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A worker within a firm, or a researcher within the academia, is required to both cooperate with colleagues in team-projects and to compete with them for career progressions. Hence, within workplaces, individuals need to adapt when switching between tasks characterized by different levels of competitiveness and cooperativeness. We study experimentally whether males and females differently spill over their cooperative behaviour when playing indefinitely repeated Prisoner's Dilemmas, distinguished by two different levels of the competitiveness-cooperativeness index (*CCI*, Demuynck et al., 2022). Additionally, as the importance placed on competitiveness might differently impacts males and females' attitudes towards the task, in our Decomposition treatment we separately present its zero-sum component and its common interest component. Besides supporting the efficacy of the *CCI*, our results provide evidence that females are more likely than males to spill over their cooperative behaviour when switching from a low competitive environment to a high competitive one.

Keywords
gender, spillover effects, competitiveness-cooperativeness, framing effects, choice architecture, laboratory experiment

JEL Codes
J16, C73, C92

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Spillover effects of cooperative behaviour when switching tasks: the role of gender

Valeria Maggian* and Ludovica Spinola†

Abstract

A worker within a firm, or a researcher within the academia, is required to both cooperate with colleagues in team-projects and to compete with them for career progressions. Hence, within workplaces, individuals need to adapt when switching between tasks characterized by different levels of competitiveness and cooperativeness. We study experimentally whether males and females differently spill over their cooperative behaviour when playing indefinitely repeated Prisoner's Dilemmas, distinguished by two different levels of the competitiveness-cooperativeness index (CCI, Demuynck et al., 2022). Additionally, as the importance placed on competitiveness might differently impacts males and females' attitudes towards the task, in our *Decomposition treatment* we separately present its zero-sum component and its common interest component. Besides supporting the efficacy of the CCI, our results provide evidence that females are more likely than males to spill over their cooperative behaviour when switching from a low competitive environment to a high competitive one.

Keywords: gender, spillover effects, competitiveness-cooperativeness, framing effects, choice architecture, laboratory experiment.

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1 Introduction

Consider a situation in which a worker cooperates with colleagues in a team-project, and meanwhile she wants to stand out and show off her leadership skills to the employer. Similarly, employees within the same office might both compete for career progressions and cooperate to win the prize as the best department of the company. These examples highlight that in (highly-paid) labour market environments, competitive, cooperative and individual settings often co-exist, and workers are required to adjust their behaviours when switching between tasks characterized by different levels of competitiveness. Being able to quickly adapt to different duties is a characteristic increasingly requested by employers to employees (Peterson and Behfar, 2022[1]), a condition that however might differently impact the behaviour of workers depending on their personal characteristics, such as gender, contributing to the difference in men and women's labour market outcomes.

Starting from the seminal work of Niederle and Vesterlund (2007), several motivations have been advanced to (partially) explain this gender gap, such as differences in risk preferences (Croson and Gneezy, 2009; Dohmen and Falk, 2011; Charness and Gneezy, 2012; Lozano and Reuben, 2022), in performance (Gneezy et al., 2003; Dohmen and Falk, 2011; see Hoyer et al., 2020, for a complete review), in self-confidence (Kamas and Preston, 2012a; Kamas and Preston, 2012b; Comeig et al., 2016; Kamas and Preston, 2018; Van Veldhuizen, 2022), and in the competitiveness trait (Niederle and Vesterlund, 2007, Niederle, 2017) [2].

A common component of these studies is that participants to experiments are asked to decide how they want to be paid after performing a task, having the opportunity to self-select into (two) different payment schemes, usually being either a competitive or a piece rate one. However, the workplace is a much more complex setting, characterized by opportunities to both cooperate and compete with others, or none of them. Therefore, the main goal of this work is to experimentally investigate whether there are differences between males and females in transferring behaviours between tasks characterized by high level of competitiveness to low level of competitiveness, and vice versa.

On this regard, Demuynck et al. (2022), building on the work by Kalai and Kalai (2013), introduce the competitiveness-cooperativeness index (CCI) to measure the competitiveness and cooperativeness for a large number of games. The competitiveness-cooperativeness index allows to easily classify different games depending on their unique decomposition into a common-interest game, or cooperative part, and a zero-sum game, or competitive part, resulting in a value that ranges from 0 (pure cooperative game) to 1 (pure competitive game).

To study whether men and women differently spill over their cooperative behaviour when switching tasks, our experiment exploits a 2x2 design that considers two Prisoner's Dilemmas, respectively with high value of $CCI, CCI_H = 0.9$, and low value of CCI, $CCI_L = 0.7$. Economic social dilemma games such as the Prisoner's Dilemmas indeed easily apply to many real-life situations, including work organizations, because of the trade-off between the self and the common interest.

In our *Baseline treatment* we consider three stages of an indefinitely repeated Prisoner's Dilemma game in which we vary the order of play of the two Prisoner's Dilemmas, CCI_H or CCI_L. More

[1] Harvard Business Review https://hbr.org/2022/03/when-to-cooperate-with-colleagues-and-when-to-compete.

[2] Notwithstanding, the debate on the origins of the observed differences in preferences is still open. In this regard, Gneezy et al. (2009) have shown how attitudes towards competition are more present in women (men) than in men (women) in matrilineal (patriarchal) societies, adding on the discussion about the nature vs. nurture role in affecting behaviour. Similarly, Hauge et al. (2023) study whether and how culture affects the willingness to enter into competitions and find that men and women whose parents are from gender-equal countries do not differ in the willingness to compete.

specifically, in the $CCI_H \rightarrow CCI_L$ condition, participants are first asked to play the CCI_H indefinitely Prisoner's Dilemma (characterized by a high level of competitiveness) and, second, to play the CCI_L indefinitely repeated Prisoner's Dilemma (characterized by a low level of competitiveness). Reversely, in the $CCI_L \rightarrow CCI_H$ condition, participants are first asked to play the CCI_L indefinitely repeated Prisoner's Dilemma and, second, to play the CCI_H indefinitely repeated Prisoner's Dilemma.

As suggested by Niederle (2017), institutions can differ in the importance they place on competitiveness and, besides attracting or discouraging females from entering the organization, they can affect gender differences in economic outcomes, "an open area of behavioural market design" (Niederle, 2017, page 1). In our *Decomposition treatment*, we therefore test how differently framing the decision making environment might impact on men and women's cooperation rates (Pruitt, 1967; Dufwenberg et al., 2011). Specifically, the only difference with respect to the *Baseline treatment* is that in the *Decomposition treatment* the two Prisoner's Dilemmas, CCI_H and CCI_L, are presented to participants in their *decomposed form*, namely as the sum of a zero-sum game (or competitive component) and a common interest game (or cooperative component).

As expected, we find that both males and females cooperate significantly more when playing the CCI_L indefinitely repeated Prisoner's Dilemma than when playing the CCI_H indefinitely repeated Prisoner's Dilemma. Notwithstanding, the choice architecture intervention has a different effect depending on whether the Prisoner's Dilemma is highly competitive (CCI_H) or highly cooperative (CCI_L). Specifically, when the payoff matrix is presented in a decomposed form rather than in a standard form, cooperation increases in the highly competitive setting (CCI_H) but not in the highly cooperative one (CCI_L). Furthermore, there are no gender differences in cooperation rates in both highly competitive and highly cooperative Prisoner's Dilemmas, nor the choice architecture intervention affects differently the cooperative behaviours of males and females.
Addressing our main research question, our findings indicate that when moving from a highly cooperative Prisoner's Dilemma (CCI_L) to a highly competitive one (CCI_H), females cooperate significantly more than males. However, the reverse is not observed: we find no gender differences in the cooperation rate when moving from a highly competitive Prisoner's Dilemma (CCI_H) to a highly cooperative one (CCI_L). This result is not driven by whether the Prisoner's Dilemma is presented in standard form or in decomposed form.

2 Related literature

There is a vast experimental literature on analysing the motives and consequences of the gender gap in job market related environments initiated by Niederle and Vesterlund (2007), and followed by many applications in the laboratory (see Niederle and Vesterlund, 2011 and Markowsky and Beblo, 2022 for a more complete review). Using a novel experimental paradigm in which participants chose the payment scheme they want to be applied when performing an arithmetic task, Niederle and Vesterlund (2007) show that women are more reluctant than men in self-sorting into competitive environments, suggesting males' higher level of overconfidence than females and gender differences in preferences for competition as the main causes of such a gender gap.
The work by Kamas and Preston, (2012a) corroborates the hypothesis that women entry competitive environments less often than men mainly because of differences in confidence, with exposure to female competitive role model significantly increasing the number of best performing women entering the competition (Meier et al., 2020). However, Dohmen and Falk (2011) and Lozano and

Reuben (2022) both suggest instead gender differences in risk preferences as a major factor in explaining the gender gap in self-selection.
These studies all focus on binary choices between entering competitive and non-competitive settings. However, work environments are often characterized by a tension between cooperation and competition so that the first novelty of our approach consists in testing males and females (spillovers of) cooperative behaviour when switching between settings characterized by different degree of competitiveness. Saccardo et al. (2018), in their laboratory experiment, ask participants to choose which percentage of the compensation for their performance to be paid according to a tournament and according to a piece rate payment scheme, showing an even greater gender gap for top performers. Our experimental design, however, allows us to assess males and females' cooperative behaviour when facing indefinitely repeated social dilemmas, as repeated interaction is one of the key aspects of cooperation within organizations, and ruling out, by design, confounding factors such as non-neutral stereotypical tasks (Günther et al., 2010; Kamas and Preston, 2012b). Our study also adds on the understanding of how individual differences and task characteristics might affect the cooperation/competition trade-off within organization, a relevant issue in the management literature (see Beersma et al., 2003; Charness and Villeval, 2009; Kosfeld, 2011; Puck and Pregernig, 2014; Wood et al., 2023; Homburg et al., 2024).

The second stream of literature we contribute to focuses on how different manipulations of the Prisoner's Dilemma affect cooperative behaviours. While Charness et al. (2016) observe that the mutual cooperation parameter positively impacts cooperation rates[3], Gächter et al. (2021), when varying the three payoff indices (or incentives), *temptation*, *risk*, and *efficiency*, introduced by Mengel (2018)[4], find that the reduction of cooperative play is mainly driven by an increase in the *temptation* incentive, rather than an increase in the *risk* incentive.
Besides Mengel (2018), other studies have constructed and used indices to study individuals' cooperative behaviours in social dilemmas (Murninghan and Roth, 1983[5]). For example, Simpson (2003) manipulates the *fear* and the *greed* incentives[6] of a Prisoner's Dilemma to study differences in behaviours between women and men. He finds that women cooperate more than men when the *greed* incentive is high and there is no *fear* incentive. On the contrary, women and men have the same cooperation rate both when the *fear* incentive is high and there is no *greed* and when both incentives are present. Differently, Molina et al. (2013) observe that the average cooperation rate of males is lower than that of females when playing a repeated Prisoner's Dilemma – i.e., a social game with both the *fear* and the *greed* incentives.
Within this experimental literature, studies have focused on how different parametrizations of an indefinitely repeated Prisoner's Dilemma influence the equilibrium selection and its sustainability[7]. For example, Dal Bó and Fréchette (2011) vary the probability of moving from one stage to another and the payoffs of mutual cooperation. According to their findings, when subjects gain experience,

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[3] These results are observed also by Engel and Zhurakhovska (2016) in a similar study. They manipulate the mutual defection payoffs of one-shot Prisoner's Dilemmas and find that the cooperative rate monotonically decreases in the defection parameter.
[4] The three indices proposed by Mengel (2018) to predict cooperation in Prisoners' Dilemma games are: the *temptation* index – i.e., the percentage a player gets when she defects against a co-operator; the *risk* index – i.e., the percentage a player loses when she cooperates against a defector; and the *efficiency* index– i.e., the percentage a player gets when she coordinates with the opponent on the cooperative equilibrium rather than the defection equilibrium. Moreover, LiCalzi and Mühlenbernd (2022) extended these indices to other games such as the Stag Hunt one.
[5] See also Mengel (2018)'s review in section 3 and the paper of Böörs et al. (2022).
[6] Notice that when Simpson (2003) eliminates either the *fear* or the *greed* incentive, the game is no more a Prisoner's Dilemma.
[7] See Dal Bó and Fréchette (2011, 2018) for an extended review on the determinants of cooperative play in indefinitely repeated Prisoner's Dilemma.

they can either achieve a low average cooperation rate when cooperation cannot be supported in equilibrium, or they might reach a high average cooperation level when this can be supported in equilibrium. Instead, Friedman and Oprea (2012) consider four different parametrizations of a Prisoner's Dilemma and manipulate the setting in which the game is played: continuous time, discrete time and one shot. They report that in the continuous time setting subjects achieve a high level of mutual cooperation, and this is verified in all the four parameterizations of the Prisoner's Dilemma. However, when running the discrete time and the one-shot settings, the average mutual cooperation drops.

More closely related to our work, Peysakhovich and Rand (2015) run an experiment where participants first play an indefinitely repeated Prisoner's Dilemma in which both payoff parameters and continuation probability are manipulated to obtain either a social norm of cooperation or a social norm of defection. Then, in a second phase, subjects play different one-shot games – i.e., public good game, trust game, ultimatum game, and dictator game. They find that subjects who experienced the indefinitely repeated Prisoner's Dilemma that favour cooperation behave more pro-socially in the subsequent one-shot games as compared to participants who experienced the indefinitely repeated Prisoner's Dilemma that favour defection. Similarly, Duffy and Fehr (2018) investigate whether the average cooperation rate of subjects in an indefinitely repeated Prisoner's Dilemma transfers to an indefinitely repeated Stug Hunt game, and vice versa. Their main manipulation consists in varying the *temptation* incentive (Mengel, 2018) – i.e., high and low. Their findings do not support transfer of the efficient equilibrium when moving from the Stag Hunt game to the Prisoner's Dilemma.

However, rather than looking at how behaviours carry out across similar repeated games (Duffy and Fehr, 2018) or from indefinitely repeated Prisoner's Dilemmas to one-shot games (Peysakhovich and Rand, 2015) [8], we are interested in studying how individuals spill over behaviours when the degree of competitiveness-cooperativeness of the same game (setting) is manipulated. Furthermore, we focus on the role of gender. Indeed, while Simpson (2003) and Molina et al. (2013) assess gender differences within a Prisoner's Dilemma with fixed parameters, our objective is to test whether there are differences between males and females in transferring behaviours from a highly competitive indefinitely repeated Prisoner's Dilemmas to a highly cooperative one, and vice versa. Indeed, as suggested by Dal Bó and Fréchette (2018) "It is interesting that altruistic and trusting tendencies [...] do not seem to play an important role in infinitely repeated games. Future research should [...] continue to search for personal characteristics that would help us predict who will attempt to establish cooperative relationships."

