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Shedding Light into Preference Heterogeneity: Why Players of Traveller's Dilemma Depart from Individual Rationality?

Working papers

Shedding Light into Preference Heterogeneity:
Why Players of Traveller's Dilemma Depart from Individual Rationality?

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Abstract

We analyse the experimental outcome of the *Traveller's Dilemma* under three different treatments - baseline (BT), compulsory ex post players' meeting (CET) and voluntary ex post players' meeting (VET) - to evaluate the effects of removal of anonymity (without preplay communication) in a typical one shot game in which there is a dilemma between individual rationality and aggregate outcome. We show that deviations from the Nash equilibrium outcome are compatible with the joint presence in the sample of individually rational, team-rational, (gift giving), "irrational" and (opportunistic) "one-shot-cooperator" types. The two main factors affecting deviations from the standard individually rational behaviour are male gender and the interaction of generalised trust with the decision of meeting the counterpart in the VET design.

Keywords: Traveller's Dilemma, Team Preferences, Social Distance, Generalised Trust, Relational Goods.
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1. Introduction

Evidence from laboratory experiments often provides findings which dispute the predictions of Nash Equilibrium, a central concept in game theory. In the context of social dilemmas cooperative outcomes emerge, while the Nash equilibrium prediction fails, not only in repeated games, but also in one-shot games (see, among others, Ladyard 1995; Goeree and Holt 2001; Camerer 2003)

One of the reasons why this is presumed to happen is the implausibility of the extreme rationality and self-interest assumptions in some of these contexts. Since its first appareance the Traveler's dilemma" (Basu 1994), has been accepted as one of the best examples of conflict between intuition and game-theoretic reasoning (Basu 1994, Capra et al. 1999).

The parable associated with this game concerns two travellers returning from a remote island who lose their luggage containing the same type of souvenir because of the airline company. In order to be reimbursed, they have to write down on a piece of paper the value of the souvenir which may range between 2 and 100 (in the original Basu 1994 paper). If the travellers write a different number, they are reimbursed with the minimum amount declared. Moreover, a reward equal to 2 is paid to the traveller who declares the lower value, while a penalty of the same amount is paid by the traveller who writes the higher value. In case the two claims are exactly the same, the two travellers receive the declared value without reward or penalty. Given game characteristics, if both of them want to maximize their monetary payoffs, the (2,2) outcome is the only Nash equilibrium of the game and this is true independently of the size of the penalty or reward (hereafter also P|R).

Basu (1994) rises the problem of the implausibility of the Nash solution (far below the (100,100) cooperative outcome) and suggests that a more plausible result is the one in which each player declares a large number, in the belief that the other does the same. Further contributions emphasize that the severity of the punishment has a role in determining the likelihood of the Nash equilibrium.

These two issues have been empirically explored by different authors. Goeree and Holt (2001) run an experiment in which they show that the P|R size significantly affects subjects strategies. The

P|R size also affects the Nash equilibrium result in repeated Traveller's Dilemma (Capra et al. 1999). An important conclusion in the literature is that "the Nash equilibrium provides good predictions for high incentives (R = 80 and R = *50*), but behavior is quite different from the Nash prediction under the treatments with low and intermediate values of R". (Capra et al. 1999, p.680). The scarce predictive capacity of the Nash equilibrium is confirmed by Rubinstein (2007) showing that around 50 percent of more than 4.500 subjects who played the Traveller's Dilemma (henceforth TD) online opted for the maximum choice (the minimum and maximum choice allowed were 180$ and 300$ respectively and P|R was 5$).[1] Rubinstein, by using response time data, concludes that in his experiment declaring 300$ (the largest number) can be interpreted as an instinctive (emotional) choice, while choices in the range 255-299 appear as the ones which imply the strongest cognitive effort.[2]

The present paper aims to shed light on the "stylised fact" of the failure of Nash equilibrium predictions in one-shot Traveller's Dilemmas in an original way by:

1. focusing on the effect of the reduction of social distance on such failure and on its influence on the relationship between players' choice and their beliefs about their opponents' strategy. In particular, we interpret the reduction of social distance in terms of removal of anonymity after the experiment (without pre-play communication[3]) and we distinguish between a treatment where a meeting at the end of the experiment between the two players in the same couple is a compulsory characteristic of the TD and a treatment where the meeting is a voluntary choice of players.
2. interpreting deviations from the unique Nash equilibrium and its determinants in terms of the interplay of: i) standard individually rational players; ii) we-rational (or team) players;

[1] Note that subjects who participated in the online experiment were not paid. However, Rubinstein stresses that the distribution of answers given by these subjects is similar to that of Goeree and Holt (2001) when they use the low P|R.
[2] From a theoretical point of view, in order to explain the evidence in one-shot Traveller's Dilemma, Cabrera, Capra and Gomez (2004) proposed a model of introspection in which subjects are thought to trace through responses until a stopping rule is satisfied. The beliefs that generate response probabilities are degenerate distributions which put all the probability into a point and the response probability is based on the logit rule.
[3] On the effects of pre-play communication see, among others, Hoffman, McCabe and Smith (1996); Bohnet and Frey (1999); Buchan, Croson and Johnson (2000).

iii) one-shot cooperators and iv) (gift giving) “irrational” players. More specifically, we investigate the relation between the reduction of social distance and the probability to observe players’ strategies associated with these types.

The main result of the paper is that the voluntary decision to meet the other player significantly affects the probability to deviate from the standard individually rational behavior when it is combined with a high level of generalized trust. By combining behaviour with declared values we therefore extend the literature on social distance by explicitly considering also the role of agents’ social orientation.

