizer). Neither men nor women appeared to be sensitive to wording when only their payoff opportunities (i.e. the unilateral defection and cooperation gains) changed, while both tended to be more cooperative in the socially-oriented treatment when the probability to meet a more-or-less cooperative partner was at stake. Moreover, this partial wording effect appeared to be 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 decision task⁹.

⁹ These somewhat unexpected effects of aggregation should prompt us to cautiousness when aggregating potentially heterogeneous data to investigate overall effects, as well as when trying to interpret overall effects.

At this stage, the question remains why socially-oriented wording may induce a more cooperative behaviour when the probability to meet a partner of one or another type is manipulated, while it seems not to have any impact when only the payoff opportunities are manipulated. Obviously, further and more systematic research is warranted to identify which kind(s) of cognitive decision tasks may be sensitive to wording, and which may not, as well as to identify the reasons why they do, or do not. And, similarly, it would be worth investigating gender effects more thoroughly, depending on the decision task under consideration.

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

| | | Player j | |
|------------|--------------------------------------|------------------------------|--------------------------------------|
| | | <i>I cooperate (Red)</i> | <i>I do not cooperate (Blue)</i> |
| Player i | <i>I cooperate (Red)</i> | $X ; X$ | $L ; H$ |
| | <i>I do not cooperate (Blue)</i> | $H ; L$ | $Y ; Y$ |

Figure 2. Proportion of cooperative choices depending on the proportion of payoff maximizers in the population (% questions)

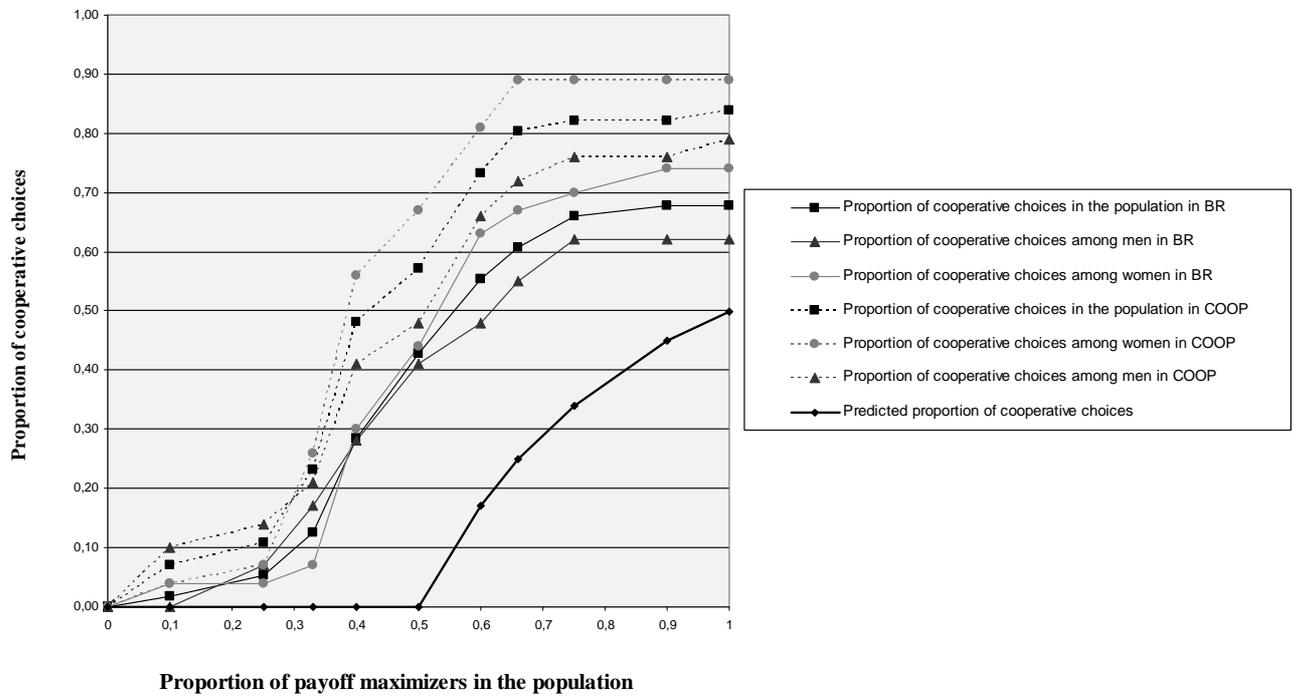


Figure 3. Proportion of cooperative choices depending on the unilateral defection gain H (H questions)