In our *Decomposition treatment*, by exploiting the decomposition of Kalai and Kalai (2013), participants are shown the same Prisoner's Dilemmas implemented in the *Baseline treatment* as the sum of a zero-sum game (or competitive component) and a common interest game (or cooperative component). The psychological and experimental literature have shown that the framing of the reward structure of a game can have a significant effect on individual's decision. For example, Pruitt (1967) observes that presenting Prisoner's Dilemmas in a decomposed form, such that a player can focus separately on her own payoff and on the opponent's one, leads to higher cooperation rates than when the payoff matrices are shown in standard form. Dufwenberg et al. (2011) run an experiment in which they manipulate the way a one-shot and a repeated public good game is framed and report that this has an impact on both (first and second order) beliefs and contributions. Furthermore, Kendall (2022)

[8] There is also a related extended literature that experimentally studies spillover effects across multiple games or coordination games (Van Huyck et al. (1991); Huck et al. (2010); Cason et al. (2012); Mengel (2012); Grimm and Mengel (2012); Bednar et al. (2012)). In contrast to this literature, we consider spillover effect in indefinitely repeated Prisoner's Dilemma with different degree of competitiveness-cooperativeness.

decomposes a Stag Hunt game[9] in three components (strategic, behavioural and kernel) to study coordination and finds that the behavioural component correctly predicts individuals' decision to coordinate. Similarly, Garcia-Galocha et al. (2022) experimentally test the direct-sum decomposition of Candogan et al. (2011)[10] and study individuals' decisions in a 3x3 Prisoner's Dilemma. By varying the nonstrategic component of the game, they observe a change in participants' cooperative play.

Differently from these works, we consider a Prisoner's Dilemma decomposed into a zero-sum game and a common interest game; to define the CCI_H and CCI_Lconditions, we manipulate the payoff structure such that only the common interest game changes. Moreover, while Kendall (2022) and Garcia-Galocha et al. (2022) display the matrix payoff of the game only in standard form, we present the two Prisoner's Dilemmas – i.e., the CCI_H and the CCI_L Prisoner's Dilemma– either in standard form, in our *Baseline treatment*, or in decomposed form, in our *Decomposition treatment*. By altering the *importance* placed on the common interest part of the game, we aim at testing whether modifying the choice architecture is sufficient to stimulate (spillovers of) cooperation among males and females.

3 Experimental design and hypotheses

3.1 Experimental Design

In our experiment we ask participants to play a Prisoner's Dilemma game (see Table 1) in which we vary its competitiveness-cooperativeness as measured by the competitiveness-cooperativeness index (CCI) constructed by Demuynck et al. (2022) [11]. In particular, in our *Baseline treatment*, we start from the following game:

Table 1 – 2x2 symmetric game.

		Player 2	
		X	**Y**
Player 1	**X**	b, b	d, e
	Y	e, d	f, f

that is a Prisoner's Dilemma if $e > b > f > d$[12]. Then, we consider the formula of the CCI value for the Prisoner's Dilemma game (Demuynck et al., 2022):

[9] Kendall (2022)'s decomposition can be applied to any games with finite strategy space and finite number of players.

[10] See also Böörs et al. (2022) for a complete classification by decomposition of 2x2 symmetric games.

[11] The experimental design and hypotheses were pre-registered in AsPredicted (AsPredicted #112174, https://aspredicted.org/1S5_7J1). For further details, see also the hypotheses section, footnote 18.

[12] We further impose that $2b > d + e$ in order to get that the mutual cooperative play maximises players' joint payoff. Indeed, in the real-world example we have in our mind - i.e., labour market environment - an office maximizes its payoff when everyone cooperates, rather when an individual cooperates and one does not. Moreover, in the meta-analysis by

$$CCI = \frac{2(d-e)^2}{(b-d)^2 + (b-e)^2 + (b-f)^2 + (d-e)^2 + (d-f)^2 + (e-f)^2}$$

By manipulating the parameters of the game, we obtain two Prisoner's Dilemmas (Table 2). Table 2a shows the Prisoner's Dilemma with a relatively high CCI, $CCI_H = 0.9$[13], while Table 2b presents the Prisoner's Dilemma with a relatively low CCI, $CCI_L = 0.7$. We set the payoff parameters of the Prisoner's Dilemma with relatively low CCI in order to i) only vary the mutual cooperative play, so to allow only one modification with respect to the Prisoner's Dilemma with a relatively high CCI, and to ii) keep the risk index (Mengel, 2018) equal to 1 in both Prisoner's Dilemmas[14]. Additionally, the variation in the CCI between Prisoner's Dilemmas should be sufficient to allow observing significant differences in cooperative play: to check for this, we computed the CCI of the Prisoner's Dilemmas used by Dal Bó and Fréchette (2011) in their experiment, which is equal to $CCI_{32} = 0.959$, $CCI_{40} = 0.863$ and $CCI_{48} = 0.710$. We choose their work as they also vary only the payoff of the mutual cooperative play – i.e., they use parameters $b \in \{32, 40, 48\}, d = 12, e = 50, f = 25$. Results in Dal Bó and Fréchette (2011)'s paper show that subjects interacting in the Prisoner's Dilemma with $CCI_{48} = 0.710$ cooperate significantly more than those playing the Prisoner's Dilemma with $CCI_{40} = 0.863$.

Table 2 – Payoff matrices of the two Prisoner's Dilemmas.

Player 2

Player 1		X	Y
	X	20, 20	0, 30
	Y	30, 0	10, 10

Table 2a – 2x2 Prisoner's Dilemma with $CCI_H = 0.9$

	X	Y
X	29, 29	0, 30
Y	30, 0	10, 10

Table 2b – 2x2 Prisoner's Dilemma with $CCI_L = 0.7$

In addition to changes in the value of the CCI, we vary the order with which these two indefinitely repeated Prisoner's Dilemma are played. In the $CCI_H \rightarrow CCI_L$ *condition* participants first play the indefinitely repeated Prisoner's Dilemma with $CCI_H = 0.9$, then the one with $CCI_L = 0.7$, and conclude by playing again the indefinitely repeated Prisoner's Dilemma with CCI_H. In the $CCI_L \rightarrow CCI_H$ *condition*, subjects start by interacting in the indefinitely repeated Prisoner's Dilemma with

Mengel (2018), when describing their sample, they separately consider studies that impose the above described condition from those that did not (see Mengel, 2018, Table B10 in online Appendix B.2). This is to say that this feature can influence individual's behaviour, so that we opted to impose such additional assumption.

[13] In order to have a benchmark, the payoff parameters of Table 2a are the same as those employed by Duffy and Fehr, (2018) in their PD30-SH10 treatment.

[14] This is calculated as the percentage a player loses when she cooperates against a defector: $RISK = \frac{(f-d)}{f}$.

$CCI_L = 0.7$, then they play the one with $CCI_H = 0.9$, and finally participants switch back to play the indefinitely repeated Prisoner's Dilemma with $CCI_L = 0.7$. Therefore, within each experimental session, we switch twice the value of the CCI of the Prisoner's Dilemma.

In our *Decomposition treatment*, the only variation with respect to the *Baseline treatment* consists in the way the Prisoner's Dilemma payoff matrix is presented to participants. Specifically, we consider the unique decomposition of a game introduced by Kalai and Kalai (2013), based on which Demuynck et al. (2022) constructed the competitiveness-cooperativeness index (CCI). In order to illustrate how the decomposition of the game works, consider again the payoff matrix shown in Table 1. This can be seen as the juxtaposition of two matrices: the payoff matrix of player 1, and that of player 2.

$A = \begin{bmatrix} b & d \\ e & f \end{bmatrix}$ payoffs matrix of player 1

$B = \begin{bmatrix} b & e \\ d & f \end{bmatrix}$ payoff matrix of player 2

Notice that both matrices A and B can be constructed as the sum of a zero-sum component and common interest component:

$A = \frac{A-B}{2} + \frac{A+B}{2}$:

$$\begin{bmatrix} b & d \\ e & f \end{bmatrix} = \begin{bmatrix} 0 & \frac{d-e}{2} \\ \frac{e-d}{2} & 0 \end{bmatrix} + \begin{bmatrix} b & \frac{d+e}{2} \\ \frac{e+d}{2} & f \end{bmatrix} \quad (1)$$

while $B = \frac{B-A}{2} + \frac{A+B}{2}$:

$$\begin{bmatrix} b & e \\ d & f \end{bmatrix} = \begin{bmatrix} 0 & \frac{e-d}{2} \\ \frac{d-e}{2} & 0 \end{bmatrix} + \begin{bmatrix} b & \frac{d+e}{2} \\ \frac{e+d}{2} & f \end{bmatrix} \quad (2)$$

Indeed, in both equations 1 and 2, the first term on the right-hand side is the zero-sum game while the second term is the common interest game. Therefore, by considering again the whole game, we obtain:

$$\begin{bmatrix} b,b & d,e \\ e,d & f,f \end{bmatrix} = \begin{bmatrix} 0,0 & \frac{d-e}{2},\frac{e-d}{2} \\ \frac{e-d}{2},\frac{d-e}{2} & 0,0 \end{bmatrix} + \begin{bmatrix} b,b & \frac{d+e}{2},\frac{d+e}{2} \\ \frac{e+d}{2},\frac{e+d}{2} & f,f \end{bmatrix}$$

where the first matrix on the right-hand side is a zero-sum game and the second matrix on the right-hand side is a common interest game.

In Table 3, we display the two Prisoner's Dilemmas as presented to the subjects in the *Baseline treatment (left-hand side of the equation)* and in the *Decomposition treatment (right hand side of the equation)*[15].

Table 3 – The two Prisoner's Dilemmas decomposed.

$$\begin{bmatrix} 20,20 & 0,30 \\ 30,0 & 10,10 \end{bmatrix} = \begin{bmatrix} 0,0 & -15,15 \\ 15,-15 & 0,0 \end{bmatrix} + \begin{bmatrix} 20,20 & 15,15 \\ 15,15 & 10,10 \end{bmatrix}$$

Table 3a – decomposed Prisoner's Dilemma with $CCI_H = 0.9$

$$\begin{bmatrix} 29,29 & 0,30 \\ 30,0 & 10,10 \end{bmatrix} = \begin{bmatrix} 0,0 & -15,15 \\ 15,-15 & 0,0 \end{bmatrix} + \begin{bmatrix} 29,29 & 15,15 \\ 15,15 & 10,10 \end{bmatrix}$$

Table 3b – decomposed Prisoner's Dilemma with $CCI_L = 0.7$

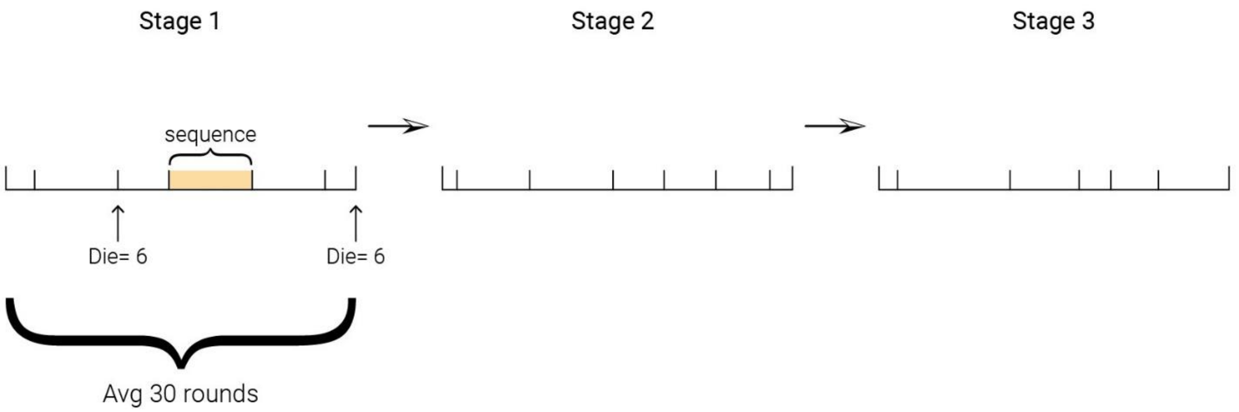
3.2 Experimental procedures

At the beginning of each experimental session, subjects are randomly matched in groups of 10 and the group composition remains constant for the entire session. Each experimental session is formed by three stages and in each stage either an indefinitely repeated Prisoner's Dilemma with CCI_H or one with CCI_L is played. Depending on the condition, the first stage is either the indefinitely repeated Prisoner's Dilemma with CCI_H (in the $CCI_H \rightarrow CCI_L$ *condition*) or the indefinitely repeated Prisoner's Dilemma with CCI_L (in the $CCI_L \rightarrow CCI_H$ *condition*). In turn, each stage is composed by an indefinitely number of sequences and each sequence is formed by indefinitely number of rounds. Moreover, in each round, subjects are randomly and anonymously re-matched within the group of 10 people.

[15] In figure A.1 (Appendix A), we show the screenshot of the decomposed Prisoner's Dilemma with CCI_H, as visualised by participants.

To construct the indefinite time-horizon we proceed as follows (as implemented by Duffy and Fehr (2018) and Roth and Murninghan (1978)). Given a stage (e.g. CCI_H), subjects play an indefinite number of sequences of the repeated Prisoner's Dilemma with the same value of CCI (e.g. CCI_H). Each sequence lasts for an unknown number of rounds and ends with probability 1/6. Specifically, once subjects submitted their choices in a specific round, they are first informed on both their own and their opponent's choice and on their own payoff. Second, a virtual die is rolled and subjects are informed about its outcome. If the outcome of the virtual die roll is a number from 1 to 5, the sequence continues: players within the same group are randomly rematched, and they start another round. If the outcome of the virtual die roll is a 6, the sequence ends, and the stage game may change. Figure 1 shows the flowchart of the experiment.

Figure 1 – Timeline of the experiment



Before the beginning of each experimental session, participants were instructed about the random matching procedure. Moreover, they were shown the two possible payoff matrices they would play, and they were told that a game could change only when a sequence ends – i.e., the die roll is a 6. To ensure that individuals understood the procedure and rules of the game, they had to correctly answer a set of comprehension questions before starting the first stage game. Once the experiment was over, participants had to fill-in a post-experimental questionnaire.

In total, 240 subjects participated in the experiment. We recruited them through the ORSEE platform (Greiner, 2004) and we conducted all the experimental sessions at the VeraLabEx in Ca' Foscari Economics Campus in Venice (Italy)[16]. We run 8 experimental sessions, balanced by gender[17] , but this was not made salient to participants. While participants could easily notice that the number of males and females was equal while waiting before entering the laboratory, during the experiment both the gender of the opponent and the gender composition of the matching group was never revealed.

[16] Among the participants, 118 were students at Ca' Foscari University in Venice, either from economics (71) or other tracks (47). The other 2 subjects were not students.

[17] In order to get the same number of males and females in each experimental session, we first set up two distinct randomized invitation processes, each corresponding to an experimental sub-session: one reserved to females, and one reserved to males. In particular, we allow 18 females (15 participants and 3 reserves) and 18 males (15 participants and 3 reserves) to register for each of the sub-sessions. The sub-sessions were scheduled at the same time of the same day and invitations to register to each sub-session were sent contemporaneously. Participants were not aware about the above-described process and about the session's partition: they only received a link to register to a specific sub-session, which remained active until there were available spots. As shown in table 4, in 2 sessions out of 8, because of some invited individuals did not show up, we have slightly unbalanced sessions, with respectively 16 and 14 females participating.

This was made to avoid any confounds due to subjects' different expectations on the probability of being matched with a male or a female, an issue that we think is worth of interest for future research.

The experiment was computerized using z-Tree (Fischbacher, 2007) and each session lasted approximately 90 minutes. While the number of rounds of each stage game is the same when considering groups participating in the same experimental session, it varies across sessions, as shown in Table 4.

Table 4 – Details of the experimental sessions.