In the second and third sections we illustrate the rationale of our experiment and describe its design. In the fourth and fifth sections we present descriptive and econometric findings respectively. The sixth section concludes.

2. Traveller’s Dilemma and Reduction of Social Distance

Our experiment is based on a two-player Traveller’s Dilemma in which each player is asked to choose a number between 20 and 200 and the P|R is equal to 20. We compare subjects’ choices under three treatments: *Baseline Treatment* (*BT*), *Compulsory Encounter Treatment (CET)* and *Voluntary Encounter Treatment (VET)*. Each subject participates in only one treatment. In the *BT* subjects play the standard Traveler’s Dilemma. In the *CET* subjects play the game after having been informed that they would meet their counterpart at the end of the experiment (see Appendix 1 for the timing of the experiment). The meeting consists simply in the presentation of the two players after the game and does not involve any post-play activity. In the VET, before playing the game, subjects are asked to choose whether to meet or not their counterpart at the end of the experiment and are informed that the encounter takes place only if both the participants choose to meet the counterpart.

The “lightness” of the meeting element with which we want to reduce social distance in our game has a precise rationale. In the spirit of many experimental studies, rigorous anonimity is preferred to test whether, even in those "limit social conditions", players exhibit non standard social preferences. With a parallel approach we want to verify if the slightest reduction of social distance (ex post meeting of players who do not know each other) may change players' behaviour with respect to the anonymity condition.

According to our interpretation, the meeting reduces social distance among players and allows us to study the effect of this variable (by distinguishing when it is a compulsory and a voluntary characteristic of the game) both on the deviation from Nash equilibrium in the Traveller's Dilemma and on the difference between choice and belief in the same context. This last point seems to be quite original with respect to the experiments based on the Traveller's Dilemma which virtually did not pay attention to the relation between the decision of subjects and their belief declaration. On the contrary, we think that many interesting considerations may be deduced from the analysis of these data.

Our empirical work may be considered part of that strand of the literature which finds that a reduction in social distance fosters cooperation in different situations: public good games (Bohnet and Frey 1999), dictator games (Hoffman, McCabe and Smith 1996, Bohnet and Frey 1999), prisoner's dilemmas (Frohlich and Oppenheimer 1998) and trust games (Scharlemann et al. 2001). According to the literature, the effect depends on two main reasons. On the one side, the reduction of social distance promotes empathy among subjects (Bohnet and Frey 1999). On the other side, it allows for a social norm of cooperation or fairness to become effective (Roth 1995, Hoffman, McCabe and Smith 1996, Bohnet and Frey 1999). Furthermore, by comparing the effects of the reduction of social distance when it is voluntary and when it is compulsory, we are able to give to the theory of social distance an original interpretation based on the idea of relational goods. [4] Only

[4] Relational goods are intangible outputs of an affective and communicative nature that are produced through social interactions (Gui 2000). Examples of them are companionship, emotional support, social approval, solidarity, a sense of belonging and of experiencing one's history, the desire to be loved or recognized by others, etc. According to Gui (1987) and Ulhaner (1989), they are a *specific kind of local public goods.* They are *public* because, unlike conventional goods, they cannot be enjoyed by an isolated individual, but only jointly with some others. They are *local* public goods because the collective entity consuming them is represented by a specific subset of agents in the economy. They are a *specific* kind of public goods, which should be better defined as *anti-rival* than as non rival, because their very same nature is based on the interpersonal sharing of them. This implies that participation to their consumption actually creates

when the decision of meeting the counterpart is voluntary we may in fact talk of revealed taste for relational goods, while in the compulsory treatment we cannot infer anything about preferences of subjects who are forced to meet. With this respect, note that assuming nonzero opportunity cost of time, the decision of meeting the counterpart at the end of the game reveals that the player attaches a positive value to the encounter.

We therefore test the idea that people with preferences for consumption of relational goods, which we associate with the voluntary decision to meet the other player, are more likely not to choose an opportunistic behaviour in the game in order to create a positive environment and to avoid a bad disposition in the other player which would reduce the probability to consume relational goods.[5]

3. Experimental Design and Procedure

The experiment is based on a two-player Traveler's Dilemma in which each player is asked to choose a number between 20 and 200.[6] Let us call n_1 and n_2 the numbers chosen by player 1 and player 2 respectively. Following the standard game rules, if $n_1 = n_2$, both players receive n_1 tokens; if $n_1 > n_2$, player 1 receives n_2-20 tokens and player 2 receives n_2+20 tokens; finally, if $n_1 < n_2$, player 2 receives n_1+20 tokens and player 2 receives n_1-20 tokens. The unique Nash equilibrium in pure strategies of this game is $n_1 = n_2 =20$.

We compare subjects' choices in three treatments: *Baseline Treatment* (*BT*), *Compulsory Encounter Treatment (CET)* and *Voluntary Encounter Treatment (VET)*. Each subject participates in only one treatment. In the *BT* subjects are divided in couples and instructed about the Traveler's Dilemma. After reading the instructions and before subjects play the Traveler's Dilemma, some control questions are asked in order to be sure that players understood the rules of the game. In the

a positive externality on partners and contributes to the quality of the public good itself (Becchetti, Pelloni and Rossetti, 2008).

[5] Notice that, in our case, relational goods may vary from a minimum to a maximum content. The minimum content is just the desire to avoid the hostility of the counterpart, while the maximum content may be the hope to build a friendship with the other player starting from the small joint experience lived during the game.

[6] The instructions of the experiment are available from the authors upon request.