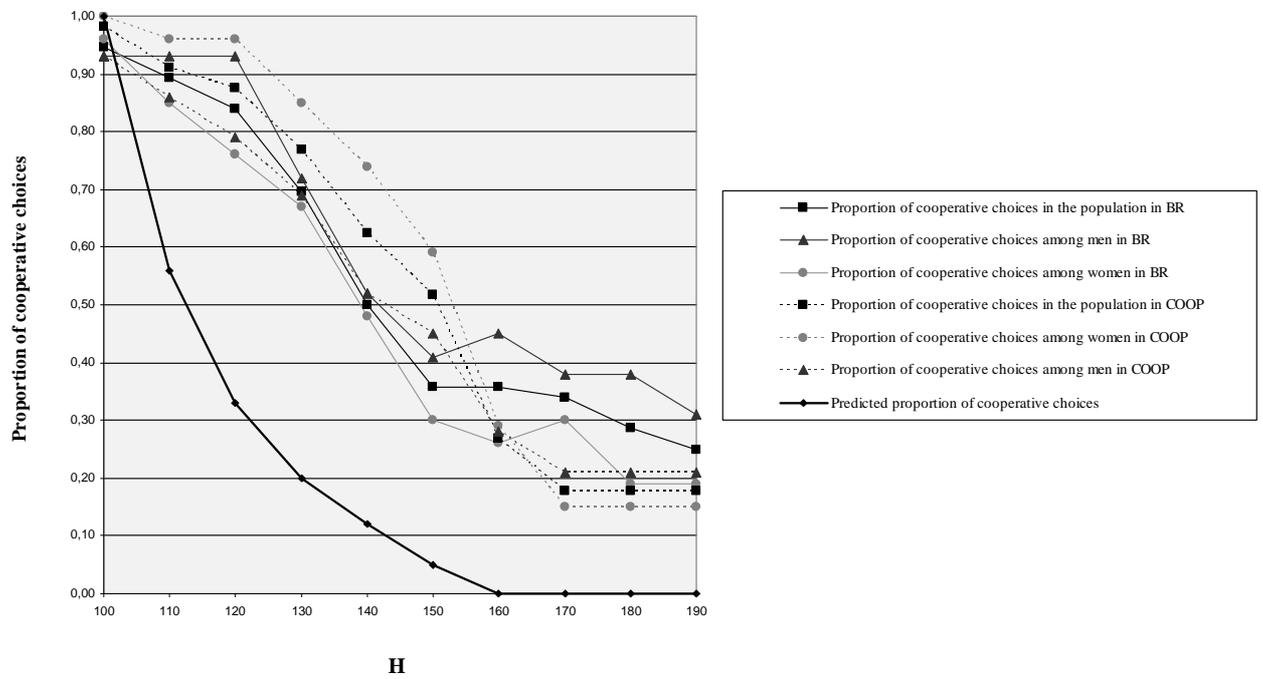
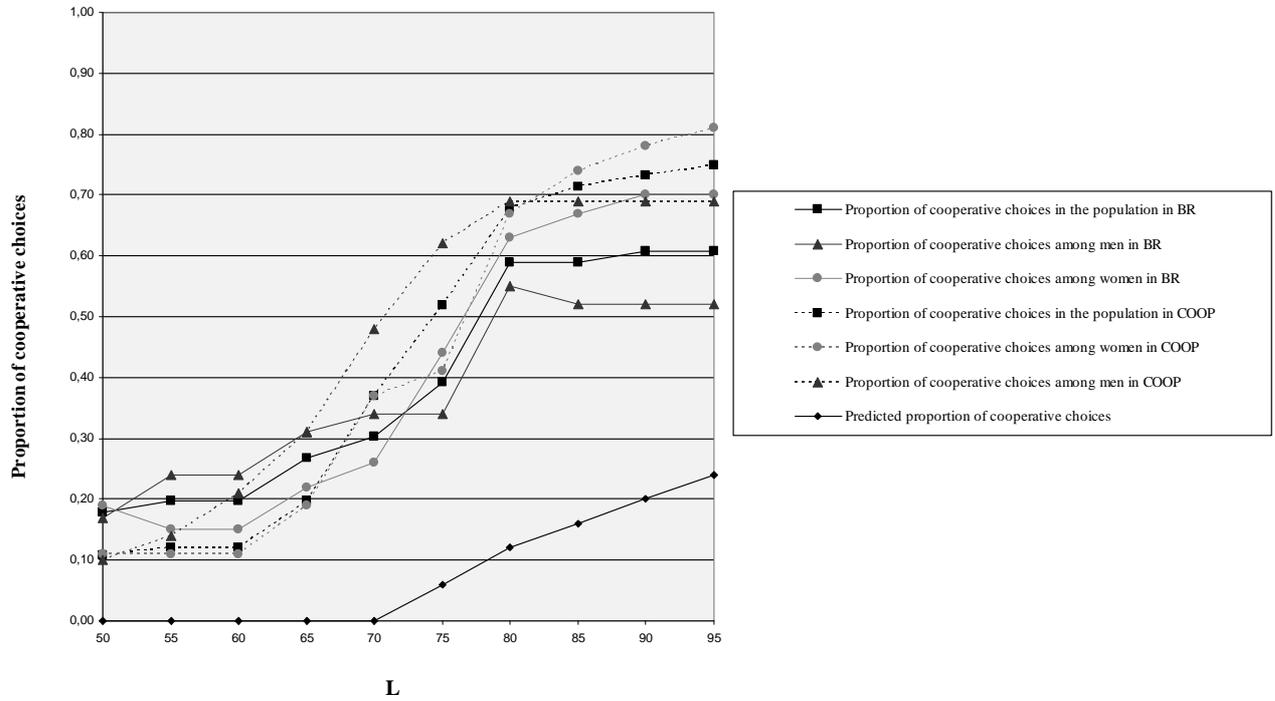


Figure 4. Proportion of cooperative choices depending on the unilateral cooperation gain L (L questions)



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

You are facing a partner. You both 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 hers.

The matrix below gives the different choices for you and your partner, as well as the corresponding gains. Your gains are in **bold**:

| | | The choice of my partner | |
|-----------|------|--------------------------|-------------------|
| | | Red | Blue |
| My choice | Red | 100 € 100 € | 70 € 120 € |
| | Blue | 120 € 70 € | 50 € 50 € |

Question 1.1 :

You have **100%** chances to meet a partner of **type (b)** who plays either Red or Blue, depending on her potential gains as well as on what she thinks 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 :

We are now in the general case. Your partner has:

- **X%** chances to be of **type (a)**, in which case she always plays Red,
and
- **(100-X)%** chances to be of **type (b)**, in which case she plays either Red or Blue, depending on her potential gains as well as on what she thinks you are going to play.

Which colour do you choose for the different values of **X** that are given in the table below? Just tick the appropriate box (**Red** or **Blue**) for each of these values.

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

↑
Question 1.1.

↑
Question 1.2.