Treatment	**Condition**	**Num. Subjects**	**Num. of groups**	**Num. of females**	**Num. of sequences (num. of rounds)**		
					Stage 1	Stage 2	Stage 3
Baseline	$\boldsymbol{CCI_H} \rightarrow \boldsymbol{CCI_L}$	30	3	15	4 (26)	6 (40)	7 (19)
Baseline	$\boldsymbol{CCI_L} \rightarrow \boldsymbol{CCI_H}$	30	3	16	5 (33)	5 (21)	2 (23)
Baseline	$\boldsymbol{CCI_H} \rightarrow \boldsymbol{CCI_L}$	30	3	14	3 (30)	6 (31)	4 (26)
Baseline	$\boldsymbol{CCI_L} \rightarrow \boldsymbol{CCI_H}$	30	3	15	4 (37)	7 (27)	5 (27)
Decomposition	$\boldsymbol{CCI_H} \rightarrow \boldsymbol{CCI_L}$	30	3	15	3 (20)	7 (25)	5 (23)
Decomposition	$\boldsymbol{CCI_L} \rightarrow \boldsymbol{CCI_H}$	30	3	15	3 (32)	5 (26)	7 (28)
Decomposition	$\boldsymbol{CCI_H} \rightarrow \boldsymbol{CCI_L}$	30	3	15	10 (45)	7 (35)	4 (30)
Decomposition	$\boldsymbol{CCI_L} \rightarrow \boldsymbol{CCI_H}$	30	3	15	5 (28)	7 (31)	5 (25)
All	**Tot**	240	24	120	4.6 (31.4)	6.3 (29.5)	4.9 (25.1)

At the end of each experimental session, participants were privately paid in cash. Each subject was paid the sum of all rounds of all stages in euro cents. Average earnings were 13.18€, including a show-up fee of 3€.

3.3 Hypotheses

Our experiment is designed to assess whether men and women behave differently when moving from a highly competitive to a highly cooperative task, and vice versa. Additionally, we aim at testing the effect of a choice architecture intervention in affecting individuals' cooperative behaviour. Specifically, we expect that in the *Decomposition treatment* individuals should focus more their attention on the common interest game than on the zero-sum game, as it shows only non-negative outcomes (loss avoidance, Cachon and Camerer, 1996), so that, anything equal, participants should cooperate significantly more than those in the *Baseline treatment.* As pointed by Devetag and Ortmann (2007) "there is some evidence (albeit by no means undisputed, see e.g., List 2004; Plott and Zeiler 2005) that framing outcomes as gains or losses is not neutral with respect to behavior. [...] if people follow loss avoidance, they should avoid playing strategies that result in certain losses if strategies leading to potential gains are available" (page 339). However, we have no clear predictions on whether the *Decomposition treatment* differently affects men and women, so we will formulate our hypotheses expecting the *level* of cooperation to be higher in the *Decomposition treatment* than in the *Baseline treatment,* while we have no clear-cut predictions on how it will affect the possible gender gap in spillover effects of cooperative behaviour, when switching tasks.

Before testing our core hypotheses, we want to examine whether participants in our experiment cooperate more when playing the CCI_L indefinitely Prisoner's Dilemma than when interacting in the CCI_H indefinitely Prisoner's Dilemma. Therefore, our first hypothesis concerns the efficacy of the competitive-cooperative index.

Hypothesis 1 *When comparing the average cooperation rate in each first stage of the experiment, both in the Baseline and in the Decomposition treatment, women and men cooperate more when playing a Prisoner's Dilemma with* CCI_L *than when playing a Prisoner's Dilemma with* CCI_H.

We analyse this hypothesis by comparing the average cooperation rates in the first stage of the $CCI_L \rightarrow CCI_H$ *condition* with the first stage of the $CCI_H \rightarrow CCI_L$ *condition*. We only consider the first stage of the experiment because we want to test the efficacy of the index, ruling out any possible spillover effect.

According to what has been mainly observed in the literature, men and women differ in their preferences for competition (Croson and Gneezy, 2009), with men being more likely than women to self-select into competitive environments instead of choosing fixed-pay payment schemes (Niederle and Vesterlund, 2011 and Markowsky and Beblo, 2022). On the other hand, studies conducted so far to investigate whether gender affects cooperative behaviour report mixed results (Balliet et al., 2011; Kuhn and Villeval, 2015; Dal Bó and Fréchette, 2018; Furtner et al., 2021). Within this literature, Charness and Rustichini (2011) and Molina et al. (2013) report that women cooperate significantly more than men when interacting in a Prisoner's Dilemma. Therefore, we expect that when the game is less favourable for cooperative play (CCI_H), both men and women cooperation rates will not be significantly different. On the contrary, we believe that when the game is supportive of cooperation (CCI_L), women will exhibit a higher cooperation rate than men.

Hypothesis 2 *In both the Baseline Treatment and in the Decomposition Treatment, when playing the Prisoner's Dilemma with* CCI_L *women cooperate significantly more than men while no gender difference is observed when playing the Prisoner's Dilemma with* CCI_H.

To assess this second hypothesis, we will test for differences in the average cooperation rates of men and women when playing, as a first stage, the CCI_L Prisoner's Dilemma versus the CCI_H Prisoner's Dilemma.

Hypotheses 1 and 2 are preliminary with respect to our core predictions, since they are meant to check for both the efficacy of the *CCI* in predicting cooperative behaviour and for analysing the consistency of our results with previous evidence on gender differences in cooperation. The two core hypotheses of our work are aimed at investigating gender differences in spilling over cooperative behaviour between tasks characterized by different degree of competitiveness. Specifically, we will assess whether women transfer their cooperative behaviour when moving from a highly cooperative Prisoner's Dilemma to a highly competitive one. We predict that, when playing the first round of a highly competitive (CCI_H) Prisoner's Dilemma after having interacted in a highly cooperative one (CCI_L), women will exhibit a higher average cooperation rate than men[18].

Hypothesis 3 *When playing the highly competitive (CCI_H) Prisoner's Dilemma after having experienced the highly cooperative (CCI_L) Prisoner's Dilemma, women cooperate more than men.*

Similarly, we will test whether men preserve their competitive attitude when moving from a highly competitive Prisoner's Dilemma to a highly cooperative one. We expect that, in the first round of a highly cooperative (CCI_L) Prisoner's Dilemma following interaction in a highly competitive (CCI_H) one, men will show a lower average cooperation rate than women.

Hypothesis 4 *When playing the highly cooperative (CCI_L) Prisoner's Dilemma after having experienced the highly competitive (CCI_H) Prisoner's Dilemma, men cooperate less than women.*

4 Results

In this section, we first test hypotheses 1 and 2, focusing i) on the first round, ii) first five rounds, and iii) all rounds of the first stage. Then, we test for gender differences when switching between high competitive to high cooperative indefinitely repeated Prisoner's Dilemma, and vice versa.

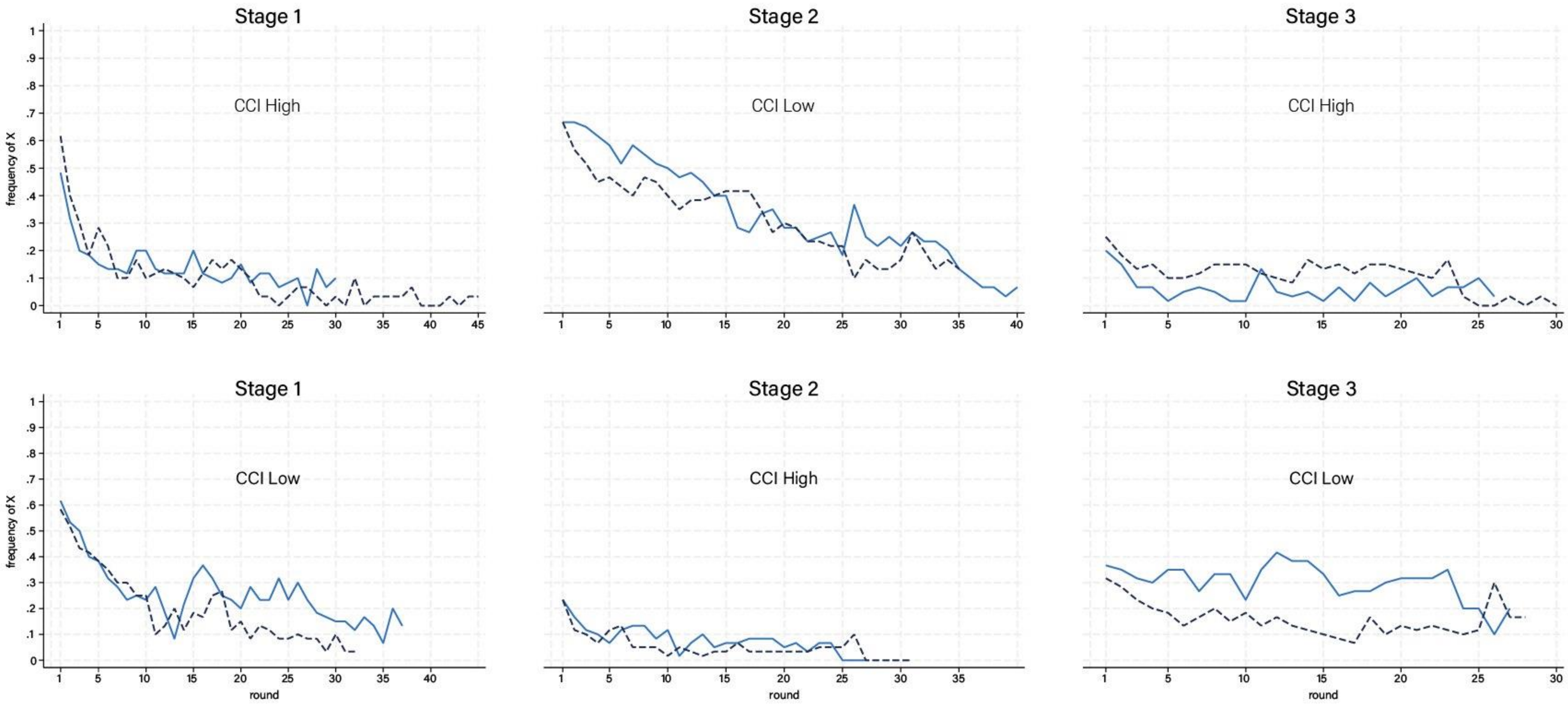
4.1 Efficacy of the CCI, choice architecture, and gender difference in cooperative behaviour

Figure 2 presents the average cooperation rates in each round of a stage – i.e., the choice of X – in both the *Baseline treatment* (solid blue line) and the *Decomposition treatment* (dashed black line), separately accounting for the $CCI_H \rightarrow CCI_L$ *condition* (top panel) and the $CCI_L \rightarrow CCI_H$ *condition* (bottom panel)[19]. The horizontal axes of Figure 2 display the numbering of the rounds within a stage game, hence round number 1 indicates the start of a new stage – i.e., the first round after a change in the payoff matrix has occurred. Since we run two experimental sessions for each of the two conditions of each treatment, the average duration of stages varied across groups in the same treatment and condition (refer to Table 4 for details). Therefore, the aggregate frequencies in the last rounds of a stage (see Figure 2) may not necessarily comprise the cooperative choice of all groups assigned to the same treatment and condition.

[18] In section 4.2 we assess the spillover effects by measuring the proportion of males and females cooperating in the first round of the highly competitive Prisoner's Dilemma (CCI_H) after having played the highly cooperative one (CCI_L) – i.e., we run a within-subjects analysis. In the pre-registered hypothesis 3, we instead stated that we would have measured the spillover effects by performing a between-subjects analysis. In particular, we indicated that we would have compared the average cooperation rate of women and men who first play the highly competitive Prisoner's Dilemma (CCI_H) with those who have experienced the highly cooperative Prisoner's Dilemma (CCI_L) before playing the highly competitive Prisoner's Dilemma (CCI_H). However, the latter analysis might suffer of starting effects in the first stage, so that the former approach is the most appropriate to investigate our main research question. Additionally, the analysis provided in this paper follows the one adopted by Duffy and Fehr (2018). The same reasoning applies to hypothesis 4.

[19] In Table B.1 (Appendix B) we report the average cooperation rates of each group across the first round, the first five rounds and all rounds in a stage, along with the weighted averages in the respective treatment and condition.

Figure 2 – Aggregate frequency of cooperation in both the *Baseline treatment* (solid blue line) and the *Decomposition treatment* (dashed black line)



First, we observe that the aggregate cooperation rate in the *Baseline treatment* and in the *Decomposition treatment* follows similar patterns. In both treatments, the cooperation rate of participants in the first stage of the $CCI_H \rightarrow CCI_L$ *condition* sharply drops toward 0 within few rounds, while the frequency of cooperation in the first stage of the $CCI_L \rightarrow CCI_H$ *condition* has a moderate downward trend toward 0.1. Therefore, cooperation appears to be more sustainable in the CCI_L Prisoner's Dilemma than in the CCI_H one, even though the frequency of cooperation decreases over time in both conditions.
We test our first hypothesis by considering together the *Baseline treatment* and the *Decomposition treatment* and comparing the first round of the first stage of the two conditions. Results show that the difference between the average cooperation rate in the first round of the first stage of the $CCI_L \rightarrow CCI_H$ *condition* (0.60) and the average cooperation rate in the first round of the first stage of the $CCI_H \rightarrow CCI_L$ *condition* (0.55) is not significantly different (Fisher's exact test: $p = 0.514$). This might be due to a starting effect. In Figure 2, we observe a relatively high cooperation rate in the first round of the first stage in both conditions and treatments. However, as subjects play the following rounds, the cooperation rate drops down in the $CCI_H \rightarrow CCI_L$ *condition* , while it gently decreases in the $CCI_L \rightarrow CCI_H$ *condition* (in both treatments). To further investigate this, we compare the aggregate cooperative behaviour in the first five rounds of the first stage of the $CCI_H \rightarrow CCI_L$ *condition* with the average cooperative behaviour in the first five rounds of the first stage of the $CCI_L \rightarrow CCI_H$ c*ondition*. Again, for each condition, we consider together the frequency of cooperation in the *Baseline treatment* and in the *Decomposition treatment*. A Mann-Whitney U-test (MW in the following) rejects the null hypothesis that the average cooperation rates in the first five rounds of the first stage of the $CCI_L \rightarrow CCI_H$ *condition* (0.48) and of the $CCI_H \rightarrow CCI_L$ *condition* (0.31) are the same (MW: $p = 0.042$). Similarly, when considering all rounds of the first stage of both treatments, the aggregate cooperative behaviour in the $CCI_L \rightarrow CCI_H$ *condition* (0.24) is significantly higher than that in the $CCI_H \rightarrow CCI_L$ *condition* (0.15) (MW: $p = 0.053$).

These results support our hypothesis 1: participants cooperate more in the Prisoner's Dilemma characterised by low level of competitiveness (CCI_L) than in the Prisoner's Dilemma characterised by high level of competitiveness (CCI_H). Note that in testing our first hypothesis we consider the two treatments (*Baseline* and *Decomposition*) together. We now want to investigate whether the choice architecture intervention has an impact on affecting participants' cooperative behaviour. Specifically, we aim at studying whether the way the Prisoner's Dilemma is presented – i.e., *Baseline treatment* or *Decomposition treatment* – has a different effect depending on whether the Prisoner's Dilemma is highly competitive (CCI_H) or highly cooperative (CCI_L).