CET, before playing the game, subjects are informed that they would meet their counterpart at the end of the experiment. The VET differs from the CET because in the former the meeting is a voluntary choice of the players. In the VET, after being instructed about the game but before playing it, subjects are handed a form with the following question: “Do you want to meet, at the end of the experiment, the person you are going to play with?” They are informed of the fact that the meeting would take place only if both players replied with a “Yes”[7] For a more detailed description of the treatments see Appendix 1.

In all the treatments, at the end of the game, beliefs about the opponent’s choice are elicited with a surprise question. In particular, each subject is asked to guess the number chosen by her opponent and she is paid 1 euro if the distance between her guess and their opponent’s actual choice is less then 10.[8] Finally, subjects are asked to answer a set of socio-demographic and attitudinal questions.

The experiment was run both at the Experimental Economics Laboratory (EELAB) of the University of Milan Bicocca and at the Laboratory of Experimental Economics (LES) of the University of Forlì [9]. We ran 2 sessions for the *BT* (1 in Milan and 1 in Forlì), 2 sessions for the *CET* (1 in Milan and 1 in Forlì), 3 sessions for the *VET* (1 in Milan and 2 in Forlì). A total of 140 undergraduate students – 76 in Milan and 64 in Forlì – participated in the experiment. Players were given a show – up fee of 3 euro.

4. Preliminary Evidence from Choice and Belief Distributions

Distributions of belief (expected bid of the other player), choice and the difference between choice and belief provide rich information on sample characteristics (Figures 1-3). The first two

[7] Subjects are informed about the other player decision at the end of the experiment.

[8] We believe that, in our kind of experiment, a prize exclusively given to the correct guess could be considered too difficult to achieve, thereby discouraging players and increasing the likelihood of casual answers. At the same time, eliciting procedures based on quadratic scoring rules (Davis and Holt 1993) are useless for a game - like our version of the Traveller’s Dilemma - characterized by a large number of possible strategies. The use of tolerance thresholds for subjects’ guesses is used in the literature as a valid method for eliticing beliefs (see for example Charness and Dufwemberg 2006; Croson 2000).

[9] Subjects were recruited by email. They were students included in the mailing list of the two laboratories. Two weeks before the experiment they received an email in which the staff invited them to visit the Laboratory’s website for information about the experiment and subscriptions.

distributions show, respectively, that only 2.14 percent of players play the NE outcome and only 1.43 believe that the opponent will do the same. Consider, however, that the monetary prize for correct belief allows a +/- 10 tolerance. Players who believe in the opponent's Nash rationality may strategically declare B≤30 and still believe that the opponent will be Nash rational. Allowing for the possibility of "strategic" belief declaration (which exploits the +/-10 tolerance) we arrive to 4.29 percent of beliefs compatible with NE. Even taking this into account, NE equilibria account for a very small part of our results.

Figure 1 Players' Choice

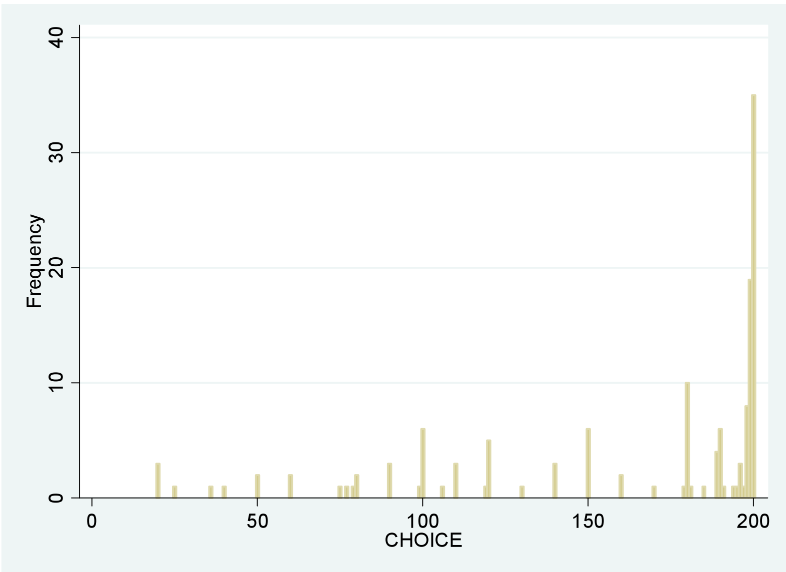
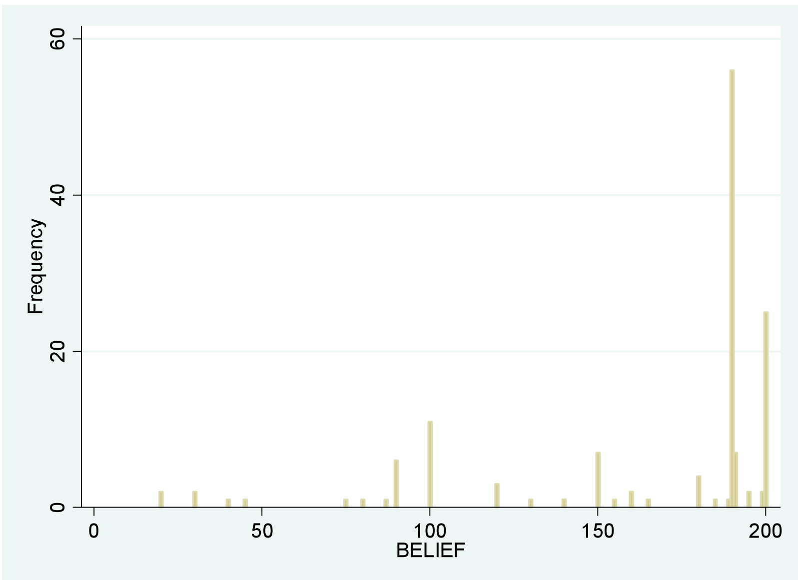


Figure 2 Players' Belief



Another piece of evidence which emerges just from the inspection of the choice and belief distributions is that one fourth of the players choose the highest bid (200) (Figure 1) and 17.86 percent the highest belief (Figure 2).[10] These choices are incompatible with individual rationality. Strategic belief choice on the upper bound of the belief distribution is also important because we find an anomalous peak around the 190 play (40 percent of the sample).