In Table 5, we report the results of a Linear Probability Model with robust standard errors clustered at the matching group level. We estimate three specifications to study whether the choice architecture intervention has an impact on individuals' cooperative behaviour. In particular, in specification 1 we consider only the first round of the first stage; in specification 2 we account for the first five rounds of the first stage; in specification 3 we look at all rounds of the first stage. The binary dependent variable *Cooperation* takes value 1 when the participant cooperates. Our main independent variables of interest are *Decomposition*, CCI_L, and their interaction (*Decomposition* $\times$ CCI_L). *Decomposition* takes value 1 if the Prisoner's Dilemma is presented in decomposed form (*Decomposition treatment*) and 0 when it is shown in standard form (*Baseline treatment*). CCI_L takes value 1 when the Prisoner's Dilemma is characterised by low level of competitiveness and 0 when the Prisoner's Dilemma is highly competitive (CCI_H). Since we add the interaction term between *Decomposition* and CCI_L dummy variables, the coefficient of *Decomposition* accounts for the effect of the choice architecture intervention when the Prisoner's Dilemma is highly competitive. The coefficient of CCI_L indicates the difference in cooperative behaviour between playing the Prisoner's Dilemma characterised by a low level of competitiveness (CCI_L) and the Prisoner's Dilemma characterised by a high level of competitiveness (CCI_H), when considering the *Baseline treatment*.

We further include some control variables. Specifically, *Others experiment* takes value 1 if the subject has previously participated in other experiments and 0 otherwise. *Game theory* is a categorical variable that takes value 0 if the subject never had a game theory course and takes value 1 or 2, respectively, if she took a basic or an advanced game theory course. We also consider a set of independent variables to measure individuals' preferences (Falk et al**.,** 2018)**,** based on the subjects' answers in the post-experimental questionnaire. *Risk lover*[22] takes value between 0 ("completely unwilling to take risks") and 10 ("very willing to take risks"); *Trust* takes value between 0, when the individual does not trust at all others, and 10, when she completely trusts others. *Negative reciprocity* is constructed as the weighted average of three self-assessment questions and ranges between 0, when the subject is completely unwilling to negatively reciprocate, and 10, when she is completely willing to reciprocate. Finally, we include two subscales' measures derived from the Competitiveness Index (Houston et al., 2005): *Enjoyment of competition*, which measures the individual's attitude toward competition, and *Contentiousness*, which measures individual's conflict avoidance behaviour.

Table 5 shows that, in the first round and in the first five rounds of the first stage, individuals in the *Decomposition treatment* cooperate more than those in the *Baseline treatment*, when interacting in the Prisoner's Dilemma characterised by a high level of competitiveness (CCI_H). Furthermore, all three specifications – i.e., in the first round, in the first five rounds and in all rounds – report that participants cooperate significantly more when interacting in the highly cooperative Prisoner's Dilemma (CCI_L) rather than when playing in the highly competitive one (CCI_H), conditional on being in the *Baseline treatment*. In addition, specifications 1 and 3 of Table 5 show that cooperative behaviour is positively affected by individuals' risk seeking attitude. Finally, when considering all rounds together, we find a positive and significant effect of trust and enjoyment of competition on individual's willingness to cooperate.

[22] We consider only qualitative subjective self-assessment as it has been shown to be a sufficient instrument to predict individuals' risk-taking behaviour (see Falk et al., 2018, page 1655).

Table 5 – The effect of the choice architecture intervention.

Cooperation	(*1st round*)	(*five rounds*)	(*all rounds*)
Decomposition	0.142*	0.096*	0.008
	(0.0726)	(0.0492)	(0.0403)
CCI_L	0.146*	0.228***	0.145***
	(0.0735)	(0.0652)	(0.0419)
CCI_L X *Decomposition*	-0.159	-0.110	-0.071
	(0.1174)	(0.0950)	(0.0653)
Other experiment	-0.038	-0.037	-0.020
	(0.0725)	(0.0528)	(0.0279)
Game theory	0.002	-0.007	-0.024
	(0.0478)	(0.0292)	(0.0172)
Risk lover	0.038**	0.011	0.017***
	(0.0163)	(0.0080)	(0.0058)
Trust	0.004	0.011	0.010**
	(0.0145)	(0.0077)	(0.0044)
Negative reciprocity	-0.020	-0.001	0.002
	(0.0161)	(0.0078)	(0.0053)
Enjoyment competition	-0.009	-0.007	-0.004*
	(0.0088)	(0.0052)	(0.0023)
Contentiousness	0.002	0.004	-0.001
	(0.0101)	(0.0064)	(0.0032)
Constant	0.562*	0.328**	0.156**
	(0.3036)	(0.1518)	(0.0720)
Round FE		✓	✓
R-squared	0.011	0.084	0.114
N	240	1200	7530

Note: * p<0.10; ** p<0.05; *** p<0.01. LPM with robust s.e. clustered at the matching group level in parenthesis.

Our results suggest that the choice architecture intervention has an impact on cooperative behaviour. In particular, presenting the payoff matrix in a decomposed form (*Decomposition treatment*) rather than in a standard form (*Baseline treatment*), has a significant and positive impact on cooperation when individuals interact in a highly competitive setting (CCI_H). One possible interpretation of these results is the following. When the environment is highly competitive (CCI_H), the level of cooperation in the *Baseline treatment* is very low. Presenting the context in a decomposed form leads subjects to focus more their attention on the common interest game than on the zero-sum game, as it shows only non-negative outcomes. Therefore, the level of cooperation in the Prisoner's Dilemma characterised by a high level of competitiveness (CCI_H) is significantly increased in the *Decomposition treatment* with respect to the *Baseline treatment*. Conversely, when the context is more cooperative (CCI_L), presenting it in a standard or decomposed form has no significant effects on the level of cooperation. Indeed, when interacting in the highly cooperative Prisoner's Dilemma (CCI_L), in the *Baseline treatment*, the level of cooperation is already quite high and, even though in the *Decomposition* *treatment* subjects focus more on the cooperative component, there is no significant increase in the level of cooperation when changing the framing of the payoff matrix.

So far, we tested the efficacy of the CCI and we analysed the effect of the choice architecture intervention. However, we have not yet investigated the role of gender. In the next paragraphs, we study whether men and women differ in their cooperative behaviour when interacting in either the highly competitive task (CCI_H) or the highly cooperative one (CCI_L) – i.e., hypothesis 2. Figures 3 and 4 display the aggregate frequencies of cooperation of both men (blue line) and women (red line) in the $CCI_H \rightarrow CCI_L$ *condition* (top panel) and in the $CCI_L \rightarrow CCI_H$ *condition* (bottom panel), respectively, in the *Baseline treatment* and in the *Decomposition treatment*[23]. As for Figure 2, the horizontal axes of Figures 3 and 4 report the numbering of rounds within a stage, and round 1 marks the start of a new stage game.

As for hypothesis 1, we test hypothesis 2 by considering together the *Baseline treatment* and the *Decomposition treatment* and comparing the average cooperation rates of men and women in the first round, in the first five rounds, and in all rounds of the first stage of either the $CCI_H \rightarrow CCI_L$ *condition* or the $CCI_L \rightarrow CCI_H$ *condition*. According to a Fisher's exact test, the frequencies of cooperation of men and women in the first round of the first stage are not significantly different, neither in the $CCI_H \rightarrow CCI_L$ *condition* (men = 0.49 vs women = 0.61; Fisher's exact test: $p = 0.205$) nor in the $CCI_L \rightarrow CCI_H$ *condition* (men = 0.61 vs women = 0.59; Fisher's exact test: $p = 0.854$). Similarly, no statistically significant difference is found when comparing the average cooperation rates of males and females in first five rounds of the first stage of the $CCI_H \rightarrow CCI_L$ *condition* (men = 0.27 vs women = 0.36; MW: $p = 0.193$), nor in the first five rounds of the first stage of the $CCI_L \rightarrow CCI_H$ *condition* (men = 0.48 vs women = 0.47; MW: $p = 0.707$). Finally, the average cooperation rate of men in all rounds of the first stage is not significantly different from that of women in all rounds of the first stage, neither in the $CCI_H \rightarrow CCI_L$ *condition* (men = 0.11 vs women = 0.16; MW: $p = 0.402$), nor in the $CCI_L \rightarrow CCI_H$ *condition* (men = 0.24 vs women = 0.24; MW: $p = 0.564$).

We find no support for the hypothesis that women are more cooperative than men when playing the highly cooperative Prisoner's Dilemma (CCI_L). Similarly, we observe no gender difference in cooperation rates when subjects interact in the highly competitive Prisoner's Dilemma (CCI_H). We further investigate whether the choice architecture intervention differently affects the cooperative behaviour of men and women. In Table C.1 in Appendix C, we report the estimation results of a Linear Probability Model in which we study whether the cooperation behaviour of men and women is affected by the way the Prisoner's Dilemma is presented: standard form (*Baseline treatment*) or decomposed form (*Decomposition treatment*). In running this analysis, we separately consider the $CCI_H \rightarrow CCI_L$ *condition* and the $CCI_L \rightarrow CCI_H$ *condition* and we focus on the first round of the first stage, the first five rounds of the first stage, and all rounds of the first stage. Again, estimation results report no difference in cooperative behaviour between men and women, no matter whether the task is highly competitive (CCI_H) or highly cooperative (CCI_L). When considering all rounds of the first stage of the $CCI_L \rightarrow CCI_H$ *condition*, we find weak support for men being more cooperative in the *Baseline treatment* rather than in the *Decomposition treatment*.

[23] In Appendix B we report the average cooperation rates of men and women of each group across the first round, the first five rounds and all rounds in a stage, in the *Baseline treatment* (Table B.2) and in the *Decomposition treatment* (Table B.3).

Figure 3 – Aggregate frequency of cooperation by gender in the *Baseline treatment*.

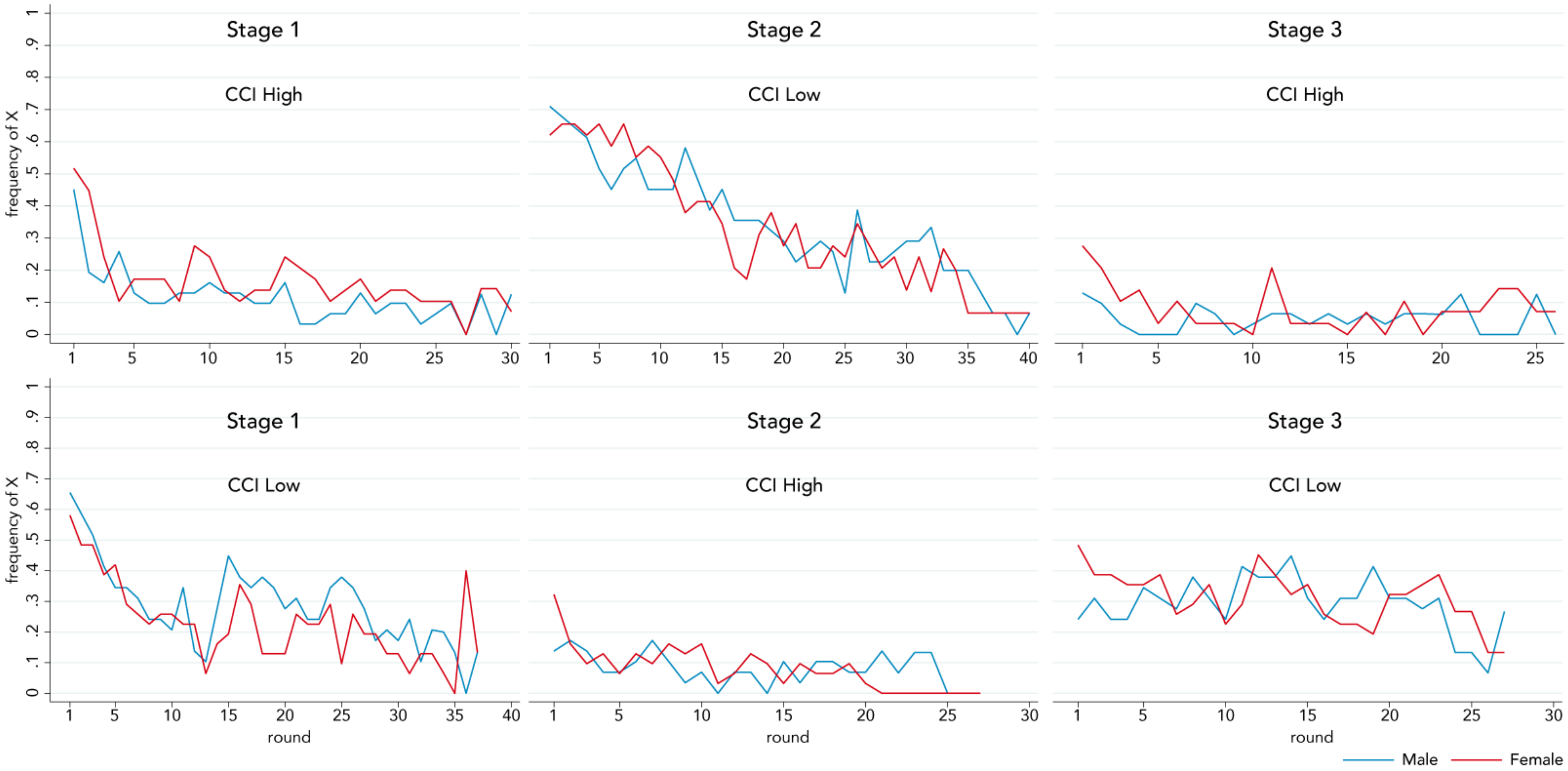
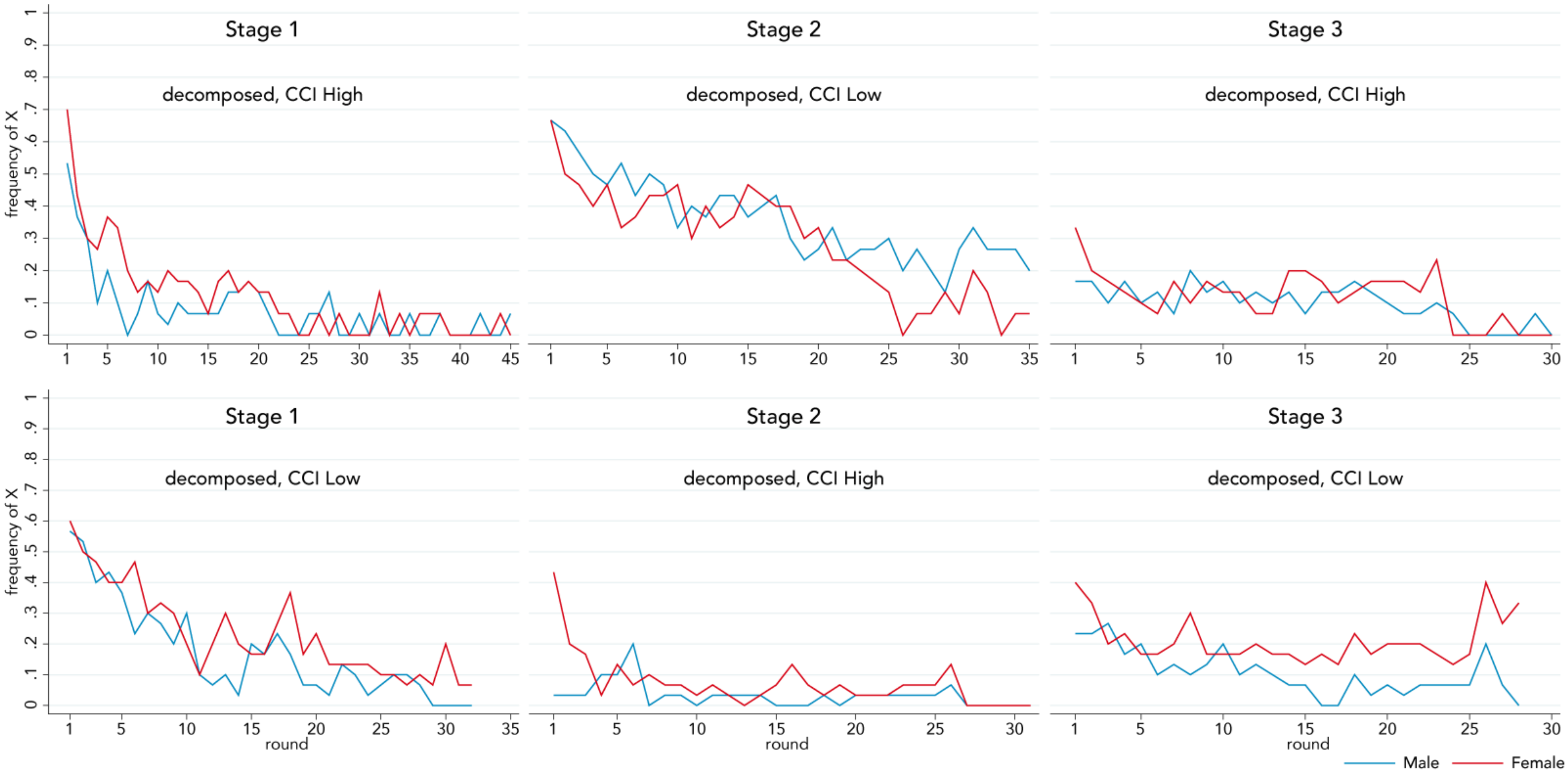


Figure 4 – Aggregate frequency of cooperation by gender in the *Decomposition treatment*.