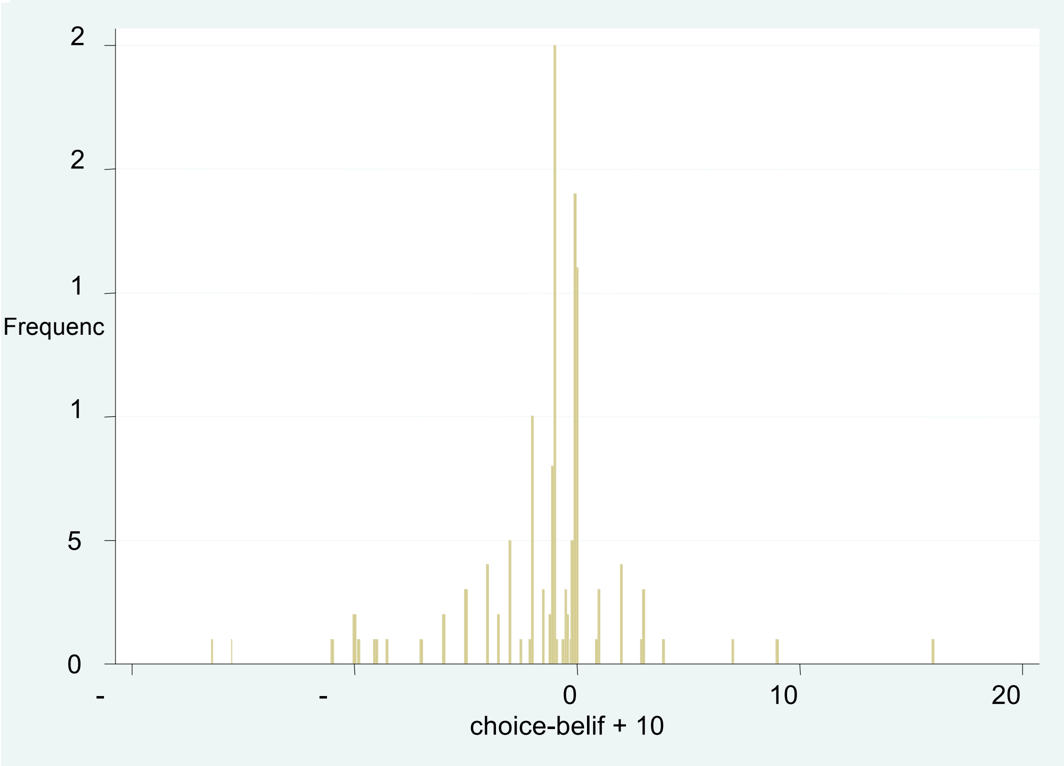
If we look at the distribution of the difference between choice and belief we find that only 18 percent of players choose one unit below the belief, while around 12 percent of them are such that C>B+10 (Figure 3). These players are definitely "irrational" since, if they declare correctly their belief, or even if they play strategically on the +/-10 belief tolerance, they voluntarily decide to incur in the traveller's game penalty. We enlarge the set of irrational players if we consider, more generally as such those for whom B≠190[11] and C>B-1.[12] In such case that 33 percent of sample choices are incompatible with individual rationality.

[10] As also shown in the introduction, the result is, however, not so unusual in TD games when the penalty for choosing higher than the counterpart is low. Goeree and Holt (2001) find that, when the penalty is 5 (and the range between 180 and 300), 80 percent of players chooses the highest bid. Cabrera Capra and Gomez (2006) find that the highest bid is the choice that occurs the most frequently when the range is between 20 and 120 and the penalty is equal to 5. Our penalty is however a bit larger (relative to the upper bound range) than in these two cases.

[11] We rule out all 190 choices since they may be strategic and do not allow us to understand whether players actually believe their opponent's choice is 190 or more of it (up to 200). In this wider definition of irrational player we argue however that players with B>190 are not exploiting the +/-10 tolerance (they could have choosen B=190 to cover all higher expected bids) and therefore we believe in their expected bids. The distribution of the belief variables seems not to contradict this assumption since, after the anomalous peak of 190, we have only very few values higher than 190 and lower than 200. Consider also that there is no reason to behave stragically declaring something different from the true expected belief if (190>B>130).

[12] Actually, if the player is extremely confident in her point estimate of the counterpart choice, the individually rational behaviour should be C=B-1. Assuming however that the players have a non degenerate distribution of the expected counterpart choice and want to take extra caution, we include also C<B-1 among choices compatible with individual rationality.

Figure 3 Players' behavior: choice-belief+10



It is evident that an homogeneous population of Nash rational individuals, with or without Nash equilibrium being common knowledge, cannot explain these findings. In order to account for the observed variability in players' combination of bids and beliefs, we therefore define in the next section a set of heterogeneous types and evaluate the predicted effects of the combinations of their possible matchings on bids and beliefs in the game.

4.1 The definition of types and of predicted outcomes arising from their combinations.

Let us define the following three types of players:

1) ***Individually rational player****: a player i is defined as individually rational (IR_i) if $C_i<B_{i(j)}$ or $C_i = B_{i(j)} = \underline{B} = \underline{C}$, where $B_{i(j)}$ is the expectation of player i on the choice of her opponent j, $\underline{C}$ is the smallest number that a player can declare and $\underline{B}$ is the player's belief that her opponent has declared the smallest number.*

The individually rational player maximises her payoff and therefore chooses at least one unit below her belief on the counterpart choice. Obviously, she is also individually rational if she expects the counterpart to play lowest and she does the same ($C_i = B_{i(j)} = \underline{B} = \underline{C}$). Since the belief is not necessarily a point estimate but may be a distribution of expected choices, we choose a broader concept of individual rationality in which we include $C_i \leq B_{i(j)} - 1$.[13]

ii) ***We-rational player****: a player i is defined as we-rational (WR_i) if $C_i = B_{i(j)}$ when $B_{i(j)} = \overline{B} = \overline{C}$ or if $C_i = B_{i(j)}$ when $B_{i(j)} \neq \overline{B}$*

The literature has emphasized that, in some circumstances, individuals find themselves in situations in which it is rational to have *team preferences* (Hollis and Sugden 1993, Hollis 1998, Sugden 2000). According to Hollis (1998) we need "a defensible definition of reason which makes it rational to trust rational people". The difference between team directed preferences and the classic individual rationality is that the former lead to say: 'It would be good for us if we did…'. If we adopt team preferences and we-rationality it is clear that the optimal choice is (200,200) and, if team preferences are common knowledge, each player opts for ($C=\overline{C}$, $B=\overline{B}$). Consider also that, in the specific case of the Traveller's Dilemma, we-rationality pays much more (10 times as much) at the individual and at the aggregate level! Hence the Traveller's Dilemma is exactly one of those circumstances in which "individuals find themselves in situations in which it is rational to have *team preferences*".

iii) ***One-shot-cooperator****: a player i is defined as (stategic) one-shot-cooperator (OSC_i) if $C_i = Bi(j)$ when $B_{i(j)} = \overline{B} = \overline{C}$ or if $C_i < Bi(j)$ when $B_{i(j)} \neq \overline{B}$.*

In our definition the one shot cooperator is a self interested, individually rational player who tries to find an implicit agreement with the counterpart on a choice which maximises the interest of both.

The reasoning of a one-shot-cooperator should be the following "I'm cool and I'm sure that my counterpart will be cool enough as well to understand that <u>it is in our individual interest</u> that we both choose the highest play". If, on the contrary, she believes that the

[13] To understand this point immagine a car driver who drives on a one lane road and respects the rules. He knows that he needs extra care to take into account the possibility if crazy driver coming from the other direction that, when overtaking another car, enter his lane. The possibility of meeting this type of drivers will lead him to take a little bit extra care in driving.

counterpart will not be smart enough to understand it without preplay communication, she will behave as a standard individually rational player and undercut the opponent (with $C_i<Bi(j)\neq \overline{B}$). Note that, when $B_{i(j)}= \overline{B}$, there is observational equivalence between an altruistically motivated form of we-rationality (I care also for the wellbeing of the other player in the same way I do for mine and therefore maximise the joint outcome) and an opportunistically motivated form of one-shot-cooperation. However, when $B_{i(j)}\neq \overline{B}$, we have no more observational equivalence, the opportunistic cooperator will behave consistently with the pursuit of her individual interest and choose $C_i<Bi(j)$.

There is no contradiction between the two different behaviours of the one shot cooperator at $Bi(j)=\overline{B}$ and $Bi(j)<\overline{B}$. In the first case she will believe that the counterpart understand the implicit agreement and behaves cooperatively, while in the second she does not believe it, the implicit agreement is not enforced and therefore behaves non cooperatively. We may therefore interpret the one-shot cooperator behaviour in terms of full reciprocity (if I guess the other player trusts on me and there is an implicit agreement on the top bid I reciprocate, if I imagine that the other player does not rust on me and the agreement is not working I will undercut her).

By considering these three types (individually rational, team rational, one shot cooperator) we obtain eight {choice, belief} outcomes according to different matches between types playing the game and their expectations on the counterpart type.

a) $\{IR_i, E_i[IR_j]\}\rightarrow\{C_i=\underline{C}, B_{i(j)}=\underline{B}\}$

If the player belongs to the individually rational type, and expects that the counterpart is of the same type, we have the NE outcome. The outcome of this case coincides with that in which Nash rationality is common knowledge.

b) $\{IR_i,E_i[\neq IR_j]\}\rightarrow\{C_i < B_{i(j)}\}$

If the player belongs to the individually rational type, and expects that the counterpart is not of the same type, she will play to undercut the opponent expected choice in order to win the prize and avoid the penalty.[14]

c) $\{WR_i,E_i[WR_j]\}\rightarrow\{C_i = \overline{C}, B_{i(j)}= \overline{B}\}$

If the player belongs to the we-rational type, and expects that the counterpart is of the same type, she will play highest under the expectation that the counterpart will do the same.

d) $\{WR_i,E_i[IR_j]\}\rightarrow\{C_i = B_{i(j)}\}$

If the player belongs to the we-rational type, and expects that the counterpart is of the individually rational type, she will play the expected choice of the counterpart without undercutting it, consistently with her goal to maximize the joint outcome.

e) $\{WR_i,E_i[OSC_j]\}\rightarrow\{C_i = \overline{C}, B_{i(j)}= \overline{B}\}$