4.2 Gender difference in spillover effects across tasks characterized by high vs. low competitiveness

In the following, we first analyse whether women cooperate more than men when playing the highly competitive (CCI_H) Prisoner's Dilemma after having experienced the highly cooperative (CCI_L) Prisoner's Dilemma (hypothesis 3). Then, we study whether men cooperate less than women when interacting in the highly cooperative (CCI_L) after having played in the highly competitive (CCI_H) one (hypothesis 4). In order to further test our main hypotheses, in the following we perform a within subject analysis in which we investigate whether gender affects the average choice of cooperation in the first round after a game change.

In Table 6, we report the results of a Linear Probability Model with robust standard errors clustered at the matching group level. Differently from Table 5, our independent variables of interest in Table 6 are *Decomposition*, *Female*, and their interaction (*Female* × *Decomposition*). We estimate four specifications of the determinants of the cooperative choice in the first round after a game change. In particular, the first two specifications focus on switching from a highly cooperative (CCI_L) Prisoner's Dilemma to a highly competitive one (CCI_H), while the reverse is true in specifications 3 and 4.

In Specification 1, we include as control variables *Cooperation 1^st round*, which is a dummy variable that takes value 1 if the participant has cooperated in the first round of the first stage and zero otherwise, and *Others past cooperation*, which averages the cooperation rate of one's opponents in the previous stage. In specification 2, we further add the control variables included in Table 5: *Others experiment*, *Game theory*, *Risk lover*, *Trust*, *Negative reciprocity*, *Enjoyment of competition*, and *Contentiousness*. The results of specification 1 report that being a woman increases the probability of cooperative play with respect to being a man, in both the *Baseline treatment* and the *Decomposition treatment*. This effect is robust to the inclusion of control variables in specification 2, with *Trust* having a significant and positive impact on the decision to cooperate.

Specifications 3 and 4 of Table 6 are modelled as, respectively, specifications 1 and 2, but now we restrict our analysis to the determinants of cooperative behaviour in the first round when the game changes from the highly competitive Prisoner's Dilemma (CCI_H) to the highly cooperative one (CCI_L). Our results show that there are no gender differences in spilling over cooperative behaviour when interacting in the first round of the Prisoner's Dilemma with CCI_L after having played the Prisoner's Dilemma with CCI_H, both in the *Baseline treatment* and in the *Decomposition treatment*. Indeed, neither the coefficient of *Female*, nor that of *Decomposition*, nor that of their interaction are statistically significant. The only significant factor that appears to positively affect individuals' cooperative choice is *Cooperation 1^st round*. Indeed, the coefficient of the variable *Cooperation 1^st round* is significant and positive, meaning that having cooperated in round 1 of stage 1 positively affects the cooperative choice in the first round after a game change.

Because the asymptotic properties of the cluster-robust variance estimator (CRVE) depend on the number of clusters, and we have few of them – i.e., 12[24] - statistical validity concerns might be raised. For these reasons, we test the linear hypotheses about the parameter of our main independent variable (*Female*) in specifications 1-4 of Table 6 estimating a wild cluster bootstrap inference. The wild cluster bootstrap analysis supports the results observed in Table 6 (see Appendix C, Table C.2).

To sum up, our results indicate that both when the Prisoner's Dilemma is presented in standard form (*Baseline treatment*) and in decomposed form (*Decomposition treatment*), there exists a gender

[24] According to the seminal paper of Cameron and Miller (2015), "few" range from 20 to 50 clusters.

difference in spilling over cooperative behaviour when moving from a highly cooperative game to a highly competitive one.

Table 6 – Determinants of the cooperative choice in the first round after a game change.

	$CCI_L \rightarrow CCI_H$		$CCI_H \rightarrow CCI_L$	
Cooperation	(1)	(2)	(3)	(4)
Decomposition	-0.031	-0.005	-0.030	-0.025
	(0.0605)	(0.0507)	(0.1304)	(0.1327)
Female	0.167**	0.157*	0.054	0.039
	(0.0786)	(0.0838)	(0.1027)	(0.1070)
Female X Decomposition	0.110	0.061	0.003	-0.010
	(0.1072)	(0.0974)	(0.1623)	(0.1731)
Cooperation 1st round	0.059	0.049	0.161**	0.170**
	(0.0546)	(0.0559)	(0.0617)	(0.0642)
Others past cooperation	0.041	0.024	0.530	0.485
	(0.1555)	(0.1411)	(0.3969)	(0.4310)
Other experiment		0.006		-0.045
		(0.0594)		(0.1041)
Game theory		0.005		-0.029
		(0.0377)		(0.0548)
Risk lover		-0.002		-0.012
		(0.0146)		(0.0202)
Trust		0.027***		-0.006
		(0.0094)		(0.0112)
Negative reciprocity		-0.004		0.019
		(0.0138)		(0.0121)
Enjoyment competition		-0.005		-0.007
		(0.0058)		(0.0076)
Contentiousness		0.001		0.002
		(0.0087)		(0.0072)
Constant	0.088	0.130	0.339**	0.573**
	(0.0632)	(0.2152)	(0.1263)	(0.2597)
R-squared	0.063	0.074	0.022	0.015
N	240	240	240	240

Note: * p<0.10; ** p<0.05; *** p<0.01. LPM with robust s.e. clustered at the matching group level in parenthesis.

5 Conclusion

Organizations are increasingly confronted with the call for gender equality and, at the same time, they face the challenge of establishing and sustaining high levels of cooperation over time, while securing a competitive environment for innovations and promotions. Our paper aims at investigating whether men and women differently spill over their cooperative behaviour when switching from highly competitive to highly cooperative tasks, and vice versa. We exploit the competitiveness-cooperativeness index (CCI) (Demuynck et al., 2022) to determine the parametrization of two indefinitely repeated Prisoner's Dilemmas and we built on the experimental design of Duffy and Fehr (2018) to investigate our research question. Differently than in our *Baseline treatment*, in our *Decomposition treatment*, we vary the way the Prisoner's Dilemmas are presented to subjects, namely as the sum of a zero-sum game and a common interest game (see the unique decomposition of a game introduced by Kalai and Kalai, (2013)), to further study whether the framing of the reward structure might affect individuals' (spill over of) cooperative behaviour (Pruitt, 1967; Dufwenberg et al., 2011).

First, our results indicate that the frequency of cooperative behaviour is significantly higher in the highly cooperative Prisoner's Dilemma (CCI_L) rather than in the highly competitive one (CCI_H). However, the impact of the choice architecture intervention varies based on the degree of competitiveness of the Prisoner's Dilemma. Specifically, presenting the payoff matrix in a decomposed form significantly boosts cooperation in highly competitive settings (CCI_H), but this effect is not evident in highly cooperative ones (CCI_L). However, we observe no gender differences when considering either settings, and the choice architecture intervention does not differently affect the cooperative behaviours of males and females.
Second, we find that women cooperate significantly more than men when playing the first round of a highly competitive Prisoner's Dilemma (CCI_L), after having experienced a highly cooperative one (CCI_H), while we observe no significant gender difference when considering the opposite switch in tasks.

Our findings contribute to the wide literature that studies how men and women differ in their labour market outcomes in two important aspects. First, our results indicate that when women and men are not explicitly asked to self-select into a tournament nor to outperform others, but instead they have to interact in a neutral setting, where gender-stereotypical tasks are not in place, they do not show different competitive behaviours. Second, the framing of the payoff structure can affect the cooperative behaviours of both men and women when interacting in highly competitive tasks, indicating an additional tool for companies and institutions to increase cooperation in highly competitive settings. Finally, we find support for a gender difference in transferring cooperative behaviour when moving from a high cooperative setting to a highly competitive one. This could inform firms on how to structure their organizations in terms of gender diversity within offices.

We are aware of the limits of our findings. Indeed, our subjects are mainly students, the payoffs are modest, and individuals, while interacting several times with each other, have no way of knowing with whom they are relating with, which can be an important aspect in affecting competitive and cooperative behaviours. However, our laboratory experiment allows to study whether the gender gap in competition could be attributed to specific gender traits or to internalised social habits, abstracting away from co-founding factors. To shed light on them, future research could explore spillovers of cooperative behaviour in settings where the gender of the opponent is known, or when reputation can play a role.

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Appendix A – Instructions and extra materials

[Below we present the instructions used in the experiment. The parts written in blue colour are the ones used only in the *Baseline treatment*, while those written in red colour are the ones used only in the *Decomposition treatment*.]

Welcome and thank you for taking part in this experiment.

The experiment will last about an hour and a half. You will receive 3 Euro for showing up and you will have the opportunity to earn more money depending on the decisions you make in the experiment. During the experiment, your gains will be expressed in points and, at the end of the experiment, your total points will be converted into euro at the rate 150 points=1 Euro and you will be paid in cash and in private.

The experimenter will read the instructions aloud. If at the end of the reading or during the experiment you have any questions, press the help button that you see at the top right of your screen, we will come to answer your questions in private.

At the end of the reading of the instructions, you will have to answer a short comprehension test, to make sure that everything is clear to you. When all of you will have successfully completed the comprehension test, the experiment will start. During the experiment, it is not allowed to talk or communicate in any way with other participants. Please turn off your mobile phone.

Instructions

There are 30 participants in today's session. At the beginning of the experiment, the computer will randomly divide you and the other participants into 3 groups of 10 people. Your assignment to a group of size 10 will not change for the entire duration of the experiment. During the experiment, you will interact with the other 9 members of your group.

The experiment is made up of a number of "sequences". Each sequence consists of an indefinite number of "rounds". In each round you will be randomly and anonymously matched with one of the other 9 participants in you group of size 10 and asked to make a decision. The matching with one of the other 9 participants is equally likely, hence, in each round, you will have a 1/9 chance of being matched with any of the other 9 members in your group of 10 participants.

In each round, both you and the other member of your group of 10 participants with whom you have been randomly matched, will have to choose between two possible options labelled "X" and "Y": each of the two randomly matched group members will make its decision independently and without knowing each other decision.

To make a choice, you have to simply select one of the two options and then click on the "OK" button. At the end of each round, after all participants have made their choice, you will be informed of the decision made by the member of your group to which you have been matched. In the same way, the latter will know of your decision.

Your decision, together with the decision of the participant matched with you will determine one of four possible scenarios: (X, X), (X, Y), (Y, X) e (Y, Y). In each of these scenarios, the first letter in the brackets corresponds to your decision, the second letter in the brackets corresponds to that of the other member matched with you.

[only in the *Baseline treatment*]
The scenario that occurs determines your earnings in the round, according to two possible ways, and these are shown in the two Tables below: Table 1 and Table 2. Your gain in a round is given by the points you earned according to the Table, in the occurred scenario.
Let's make an example.

Suppose that you chose the letter X and the participant matched with you chose the letter X. The scenario that occurs is then the scenario (X, X).

- If Table 1 determines your earnings, your total gain for this round will be equal to what you get in the scenario (X, X), which is 20 points. Similarly, the total gain for this round of the other participant matched with you will be equal to what the other gets in the scenario (X, X) in Table 1, that is 20 points.
- If Table 2 determines your earnings, your total gain for this round will be equal to what you get in the scenario (X, X), which is 29 points. Similarly, the total gain for this round of the other participant matched with you will be equal to what the other gets in the scenario (X, X) in Table 1, that is 29 points.

Tabella 1

Table 1	Other's choice: X	Other's choice: Y
Your choice: X	Your gain: **20** Other's gain: **20**	Your gain: 0 Other's gain: 30
Your choice: Y	Your gain: 30 Other's gain: 0	Your gain: 10 Other's gain: 10

Tabella 2

Table 2	Other's choice: X	Other's choice: Y
Your choice: X	Your gain: **29** Other's gain: **29**	Your gain: 0 Other's gain: 30
Your choice: Y	Your gain: 30 Other's gain: 0	Your gain: 10 Other's gain: 10

Note that the gains of Table 1 and Table 2 are the same with the only difference given by the gain obtained in the scenario (X, X), that is, in the scenario in which both you and the other participant matched to you choose the option X, as indicated by the bold numbers.

Which table?

In all rounds of the same sequence ONLY ONE Table, either Table 1 or Table 2, will be used to determine earnings. The Table used to determine the earnings in all rounds of the same sequence is the same for all participants in the experiment and will be shown, at each round, before making any choice.

Each time a new sequence starts, the Table used to determine the gains COULD change with respect to the one used in the previous sequence (but it could also remain the same!). The Table can change ONLY at the beginning of a new sequence and will remain the same for all rounds of a sequence.

Each time you start a new sequence you will be informed, so that you can carefully check which Table will be used to determine the gains of all the rounds of the new sequence. The Table could in fact remain unchanged or change with respect to the one in the previous sequence.

When does a sequence of rounds end?

Each sequence consists of at least one round. At the end of each round, a virtual six-sided die will be rolled. If the die roll results in a 1, 2, 3, 4 or 5 being rolled, then the sequence will continue and a new round of the same sequence will start, and so the Table used to determine the gains will remain the same. If the die roll results in a 6 being rolled, then the sequence will end and a new sequence will begin. As mentioned above, at the beginning of a new sequence the Table used to determine earnings may change.