If the player belongs to the we-rational type, and expects that the counterpart is a one shot cooperator, she will play highest under the expectation that the counterpart will do the same.

f) $\{OSC_i,E_i[OSC_j]\}\rightarrow\{C_i = \overline{C}, B_{i(j)}= \overline{B}\}$

If the player is a one shot cooperator, and expects that the counterpart is of the same type, she will consider the "implicit agreement" at work and play highest under the expectation that the counterpart will do the same.

g) $\{OSC_i,E_i[IR_j]\}\rightarrow\{C_i = \underline{C}, B_{i(j)}= \underline{B}\}$

If the player is a one shot cooperator, and expects that the counterpart is of the individually rational type, she will play lowest under the expectation that the counterpart will do the same.

h) $\{OSC_i,E_i[WR_j]\}\rightarrow\{C_i = \overline{C}, B_{i(j)}= \overline{B}\}$

[14]See footnote 13 for the motivation of our decision not to restrict individual rationality to C=B-1.

If the player is a one shot cooperator, and expects that the counterpart is a we-rational type, she will play highest under the expectation that the counterpart will do the same.

Note that solutions from cases c), e), f) and h) are observationally equivalent and the same occurs for solutions a) and g). Solution b) includes in reality several possibilities such as $\{IR_i,E_i[(WR_j)]\}$, $\{IR_i,E_i[(OSC_j)]\}$ and also those in which the counterpart is expected not to have the capacity of understanding recursive rationality even not being a we-rational type or a one-shot-cooperator.

Note as well that our taxonomy left out an important part of players' strategies. The situation in which $C_i > B_{i(j)}$ is not compatible with our type definitions and will be considered for the moment as irrational. This implies in reality the existence of a fourth "irrational" type whose behaviour will be further qualified in the rest of the paper.[15]

Where do we find evidence of the existence of the above mentioned types? An indirect proof for their existence is provided by qualitative results from Becchetti, Basu and Stanca (2008) where players are asked at the end of the traveller's game to declare in an open question what was the rationale of their choice. A large part of the answers can be classified under these three definitions.

More specifically, in that paper the following examples of ex post rationalisation of players strategies may loosely[16] be attributed to one-shot cooperation: *a) I made the most likely choice, hoping that also the other would have made the same instead of gambling; b) If all the players had chosen the maximum bid, we would all have obtained the maximum. I trusted the intelligence of others, who, according to me, were interested in getting the maxumum earnings, and opted for 200; c) I made my choice by believing that the other player was clever enough to cooperate but it was not true apparently since he behaved as it needed quick pocket money;d) I wanted to make the highest profit. The best choice in this perspective was the highest bid in all the four rounds. In this way, each participant would have obtained 20€; e) The two players have to chose always 200 (the*

[15] We assume for simplicity that our three types rule out the possibility of meeting an irrational player.
[16] As we may expect declaration do not always coincide exactly with one type definition and may contain elements of more than one of them.

maximum). Since 200 is given to both the players in this case, there are not penalties and it is a profitable choice; f) I like gambling and I made hazardous choices hoping that my colleagues in the games made the same. If both the players choose the highest bid the payoffs would be high for both; g) I decided to make high choices and slightly lower than 200 so that, if the lower choice made by the players is high, we both obtain a high enough payoff; h) I thought to the possible strategies of my counterpart and tryed to limit the loss, but always trusting the couterpart and, in particular, the fact that he could opt for high bids.

By contrast, the following ex post rationalisations of players' strategies are attributed by the authors to team preferences: *a) I thought to the highest profit and the lowest loss of each player at each round;*[17] *b) You have to choose always 200, the maximum, this is the best strategy because the bid is obtained by both the players and there are not penalties;c) In certain cases I tried to choose the best choice for me, sometimes I opted for the best choice for both; d) I chose trying to maximize the earnings of both, according to the game theory, even though simetimes my choice was the dominated one; e) I made the choices which could, according to my opinion, generate the same earnings for my counterpart and me; f) My intention was to maximize the earnings of my counterpart and my earnings.*

Even though the analysis of these declarations makes clear that no perfect and univocal classification is possible, elements of we-rationality and one shot cooperation clearly emerge from them. More in detail, the classification of qualitative responses in the Basu, Becchetti and Stanca (2008) paper shows that "anomalous" preferences play an important role since one shot cooperator answers are around 12 percent, we-rational answers are 10 percent against 13 percent of answers inspired to individual rationality and 19 percent of them driven by risk aversion. Many other declarations remain of more difficult classification.

Afer having defined types we verify the compatibility of the different choice, belief combinations, with our taxonomy (Table 1) .

[17] Becchetti, Basu and Stanca (2008) considered a repeated Traveller's Dilemma.

Table 1. Compatibility of players' choice/belief combinations with predicted behaviour of our types