The total number of sequences is undefined and, at a certain point, at the end of a sequence, you will be told that the experiment is over.

To sum up, each sequence consists of an indefinite number of rounds in which the Table used to determine the gains will always be the same for the duration of the sequence. The number of rounds of each sequence depends on the roll of the virtual die: a sequence ends if the die roll results in a 6 being rolled. In this case a new sequence begins and the Table used to determine the gains may change. Therefore, at each round, the probability that the sequence continues is 5/6 and the probability that the sequence ends is 1/6.

[only in the *Decomposition treatment*]

The scenario that occurs determines your earnings in the round, according to two possible ways, and these are shown in the two pairs of Tables below: Pair 1, formed by Tables 1a and 1b; and Pair 2, formed by Tables 2a and 2b.

Your gain in a round is given by the sum of points you earned in each of the two tables of the same pair, in the occurred scenario.

Let's make an example.

Suppose that you chose the letter X and the participant matched with you chose the letter X. The scenario that occurs is then the scenario (X, X).

- If Pair 1 determines your earnings, your gain will be equal to the sum of what you get in the scenario (X, X) in Table 1a, that is 0 points, and of what you get in the scenario (X, X) in Table 1b, that is 20 points. In total, your gain for this round is 20 points. Similarly, the gain of the other participant matched to you will be equal to the sum of what the other participant gets in the scenario (X, X) in Table 1a, that is 0 points, and of what the other gets in the scenario (X, X) in Table 1b, that is 20 points. In total, the gain of the other participant matched to you for this round is 20 points.
- If Pair 2 determines your earnings, your gain will be equal to the sum of what you get in the scenario (X, X) in Table 2a, that is 0 points, and of what you get in the scenario (X, X) in Table 2b, that is 29 points. In total, your gain for this round is 29 points. Similarly, the gain of the other participant matched to you will be equal to the sum of what the other participant gets in the scenario (X, X) in Table 2a, that is 0 points, and of what the other gets in the scenario (X, X) in Table 2b, that is 29 points. In total, the gain of the other participant matched to you for this round is 29 points.

Pair 1

Table 1a	Other's choice: X	Other's choice: Y
Your choice: X	Your gain: 0 Other's gain: 0	Your gain: -15 Other's gain: 15
Your choice: Y	Your gain: 15 Other's gain: -15	Your gain: 0 Other's gain: 0

Table 1b	Other's choice: X	Other's choice: Y
Your choice: X	Your gain: **20** Other's gain: **20**	Your gain: 15 Other's gain: 15
Your choice: Y	Your gain: 15 Other's gain: 15	Your gain: 10 Other's gain: 10

Pair 2

Table 2a	Other's choice: X	Other's choice: Y
Your choice: X	Your gain: 0 Other's gain: 0	Your gain: -15 Other's gain: 15
Your choice: Y	Your gain: 15 Other's gain: -15	Your gain: 0 Other's gain: 0

Table 2b	Other's choice: X	Other's choice: Y
Your choice: X	Your gain: **29** Other's gain: **29**	Your gain: 15 Other's gain: 15
Your choice: Y	Your gain: 15 Other's gain: 15	Your gain: 10 Other's gain: 10

Note that the gains of Table 1a of Pair 1 and those of Table 2a of Pair 2 are the same. The only difference between Table 1b of Pair 1 and those of Table 2b of Pair 2 consists in the gains obtained in the scenario (X, X), that is, in the scenario in which both you and the other participant matched to you choose the option X, as indicated by the bold numbers.

Which pair of tables?

In all rounds of the same sequence ONLY ONE Pair of tables, either Pair 1 or Pair 2, will be used to determine earnings. The Pair of tables used to determine the earnings in all rounds of the same sequence is the same for all participants in the experiment and will be shown, at each round, before making any choice.
Each time a new sequence starts, the Pair of tables used to determine the gains COULD change with respect to the one used in the previous sequence (but it could also remain the same!). The Pair of tables can change ONLY at the beginning of a new sequence and will remain the same for all rounds of a sequence.
Each time you start a new sequence you will be informed, so that you can carefully check which Pair of tables will be used to determine the gains of all the rounds of the new sequence. The Pair of tables could in fact remain unchanged or change with respect to the one in the previous sequence.

When does a sequence of rounds end?

Each sequence consists of at least one round. At the end of each round, a virtual six-sided die will be rolled. If the die roll results in a 1, 2, 3, 4 or 5 being rolled, then the sequence will continue and a new round of the same sequence will start, and so the Pair of tables used to determine the gains will remain the same. If the die roll results in a 6 being rolled, then the sequence will end and a new sequence will begin. As mentioned above, at the beginning of a new sequence the Pair of tables used to determine earnings may change.
The total number of sequences is undefined and, at a certain point, at the end of a sequence, you will be told that the experiment is over.
To sum up, each sequence consists of an indefinite number of rounds in which the Pair of tables used to determine the gains will always be the same for the duration of the sequence. The number of rounds of each sequence depends on the roll of the virtual die: a sequence ends if the die roll results in a 6 being rolled. In this case a new sequence begins and the Pair of tables used to determine the gains may change. Therefore, at each round, the probability that the sequence continues is 5/6 and the probability that the sequence ends is 1/6.

Results

At the end of each round you will see a results screen reporting on your decision, your gains, and the decision and gains of the participant matched with you.

Payments

At the end of the experiment the sum of points obtained in all rounds you have participated in will be converted into euros at the rate of 150 points = 1€. The € 3 for showing up in time will be added to this gain. Your total earnings will then be paid in cash and in private at the end of the experiment.

What happens now?

Now you will have to answer some comprehension questions to make sure that everything is clear to you. Please, read carefully each question and answer. In case of a wrong answer, an error message will appear, and you will have the opportunity to correct the given answer (even several times). If case of a correctanswer, no message will appear. As soon as all participants have answered the questionnaire, the first round of the experiment will begin.

If during the comprehension test or during the experiment you have any questions, press the help button that you see at the top right of your screen, we will come to answer your questions in private.

Comprehension test

- A change in the table (Table 1 or Table 2) [pair of tables (Pair 1 or Pair 2)], if it occurs, will only occur at the beginning of a new sequence.
    - **a. True**
    - b. False
- In all rounds of a sequence, I will be matched with the same other participant.
    - a. True
    - **b. False**
- Suppose it is round 3. The chance that the sequence continues on to round 4 is:
    - a. 1/6
    - b. 4/5
    - c. 1/5
    - **d. 5/6**
- Suppose it is round 3. The chance that the sequence continues on to round 4 is: 5/6. Would your answer change if we replaced "round 3" with "round 13" and "round 4" with "round 14"?
    - a. Yes
    - **b. No**
- In each round, how many choice/s will you make for each pair of tables?
    - **a. 1**
    - b. 2

Suppose that Table 1 [*Pair 1 (table 1a and table 1b)*] *is in effect.*

- If you choose X and the other participant matched with you chooses Y, then your payoff is
    - **a. 0**
    - b. 10
    - c. 20
    - d. 30

  and the other participant's payoff is
    - a. 0
    - b. 10
    - c. 20
    - **d. 30**
- If you choose X and the other participant matched with you chooses X, then your payoff is
    - a. 0
    - b. 10
    - **c. 20**
    - d. 30

  and the other participant's payoff is
    - a. 0
    - b. 10
    - **c. 20**
    - d. 30

- If you choose Y and the other participant matched with you chooses Y, then your payoff is
    a. 0
    b. 10
    c. 20
    d. 30

  and the other participant's payoff is
    a. 0
    b. 10
    c. 20
    d. 30
- If you choose Y and the other participant matched with you chooses X, then your payoff is
    a. 0
    b. 10
    c. 20
    d. 30

  and the other participant's payoff is
    a. 0
    b. 10
    c. 20
    d. 30

Suppose that Table 2 [Pair 2 (table 2a and table 2b)] is in effect.

- If you choose X and the other participant matched with you chooses Y, then your payoff is
    a. 0
    b. 10
    c. 20
    d. 30

  and the other participant's payoff is
    a. 0
    b. 10
    c. 20
    d. 30
- If you choose X and the other participant matched with you chooses X, then your payoff is
    a. 0
    b. 10
    c. 29
    d. 30

  and the other participant's payoff is
    a. 0
    b. 10
    c. 29
    d. 30

- If you choose Y and the other participant matched with you chooses Y, then your payoff is
    a. 0
    b. 10
    c. 20
    d. 30

  and the other participant's payoff is
    a. 0
    b. 10
    c. 20
    d. 30
- If you choose Y and the other participant matched with you chooses X, then your payoff is
    a. 0
    b. 10
    c. 20
    d. 30

  and the other participant's payoff is
    a. 0
    b. 10
    c. 20
    d. 30

Post-Experiment Questionnaire

1. Have you ever participated in one or more economic experiments before today?
    a. Yes
    b. No
2. How old are you?
3. Gender?
    a. F
    b. M
4. Study course
    a. Economics and management
    b. Language and culture
    c. Science and technologies
    d. Arts and humanities studies
    e. Public and Social Politics
    f. International studies and globalization
    g. Conservation of Cultural Heritage and Performing Arts Management
    h. Other
    i. Not a student

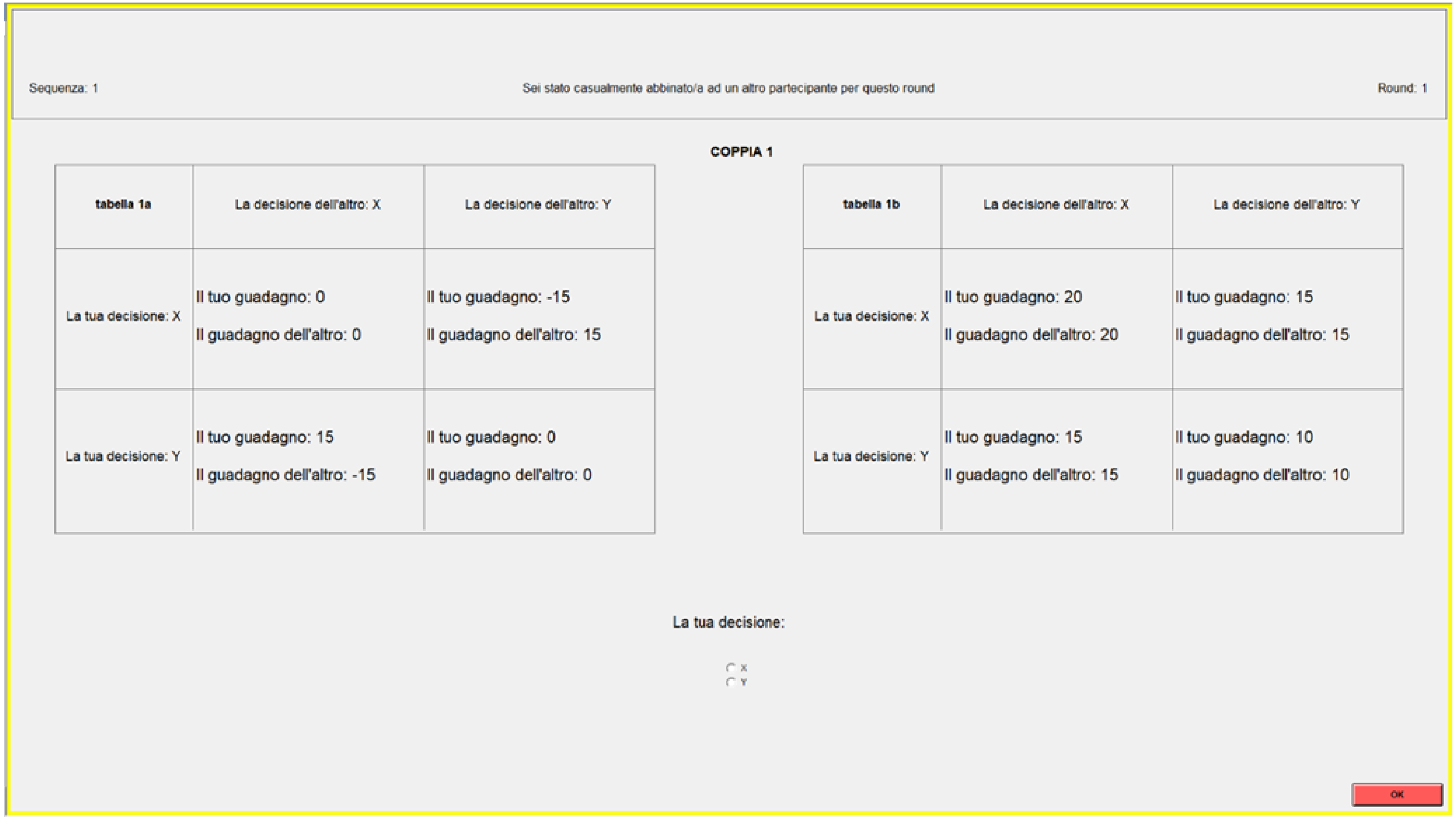
5. Which year are you enrolled in?
   a. 1^{st} (bachelor)
   b. 2^{nd} (bachelor)
   c. 3^{rd} (bachelor)
   d. 4^{th} (only if a study course of four years- i.e., quadriennale)
   e. 1^{st} (master)
   f. 2^{nd} (master)
   g. I am not enrolled in a study course
6. Are you engaged in a paid job?
   a. No
   b. Occasionally
   c. Regularly
7. Are you engaged in voluntary activity?
   a. No
   b. Occasionally
   c. Regularly
8. Have you ever had experience with game theory?
   a. No
   b. Not much
   c. A lot
9. Do you participate in:
   - Political activity:
   a. No
   b. Occasionally
   c. Regularly
   - Religious activity:
   a. No
   b. Occasionally
   c. Regularly
   - Cultural activity:
   a. No
   b. Occasionally
   c. Regularly
10. Please tell me, in general, how willing or unwilling you are to take risks. Please use a scale from 0 to 10, where 0 means “completely unwilling to take risks” and a 10 means you are “very willing to take risks”. You can also use any numbers between 0 and 10 to indicate where you fall on the scale, like 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.
11. How well do the following statements describe you as a person? Please indicate your answer on a scale from 0 to 10. A 0 means “does not describe me at all” and a 10 means “describes me perfectly”. You can also use any numbers between 0 and 10 to indicate where you fall on the scale, like 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.
    • I assume that people have only the best intentions.
    • If I am treated very unjustly, I will take revenge at the first occasion, even if there is a cost to do so.

12. In the following, “willingness to act” indicates the following introduction: We now ask for your willingness to act in a certain way in four different areas. Please again indicate your answer on a scale from 0 to 10, where 0 means you are “completely unwilling to do so” and a 10 means you are “very willing to do so”. You can also use any numbers between 0 and 10 to indicate where you fall on the scale, like 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.
    - How willing are you to punish someone who treats you unfairly, even if there may be costs for you?
    - How willing are you to punish someone who treats others unfairly, even if there may be costs for you?

Competitiveness Index

13. I like competition.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
14. I am a competitive individual.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
15. I enjoy competing against an opponent.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
16. I don’t like competing against other people.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
17. I get satisfaction from competing with others.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
18. I find competitive situations unpleasant.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
19. I dread competing against other people.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
20. I try to avoid competing with others.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
21. I often try to outperform others.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
22. I try to avoid arguments.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
23. I will do almost anything to avoid an argument.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
24. I often remain quiet rather than risk hurting another person.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
25. I don’t enjoy challenging others even when I think they are wrong.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"
26. In general, I will go along with the group rather than create conflict.
    “1 (strongly disagree)", "2", "3", "5 (strongly agree)"

Figure A.1 – Screenshot of the decomposed Prisoner's Dilemma with CCI_H visualised by participants on the PC screen.