Type of behaviour	Combination of {choice,belief} solutions compatible with the defined types	Conditions	Number of players choosing the outcome	Percent of total sample
Minimum bid		$C_i = \underline{C}$	3	2.14
Maximum bid		$C_i = \overline{C}$	35	25
NE choice and NE outcome being common knowledge (ruling out strategic beliefs which exploit the +/- 10 tolerance) * according to the observed player beliefs	$\{IR_i,E_i[IR_j]\}$, $\{OSC_i,E_i[IR_j]\}$	$\{C_i = \underline{C}, B_{i(j)} = \underline{B}\}$	1	0.71
We-rationality or one shot cooperation being common knowledge (ruling out strategic beliefs which exploit the +/- 10 tolerance) ** according to the observed player beliefs	$\{OSC_i,E_i[OSC_j]\}$, $\{OSC_i,E_i[WR_j]\}$, $\{WR_i,E_i[WR_j]\}$or $\{WR_i,E_i[OSC_j]\}$	$\{C_i = \overline{C}, B_{i(j)} = \overline{B}\}$	15	10.71
NE choice and NE outcome being common knowledge according to the observed player beliefs (including strategic beliefs which exploit the +/- 10 tolerance) *	$\{IR_i,E_i[IR_j]\}$ adjusted for the +/- 10 belief prize tolerance	$\{C_i = \overline{C}, B_{i(j)} < \overline{B} + 10 + 1\}$	1	0.71
We-rationality being common knowledge according to the observed player beliefs (including strategic beliefs which exploit the +/-10 tolerance) **	$\{OSC_i,E_i[OSC_j]\}$, $\{OSC_i,E_i[WR_j]\}$, $\{WR_i,E_i[WR_j]\}$or $\{WR_i,E_i[OSC_j]\}$ adjusted for the +/- 10 belief prize tolerance	$\{C_i = \overline{C}, B_{i(j)} > \overline{B} - 10 - 1\}$	33	23.6
Individually rational behaviour when NE outcome is not common knowledge according to the observed player beliefs	$\{IR_i,E_i[\neq IR_j]\}$	$C_i<B_{i(j)}$, $B_{i(j)} > \underline{B}$	51	36.4
We-rational choice without team preferences being common knowledge when the player does not expect the counterpart to be a we-rational or one-shot cooperator type (ruling out strategic beliefs which exploit the +/- 10 tolerance) *	$\{WR_i,E_i[IR_j]\}$	$C_i=B_{i(j)}$ with $B_{i(j)} \neq 190$ and $C_i, < \overline{C}$	5	3.57
"Irrational choice" (ruling out strategic belief which exploit the +/- 10 tolerance) *		$C_i>B_{i(j)}$ if $B_{i(j)} \neq 190$	27	19.29
"Irrational choice" (including strategic beliefs which exploit the +/-10 tolerance) *		$C_i>B_{i(j)}$	45	45.71

* Given the possibility of getting the prize for the belief even in case of a +/- 10 error, we consider that strategic players may declare a belief of 30 even though their true belief is lower than 30 (for example it could be equal to 20). If players declare a belief lower than 30 they are not exploiting this opportunity and therefore we assume that their declared beliefs correspond to the true ones. ** Given the possibility of getting the prize for the belief even in case of a +/- 10 error, we consider that strategic players may declare a belief of 190 even though their true belief is higher than 190 (for example it could be equal to 200). If players declare a belief higher than 190 they are not exploiting this opportunity and therefore we assume that their declared beliefs correspond to the true ones.

Table 2. Compatibility of players' choice/belief combinations with predicted behaviour of our types (breakdown by experiment design)

Type of behaviour	Combination of {choice,belief} solutions compatible with the defined types	Conditions	Baseline treatment	Compulsory meeting	Voluntary meeting	Voluntary meeting (yes)**	Voluntary meeting (no)
Minimum bid		$C_i = \underline{C}$	2.50	0	3.33	0	6.25
Maximum bid		$C_i = \overline{C}$	27.50	30.00	20.00	25.00	15.63
NE choice and NE outcome being common knowledge (ruling out strategic beliefs which exploit the +/- 10 tolerance) * according to the observed player beliefs	$\{IR_i, E_i[IR_j]\}$; $\{OSC_i, E_i[IR_j]\}$,	$\{C_i = \underline{C}, B_{i(j)} = \underline{B}\}$	0	0	1.67	0	3.13
We-rationality or one shot cooperation being common knowledge (ruling out strategic beliefs which exploit the +/- 10 tolerance) * according to the observed player beliefs	$\{OSC_i, E_i[OSC_j]\}$, $\{OSC_i, E_i[WR_j]\}$, $\{WR_i, E_i[WR_j]\}$ or $\{WR_i, E_i[OSC_j]\}$	$\{C_i = \overline{C}, B_{i(j)} = \overline{B}\}$	7.50	17.50	8.33	7.14	9.38
NE choice and NE outcome being common knowledge according to the observed player beliefs (including strategic beliefs which exploit the +/- 10 tolerance) *	$\{IR_i, E_i[IR_j]\}$ adjusted for the +/- 10 belief prize tolerance	$\{C_i = \overline{C}, B_{i(j)} < \overline{B} +10+1\}$	0	0	1.67	0	3.13
We-rationality being common knowledge according to the observed player beliefs (including strategic beliefs which exploit the +/-10 tolerance) *	$\{OSC_i, E_i[OSC_j]\}$, $\{OSC_i, E_i[WR_j]\}$, $\{WR_i, E_i[WR_j]\}$ or $\{WR_i, E_i[OSC_j]\}$ adjusted for the +/- 10 belief prize tolerance	$\{C_i = \overline{C}, B_{i(j)} > \overline{B} -10-1\}$	27.50	30.00	16.67	17.86	27.50
Individually rational behaviour when NE outcome is not common knowledge according to the observed player beliefs	$\{IR_i, E_i[\neq IR_j]\}$	$C_i < B_{i(j)}$, $B_{i(j)} > \underline{B}$	35.00	35.00	38.33	35.71	40.63
We-rational choice without team preferences being common knowledge when the player does not expect the counterpart to be a we-rational or one-shot cooperator type (ruling out strategic belief which exploit the +/- 10 tolerance) *	$\{WR_i, E_i[IR_j]\}$	$C_i = B_{i(j)}$ with $B_{i(j)} \neq 190$ and $C_i, < \overline{C}$	2.50	0	6.67	10.71	3.31
"Irrational choice" (ruling out strategic belief which exploit the +/- 10 tolerance) *		$C_i > B_{i(j)}$ if $B_{i(j)} \neq 190$	12.00	12.50	28.33	28.57	28.13
"Irrational choice" (including strategic beliefs which exploit the +/-10 tolerance) *		$C_i > B_{i(j)}$	50.00	42.50	45.00	46.43	43.75

* Given the possibility of getting the prize for the belief even in case of a +/- 10 error, we consider that strategic players may declare a belief of 190 even though their true belief is higher than 190 (for example it could be equal to 200). If players declare a belief higher than 190 they are not exploiting this opportunity and therefore we assume that their declared beliefs correspond to the true ones.