Appendix B

Table B.1 – Average cooperation rates in the first round, in the first five rounds and in all rounds of the *Baseline treatment* and of the *Decomposition treatment*, in both conditions ($CCI_H \rightarrow CCI_L$ condition and $CCI_L \rightarrow CCI_H$ condition). Standard deviations are in parenthesis.

Treatment	**Condition**	**Group**	**Choice X, round 1**			**Choice X, first 5 rounds**			**Choice X, all rounds***		
			Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage 3
Baseline	$\boldsymbol{CCI_H - CCI_L}$	1	0.40 (0.52)	0.70 (0.48)	0.40 (0.52)	0.36 (0.48)	0.64 (0.48)	0.14 (0.35)	0.16 (0.37)	0.27 (0.44)	0.05 (0.22)
		2	0.50 (0.53)	0.70 (0.48)	0.00 (0.00)	0.22 (0.42)	0.60 (0.49)	0.06 (0.24)	0.08 (0.27)	0.34 (0.47)	0.04 (0.19)
		3	0.80 (0.42)	0.50 (0.53)	0.10 (0.32)	0.48 (0.50)	0.54 (0.50)	0.14 (0.35)	0.30 (0.46)	0.34 (0.47)	0.09 (0.29)
		4	0.50 (0.53)	0.70 (0.48)	0.20 (0.42)	0.16 (0.37)	0.64 (0.48)	0.04 (0.20)	0.05 (0.23)	0.26 (0.44)	0.02 (0.12)
		5	0.50 (0.53)	0.60 (0.52)	0.20 (0.42)	0.2 (0.40)	0.58 (0.50)	0.06 (0.24)	0.06 (0.24)	0.26 (0.44)	0.04 (0.20)
		6	0.20 (0.42)	0.80 (0.42)	0.30 (0.48)	0.18 (0.39)	0.82 (0.39)	0.16 (0.37)	0.23 (0.42)	0.76 (0.42)	0.14 (0.35)
		Avg.	**0.48 (0.50)**	**0.67 (0.48)**	**0.20 (0.40)**	**0.27 (0.44)**	**0.64 (0.48)**	**0.1 (0.30)**	**0.15 (0.35)**	**0.36 (0.48)**	**0.06 (0.24)**
Baseline	$\boldsymbol{CCI_L - CCI_H}$	7	0.70 (0.48)	0.10 (0.32)	0.80 (0.42)	0.54 (0.50)	0.06 (0.24)	0.7 (0.46)	0.30 (0.46)	0.06 (0.23)	0.73 (0.45)
		8	0.40 (0.52)	0.40 (0.52)	0.30 (0.48)	0.24 (0.43)	0.20 (0.40)	0.20 (0.40)	0.13 (0.33)	0.14 (0.35)	0.11 (0.32)
		9	0.60 (0.52)	0.20 (0.42)	0.20 (0.42)	0.58 (0.50)	0.18 (0.39)	0.22 (0.42)	0.32 (0.47)	0.12 (0.32)	0.28 (0.45)
		10	0.60 (0.52)	0.40 (0.52)	0.30 (0.48)	0.56 (0.50)	0.14 (0.35)	0.16 (0.37)	0.21 (0.40)	0.10 (0.30)	0.07 (0.25)
		11	0.70 (0.48)	0.00 (0.00)	0.50 (0.53)	0.54 (0.50)	0.14 (0.35)	0.54 (0.50)	0.32 (0.47)	0.08 (0.27)	0.54 (0.50)
		12	0.70 (0.48)	0.30 (0.48)	0.10 (0.32)	0.46 (0.50)	0.10 (0.30)	0.20 (0.40)	0.31 (0.46)	0.05 (0.21)	0.17 (0.38)
		Avg.	**0.62 (0.49)**	**0.23 (0.43)**	**0.37 (0.49)**	**0.49 (0.50)**	**0.14 (0.34)**	**0.34 (0.47)**	**0.26 (0.44)**	**0.09 (0.28)**	**0.31 (0.46)**

Table B.1 continued

Treatment	Condition	Group	Choice X, round 1			Choice X, first 5 rounds			Choice X, all rounds*		
			Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage 3
Decomposition	$CCI_H - CCI_L$	1	0.60 (0.52)	0.60 (0.52)	0.50 (0.53)	0.42 (050)	0.50 (0.51)	0.38 (0.49)	0.31 (0.46)	0.41 (0.49)	0.28 (0.45)
		2	0.60 (0.52)	0.70 (0.48)	0.20 (0.42)	0.42 (0.50)	0.54 (0.50)	0.08 (0.27)	0.14 (0.35)	0.42 (0.49)	0.16 (0.36)
		3	0.70 (0.48)	0.80 (0.42)	0.10 (0.32)	0.34 (0.48)	0.50 (0.51)	0.12 (0.33)	0.29 (0.46)	0.35 (0.48)	0.16 (0.36)
		4	0.70 (0.48)	0.70 (0.48)	0.30 (0.48)	0.30 (0.46)	0.72 (0.45)	0.10 (0.30)	0.07 (0.26)	0.42 (0.49)	0.08 (0.28)
		5	0.50 (0.53)	0.50 (0.53)	0.10 (0.32)	0.34 (0.48)	0.32 (0.47)	0.02 (0.14)	0.06 (0.24)	0.09 (0.29)	0.00 (0.06)
		6	0.60 (0.52)	0.70 (0.48)	0.30 (0.48)	0.32 (0.47)	0.62 (0.49)	0.28 (0.45)	0.08 (0.28)	0.44 (0.50)	0.10 (0.30)
		Avg.	**0.48 (0.50)**	**0.67 (0.48)**	**0.20 (0.40)**	**0.27 (0.44)**	**0.64 (0.48)**	**0.1 (0.30)**	**0.15 (0.35)**	**0.36 (0.48)**	**0.06 (0.24)**
Decomposition	$CCI_L - CCI_H$	7	0.40 (0.52)	0.10 (0.32)	0.10 (0.32)	0.20 (0.40)	0.02 (0.14)	0.06 (0.24)	0.05 (0.22)	0.00 (0.06)	0.03 (0.18)
		8	0.60 (0.52)	0.50 (0.53)	0.50 (0.53)	0.70 (0.46)	0.26 (0.44)	0.46 (0.50)	0.41 (0.49)	0.15 (0.35)	0.49 (0.50)
		9	0.40 (0.52)	0.20 (0.42)	0.20 (0.42)	0.42 (0.50)	0.10 (0.30)	0.16 (0.37)	0.16 (0.37)	0.04 (0.19)	0.10 (0.30)
		10	0.80 (0.42)	0.30 (0.48)	0.40 (0.52)	0.44 (0.50)	0.12 (0.33)	0.14 (0.35)	0.18 (0.38)	0.06 (0.24)	0.04 (0.19)
		11	0.50 (0.53)	0.00 (0.00)	0.30 (0.48)	0.44 (0.50)	0.10 (0.30)	0.40 (0.50)	0.20 (0.40)	0.04 (0.19)	0.20 (0.40)
		12	0.80 (0.42)	0.30 (0.48)	0.40 (0.52)	0.60 (0.50)	0.16 (0.37)	0.24 (0.43)	0.27 (0.45)	0.05 (0.23)	0.07 (0.25)
		Avg.	**0.58 (0.50)**	**0.23 (0.43)**	**0.32 (0.47)**	**0.47 (0.50)**	**0.13 (0.33)**	**0.24 (0.43)**	**0.21 (0.41)**	**0.06 (0.23)**	**0.16 (0.36)**

*The average cooperation rate across all rounds of a stage within a treatment is weighted by the number of rounds played by groups within a stage (recall that the number of rounds of a stage varies across experimental sessions).

Table B.2. Average cooperation rates in the *Baseline treatment* by gender in the first round, in the first five rounds and in all rounds of the $CCI_H \rightarrow CCI_L$ *condition* and in the $CCI_L \rightarrow CCI_H$ *condition*. Standard deviations are in parenthesis.

Condition	**Number of rounds**	**Group**	**MALE***			**FEMALE***			**Freq. of female in the group**
			Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage 3	
$\boldsymbol{CCI_H - CCI_L}$	1st round	1	0.75 (0.50)	0.50 (0.58)	0.50 (0.58)	0.17 (0.41)	0.83 (0.41)	0.33 (0.52)	0.6
		2	0.38 (0.52)	0.75 (0.46)	0.00 (0.00)	1.00 (0.00)	0.50 (0.71)	0.00 (0.00)	0.2
		3	0.67 (0.58)	0.67 (0.58)	0.00 (0.00)	0.86 (0.38)	0.43 (0.53)	0.14 (0.38)	0.7
		4	0.40 (0.55)	0.80 (0.45)	0.20 (0.45)	0.60 (0.55)	0.60 (0.55)	0.20 (0.45)	0.5
		5	0.60 (0.55)	0.60 (0.55)	0.00 (0.00)	0.40 (0.55)	0.60 (0.55)	0.40 (0.55)	0.5
		6	0.17 (0.41)	0.83 (0.41)	0.17 (0.41)	0.25 (0.50)	0.75 (0.50)	0.50 (0.58)	0.4
		Avg.	**0.45 (0.51)**	**0.71 (0.46)**	**0.13 (0.34)**	**0.52 (0.51)**	**0.62 (0.49)**	**0.28 (0.45)**	**0.48**
$\boldsymbol{CCI_L - CCI_H}$	1st round	7	1.00 (0.00)	0.00 (0.00)	1.00 (0.00)	0.63 (0.52)	0.13 (0.35)	0.75 (0.46)	0.8
		8	0.40 (0.55)	0.00 (0.00)	0.20 (0.45)	0.40 (0.55)	0.80 (0.45)	0.40 (0.55)	0.5
		9	0.71 (0.49)	0.29 (0.49)	0.14 (0.38)	0.33 (0.58)	0.00 (0.00)	0.33 (0.58)	0.3
		10	0.33 (0.58)	0.33 (0.58)	0.33 (0.58)	0.71 (0.49)	0.43 (0.53)	0.29 (0.49)	0.7
		11	0.80 (0.45)	0.00 (0.00)	0.40 (0.55)	0.60 (0.55)	0.00 (0.00)	0.60 (0.55)	0.7
		12	0.71 (0.49)	0.14 (0.38)	0.00 (0.00)	0.67 (0.58)	0.67 (0.58)	0.33 (0.58)	0.5
		Avg.	**0.66 (0.48)**	**0.14 (0.35)**	**0.24 (0.44)**	**0.58 (0.50)**	**0.32 (0.48)**	**0.48 (0.51)**	**0.52**
$\boldsymbol{CCI_H - CCI_L}$	5 rounds	1	0.50 (0.51)	0.55 (0.51)	0.10 (0.31)	0.27 (0.45)	0.70 (0.47)	0.17 (0.38)	0.6
		2	0.18 (0.38)	0.63 (0.49)	0.03 (0.16)	0.40 (0.52)	0.50 (0.53)	0.2 (0.42)	0.2
		3	0.47 (0.52)	0.53 (0.52)	0.00 (0.00)	0.49 (0.51)	0.54 (0.51)	0.20 (0.41)	0.7
		4	0.12 (0.33)	0.68 (0.48	0.04 (0.20)	0.20 (0.41)	0.60 (0.50)	0.04 (0.20)	0.5
		5	0.24 (0.44)	0.56 (0.51)	0.04 (0.20)	0.16 (0.37)	0.60 (0.50)	0.08 (0.28)	0.5
		6	0.13 (0.35)	0.77 (0.43)	0.10 (0.31)	0.25 (0.44)	0.90 (0.31)	0.25 (0.44)	0.4
		Avg.	**0.24 (0.43)**	**0.63 (0.48)**	**0.05 (0.22)**	**0.30 (0.46)**	**0.64 (0.48)**	**0.15 (0.36)**	**0.48**
$\boldsymbol{CCI_L - CCI_H}$	5 rounds	7	0.50 (0.53)	0.00 (0.00)	0.60 (0.52)	0.55 (0.50)	0.08 (0.27)	0.73 (0.45)	0.8
		8	0.20 (0.41)	0.00 (0.00)	0.20 (0.41)	0.28 (0.46)	0.40 (0.50)	0.20 (0.41)	0.5
		9	0.71 (0.46)	0.23 (0.43)	0.26 (0.44)	0.27 (0.46)	0.07 (0.26)	0.13 (0.35)	0.3
		10	0.53 (0.52)	0.20 (0.41)	0.13 (0.35)	0.57 (0.50)	0.11 (0.32)	0.17 (0.38)	0.7
		11	0.52 (0.51)	0.16 (0.37)	0.52 (0.51)	0.56 (0.51)	0.12 (0.33)	0.56 (0.51)	0.7
		12	0.49 (0.51)	0.06 (0.24)	0.14 (0.36)	040 (0.51)	0.20 (0.41)	0.33 (0.49)	0.5
		Avg.	**0.50 (0.50)**	**0.12 (0.32)**	**0.28 (0.45)**	**0.47 (0.50)**	**0.15 (0.36)**	**0.39 (0.49)**	**0.52**

Table B.2. continued

Condition	Number of rounds	Group	MALE*			FEMALE*			Freq. of female in the group
			Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage 3	
$\boldsymbol{CCI_H - CCI_L}$	all rounds	1	0.18 (0.39)	0.21 (0.41)	0.04 (0.20)	0.14 (0.35)	0.31 (0.46)	0.06 (0.24)	0.6
		2	0.08 (0.27)	0.33 (0.47)	0.03 (0.18)	0.08 (0.27)	0.39 (0.49)	0.05 (0.23)	0.2
		3	0.35 (0.48)	0.49 (0.50)	0.11 (0.31)	0.28 (0.45)	0.27 (0.44)	0.08 (0.28)	0.7
		4	0.03 (0.18)	0.26 (0.44)	0.02 (0.12)	0.07 (0.26)	0.26 (0.44)	0.02 (0.12)	0.5
		5	0.06 (0.24)	0.25 (0.43)	0.04 (0.19)	0.07 (0.25)	0.27 (0.45)	0.05 (0.21)	0.5
		6	0.14 (0.35)	0.69 (0.46)	0.08 (0.28)	0.36 (0.48)	0.87 (0.34)	0.22 (0.42)	0.4
		Avg.	**0.12 (0.32)**	**0.37 (0.48)**	**0.05 (0.21)**	**0.17 (0.38)**	**0.36 (0.48)**	**0.08 (0.27)**	**0.48**
$\boldsymbol{CCI_L - CCI_H}$	all rounds	7	0.30 (0.46)	0.05 (0.22)	0.89 (0.31)	0.30 (0.46)	0.06 (0.24)	0.68 (0.47)	0.8
		8	0.06 (0.24)	0.05 (0.21)	0.11 (0.32)	0.19 (0.40)	0.23 (0.42)	0.11 (0.32)	0.5
		9	0.41 (0.49)	0.16 (0.36)	0.35 (0.48)	0.09 (0.29)	0.03 (0.18)	0.10 (0.30)	0.3
		10	0.25 (0.44)	0.17 (0.38)	0.04 (0.19)	0.19 (0.39)	0.06 (0.23)	0.08 (0.27)	0.7
		11	0.27 (0.45)	0.05 (0.22)	0.51 (0.50)	0.36 (0.48)	0.10 (0.31)	0.57 (0.50)	0.7
		12	0.38 (0.49)	0.04 (0.19)	0.20 (0.40)	0.16 (0.37)	0.07 (0.26)	0.11 (0.32)	0.5
		Avg.	**0.30 (0.46)**	**0.08 (0.28)**	**0.30 (0.46)**	**0.23 (0.42)**	**0.09 (0.29)**	**0.32 (0.47)**	**0.52**

* The average cooperation rate is weighted by the number of males (and females) within a group Moreover, the average cooperation rate across all rounds of a stage within a treatment is further weighted by the number of rounds played by groups within a stage (recall that the number of rounds of a stage varies across experimental sessions).

Table B.3. Average cooperation rates in the *Decomposition treatment* by gender in the first round, in the first five rounds and in all rounds of the $CCI_H \rightarrow CCI_L$ *condition* and in the $CCI_L \rightarrow CCI_H$ *condition*. Standard deviations are in parenthesis.

Condition	**Number of rounds**	**Group**	**MALE***			**FEMALE***			**Freq. of female in the group**
			Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage 3	
$\boldsymbol{CCI_H - CCI_L}$	1st round	1	0.60 (0.55)	0.60 (0.55)	0.40 (0.55)	0.60 (0.55)	0.60 (0.55)	0.60 (0.55)	0.5
		2	0.50 (0.55)	0.67 (0.52)	0.33 (0.52)	0.75 (0.50)	0.75 (0.50)	0.00 (0.00)	0.4
		3	0.75 (0.50)	0.50 (0.58)	0.00 (0.00)	0.67 (0.52)	1.00 (0.00)	0.17 (0.41)	0.6
		4	0.60 (0.55)	1.00 (0.00)	0.20 (0.45)	0.80 (0.45)	0.40 (0.55)	0.40 (0.55)	0.5
		5	0.20 (0.45)	0.60 (0.55)	0.00 (0.00)	0.80 (0.45)	0.40 (0.55)	0.20 (0.45)	0.5
		6	0.60 (0.55)	0.60 (0.55)	0.00 (0.00)	0.60 (0.55)	0.80 (0.45)	0.60 (0.55)	0.5
		Avg.	**0.53 (0.51)**	**0.67 (0.48)**	**0.17 (0.38)**	**0.70 (0.47)**	**0.67 (0.48)**	**0.33 (0.48)**	**0.5**
$\boldsymbol{CCI_L - CCI_H}$	1st round	7	0.50 (0.55)	0.00 (0.00)	0.17 (0.41)	0.25 (0.50)	0.25 (0.50)	0.00 (0.00)	0.4
		8	0.75 (0.50)	0.25 (0.50)	0.00 (0.00)	0.50 (0.55)	0.67 (0.52)	0.83 (0.41)	0.6
		9	0.20 (0.45)	0.00 (0.00)	0.20 (0.45)	0.60 (0.55)	0.40 (0.55)	0.20 (0.45)	0.5
		10	0.80 (0.45)	0.00 (0.00)	0.60 (0.55)	0.80 (0.45)	0.60 (0.55)	0.20 (0.45)	0.5
		11	0.50 (0.55)	0.00 (0.00)	0.33 (0.52)	0.50 (0.58)	0.00 (0.00)	0.25 (0.50)	0.4
		12	0.75 (0.50)	0.00 (0.00)	0.00 (0.00)	0.83 (0.41)	0.50 (0.55)	0.67 (0.52)	0.6
		Avg.	**0.57 (0.50)**	**0.03 (0.18)**	**0.23 (0.43)**	**0.60 (0.50)**	**0.43 (0.50)**	**0.40 (0.50)**	**0.5**
$\boldsymbol{CCI_H - CCI_L}$	5 rounds	1	0.44 (0.51)	0.60 (0.50)	0.40 (0.50)	0.40 (0.50)	0.40 (0.50)	0.36 (0.49)	0.5
		2	0.33 (0.48)	0.50 (0.51)	0.10 (0.31)	0.55 (0.51)	0.60 (0.50)	0.05 (0.22)	0.4
		3	0.25 (0.44)	0.45 (0.51)	0.00 (0.00)	0.40 (0.50)	0.53 (0.51)	0.20 (0.41)	0.6
		4	0.32 (0.48)	0.96 (0.20)	0.08 (0.28)	0.28 (0.46)	0.48 (0.51)	0.12 (0.33)	0.5
		5	0.28 (0.46)	0.44 (0.51)	0.00 (0.00)	0.40 (0.50)	0.2 (0.41)	0.04 (0.2)	0.5
		6	0.16 (0.37)	0.44 (0.51)	0.24 (0.44)	0.48 (0.51)	0.80 (0.41)	0.32 (0.48)	0.5
		Avg.	**0.30 (0.46)**	**0.57 (0.50)**	**0.14 (0.35)**	**0.41 (0.49)**	**0.50 (0.50)**	**0.19 (0.39)**	**0.5**
$\boldsymbol{CCI_L - CCI_H}$	5 rounds	7	0.30 (0.47)	0.00 (0.00)	0.10 (0.31)	0.05 (0.22)	0.05 (0.22)	0.00 (0.00)	0.4
		8	0.65 (0.49)	0.15 (0.37)	0.00 (0.00)	0.73 (0.45)	0.33 (0.48)	0.77 (0.43)	0.6
		9	0.32 (0.48)	0.12 (0.33)	0.28 (0.46)	0.52 (0.51)	0.08 (0.28)	0.04 (0.20)	0.5
		10	0.40 (0.50)	0.00 (0.00)	0.20 (0.41)	0.48 (0.51)	0.24 (0.44)	0.08 (0.28)	0.5
		11	0.53 (0.51)	0.10 (0.31)	0.57 (0.50)	0.30 (0.47)	0.10 (0.31)	0.15 (0.37)	0.4
		12	0.65 (0.49)	0.00 (0.00)	0.05 (0.22)	0.57 (0.50)	0.27 (0.45)	0.37 (0.49)	0.6
		Avg.	**0.46 (0.50)**	**0.06 (0.24)**	**0.22 (0.42)**	**0.47 (0.50)**	**0.19 (0.40)**	**0.27 (0.44)**	**0.5**

Table B.3. continued

Condition	**Number of rounds**	**Group**	**MALE***			**FEMALE***			**Freq. of female in the group**
			Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage 3	
$\boldsymbol{CCI_H - CCI_L}$	all rounds	1	0.32 (0.47)	0.53 (0.50)	0.37 (0.48)	0.30 (0.46)	0.30 (0.46)	0.19 (0.40)	0.5
		2	0.12 (0.32)	0.37 (0.48)	0.12 (0.32)	0.18 (0.38)	0.49 (0.50)	0.22 (0.41)	0.4
		3	0.15 (0.36)	0.21 (0.41)	0.00 (0.00)	0.39 (0.49)	0.45 (0.50)	0.26 (0.44)	0.6
		4	0.10 (0.30)	0.68 (0.47)	0.11 (0.32)	0.04 (0.20)	0.17 (0.37)	0.05 (0.23)	0.5
		5	0.03 (0.17)	0.11 (0.32)	0.00 (0.00)	0.09 (0.29)	0.07 (0.26)	0.01 (0.08)	0.5
		6	0.04 (0.20)	0.34 (0.47)	0.08 (0.27)	0.13 (0.34)	0.54 (0.50)	0.13 (0.33)	0.5
		Avg.	**0.10 (0.30)**	**0.38 (0.49)**	**0.11 (0.31)**	**0.15 (0.36)**	**0.32 (0.47)**	**0.13 (0.34)**	**0.5**
$\boldsymbol{CCI_L - CCI_H}$	all rounds	7	0.08 (0.27)	0.00 (0.00)	0.04 (0.20)	0.02 (0.12)	0.01 (0.10)	0.02 (0.13)	0.4
		8	0.25 (0.43)	0.06 (0.23)	0.05 (0.23)	0.51 (0.50)	0.21 (0.41)	0.77 (0.42)	0.6
		9	0.12 (0.32)	0.04 (0.19)	0.13 (0.34)	0.21 (0.41)	0.04 (0.19)	0.07 (0.26)	0.5
		10	0.19 (0.40)	0.06 (0.23)	0.06 (0.23)	0.16 (0.37)	0.06 (0.25)	0.02 (0.13)	0.5
		11	0.28 (0.45)	0.05 (0.23)	0.31 (0.47)	0.07 (0.26)	0.02 (0.13)	0.03 (0.17)	0.4
		12	0.21 (0.41)	0.00 (0.00)	0.01 (0.10)	0.32 (0.47)	0.09 (0.29)	0.11 (0.31)	0.6
		Avg.	**0.18 (0.39)**	**0.04 (0.18)**	**0.11 (0.31)**	**0.24 (0.43)**	**0.08 (0.27)**	**0.21 (0.40)**	**0.5**

* The average cooperation rate is weighted by the number of males (and females) within a group Moreover, the average cooperation rate across all rounds of a stage within a treatment is further weighted by the number of rounds played by groups within a stage (recall that the number of rounds of a stage varies across experimental sessions).

Appendix C – Supplementary regressions

Table C.1. – The effect of the choice architecture intervention on cooperative behaviour of males and females.

Condition	CCI_H	CCI_H	CCI_H	CCI_L	CCI_L	CCI_L
Cooperation	(*1st round*)	(*five rounds*)	(*all rounds*)	(*1st round*)	(*five rounds*)	(*all rounds*)
Decomposition	0.027	0.026	-0.014	-0.100	-0.038	-0.130**
	(0.1298)	(0.0616)	(0.0391)	(0.1166)	(0.0954)	(0.0514)
Female	-0.006	0.019	0.029	-0.077	-0.022	-0.062
	(0.1394)	(0.0529)	(0.0367)	(0.1090)	(0.0661)	(0.0585)
Female × *Decomposition*	0.155	0.082	0.021	0.144	0.008	0.112
	(0.1914)	(0.0805)	(0.0593)	(0.1108)	(0.0886)	(0.0701)
Other experiment	-0.161*	-0.118***	-0.045	0.057	0.042	0.012
	(0.0878)	(0.0378)	(0.0287)	(0.1291)	(0.0944)	(0.0476)
Game theory	0.012	0.010	-0.005	-0.011	-0.017	-0.038
	(0.0713)	(0.0339)	(0.0193)	(0.0643)	(0.0443)	(0.0269)
Risk lover	0.027	0.011	0.016**	0.058***	0.013	0.021*
	(0.0261)	(0.0107)	(0.0069)	(0.0188)	(0.0133)	(0.0108)
Trust	0.011	0.003	0.002	-0.007	0.021	0.016**
	(0.0192)	(0.0094)	(0.0056)	(0.0277)	(0.0136)	(0.0061)
Negative reciprocity	-0.002	0.003	0.003	-0.035	-0.001	0.003
	(0.0205)	(0.0106)	(0.0089)	(0.0253)	(0.0141)	(0.0074)
Enjoyment competition	-0.008	-0.006	-0.004	-0.007	-0.007	-0.004
	(0.0141)	(0.0065)	(0.0022)	(0.0095)	(0.0079)	(0.0037)
Contentiousness	-0.006	-0.001	-0.003	0.009	0.008	-0.000
	(0.0152)	(0.0066)	(0.0025)	(0.0128)	(0.0111)	(0.0059)
Constant	0.692	0.430*	0.192*	0.582	0.418*	0.259*
	(0.4291)	(0.1975)	(0.0898)	(0.3999)	(0.2247)	(0.1187)
Round FE		✓	✓		✓	✓
R-squared	0.005	0.103	0.104	-0.009	0.028	0.107
N	120	600	3630	120	600	3900

Note: * p<0.10; ** p<0.05; *** p<0.01. LPM with robust s.e. clustered at the matching group level in parenthesis.

In Table C.1, we present the results of a Linear Probability model in which we estimate six specifications to analyse whether the choice architecture intervention has a different effect on the cooperative behaviour of men and women. Specifications 1, 2 and 3 consider the $CCI_H \rightarrow CCI_L$ *condition*, when focusing on, respectively, the first round of the first stage, the first five rounds of the first stage, and all rounds of the first stage. Specifications 4, 5 and 6 report the estimation results when subjects interact in, respectively, the first round of the first stage, the first five rounds of the first stage, and all rounds of the first stage in the $CCI_L \rightarrow CCI_H$ *condition*. The outcome variable is *Cooperation* that takes value 1 when participants choose to cooperate. While our main independent variables of interest in Table C.1 – i.e., *Decomposition*, *Female* and their interaction (*Decomposition* × *Female*) – are different from those in Table 5, the control variables are the same.

As anticipated, we find no difference in cooperative behaviour between men and women, both in $CCI_H \rightarrow CCI_L$ *condition* and in the $CCI_L \rightarrow CCI_H$ *condition*. In all rounds of the first stage under the $CCI_L \rightarrow CCI_H$ *condition,* we observe limited evidence suggesting that men exhibit higher cooperation levels in the *Baseline treatment* compared to the *Decomposition treatment*. Since this result emerges only in one specification (specification 6) out of six, we believe that this finding should be taken carefully and would need further investigation.

Table C.2 – Wild cluster bootstrap inference.

	$CCI_L \rightarrow CCI_H$		$CCI_H \rightarrow CCI_L$	
Cooperation	(1)	(2)	(3)	(4)
Decomposition	-0.031	-0.005	-0.030	-0.025
	[-0.156,0.094]	[-0.110,0.100]	[-0.299,0.240]	[-0.299,0.250]
Female	0.167**	0.157*	0.054	0.039
	[0.005,0.330]	[-0.016,0.331]	[-0.158,0.266]	[-0.182,0.260]
Female × *Decomposition*	0.110	0.061	0.003	-0.010
	[-0.112,0.331]	[-0.140,0.263]	[-0.333,0.339]	[-0.368,0.348]
Cooperation 1st round	0.059	0.049	0.161**	0.170**
	[-0.054,0.172]	[-0.066,0.165]	[0.033,0.288]	[0.037,0.302]
Others past cooperation	0.041	0.024	0.530	0.485
	[-0.281,0.362]	[-0.268,0.316]	[-0.291,1.351]	[-0.407,1.377]
Other experiment		0.006		-0.045
		[-0.116,0.129]		[-0.260,0.170]
Game theory		0.005		-0.029
		[-0.073,0.083]		[-0.143,0.084]
Risk lover		-0.002		-0.012
		[-0.033,0.028]		[-0.054,0.029]
Trust		0.027***		-0.006
		[0.007,0.046]		[-0.030,0.017]
Negative reciprocity		-0.004		0.019
		[-0.033,0.024]		[-0.006,0.044]
Enjoyment competition		-0.005		-0.007
		[-0.017,0.007]		[-0.022,0.009]
Contentiousness		0.001		0.002
		[-0.017,0.019]		[-0.013,0.017]
Constant	0.088	0.130	0.339**	0.573**
	[-0.043,0.219]	[-0.315,0.575]	[0.077,0.600]	[0.036,1.110]
R-squared	0.063	0.074	0.022	0.015
N	240	240	240	240

Wild cluster bootstrap linear regression with confidence intervals at 95% in brackets.