We resume our main findings from Table 1 as follows:

i) individual rationality is much more widespread than NE outcome.

The third line tells us that the belief/choice combination of only one player is consistent with NE outcome. The result does not change when we include strategic beliefs which exploit the +/- 10 tolerance (Table 1, line 5). However, cases of individual rationality in which C<B are much more (36.4 percent of the sample) (Table 1, line 7). A large number of individuals behave accordingly to the IR type but, either they do not know recursive reasoning or they do not believe that the counterpart knows or acts according to it.

ii) ***the outcome generated by (belief/choice) combinations assuming couples of we-rational or one-shot-cooperator players - $\{OSC_i,E_i[OSC_j)]\}$, $\{OSC_i,E_i[WR_j)]\}$, $\{WR_i,E_i[WR_j)]\}$ or $\{WR_i,E_i[OSC_j)]\}$ – is more frequent than the NE outcome.***

The $\{C_i = \overline{C}, B_{i(j)} = \overline{B}\}$ solution occurs in 10.71 percent of cases, against the 0.71 percent of the NE outcome. As explained in the previous section, the former is the observationally equivalent outcome of the four possible combinations of we-rational and one-shot-cooperator types.

iii) The undercutting choice prevails over the "pure" we-rationality choice when the expectation on the counterpart choice is not the upper bound one.

For $B_{i(j)} < \overline{B}$, we find that cases in which $C_i<B_i$ (36.4 percent) are more than those in which $C_i=B_i$ (3.57 percent). It seems that, outside the "implicit agreement" around the $\{\overline{C}_i, \overline{C}_j\}$ choice (point ii), individually rational behaviour dominates team rational one. The combination of findings ii) and iii) fits well with the definition of one-shot cooperators who behave differently whether they believe the "implicit agreement" on $\{\overline{C}_i, \overline{C}_j\}$ will be respected or not.

iv) There is a large share of "irrational" players who choose $C_i>B_{i(j)}$.

The share of such players is 19.29 percent ruling out strategic beliefs which exploit the +/- 10 tolerance (in this case we define as irrational players those who choose $C_i>B_{i(j)}+10$) and 45.71 percent if we include strategic beliefs. *Are these players truly irrational, or do they follow a* *different rationality?* We will answer to this question when we will examine the effect of the different designs of the game to the distribution of types.

In Table 2 we analyse from the descriptive point of view the relationship between the taxonomy of types conditional to the different treatments of the game.

The most relevant differences are:

i) the rise of the $\{C_i = \overline{C}, B_{i(j)} = \overline{B}\}$ belief/choice pair in the compulsory meeting treatment (17.5 percent against 7.5 in the baseline);

ii) the rise of the "irrational" behavior in the voluntary meeting design (line 9 in the table).

On this point consider that those who want to meet their counterpart in the voluntary meeting treatment have on average a choice which is 6.86 points higher than their belief. This is a remarkable result considering that, as we expect, all the other subgroup means are negative (the choice is below the belief). More specifically, all the rest of the sample has a -5.40 average, the baseline group -5.85 and the compulsory treatment group -2.77.

Let us define at this point a set of "gift givers" which is the sum of the irrational types (C>B) and of the team rational individuals who choose (C=B) when B<$\overline{B}$. By just looking at the ratio of gift givers on total players we find that we capture almost 44 percent of behaviour of players who want to meet the counterpart in the voluntary meeting design, 35 percent of those who do not want to meet the counterpart in the same scenario and 18 percent of players in both the baseline and compulsory meeting treatments. Gift giving seems therefore significantly affected by the treatment design.

5. Econometric Findings

The commented descriptive findings document (as in previous papers of this literature) widespread deviations from individual rationality, call for the existence of heterogenous types and pose fundamental questions about factors which can explain such heterogeneity and the possible effects that changes in the experiment design may have on it.

With respect to the effect of the three treatments on the likelihood of departure from individual rationality we formulate the following hypotheses:

- *H1: the move from the BT to the CET design increases the likelihood of departure from the Nash rational behavior.*
- *H2: the move from the BT to the VET design increases the likelihood of departure from the Nash rational behaviour only for players who choose to meet the counterpart.*

While hypothesis 1 comes directly from the consideration that removal of anonymity should reduce propension to opportunism by decreasing social distance, hypothesis 2 concerns the voluntary choice to meet the other player and it demands some considerations on the possible motivations behind the meeting's decision. We have three explanations on the decision to meet the counterpart in the VET:

1. *Curiosity*. Consider the following utility function: U=X-wT, where X is the game payoff, T is the time lost in case of meeting and w the opportunity cost of time. Suppose that a "curious players" obtains a positive utility from the satisfaction of her curiosity by meeting the counterpart. This kind of player will opt for the meeting in the VET only if the value of the meeting in terms of curiosity's satisfaction compensates the opportunity cost of time lost. If this is the case, such players should depart from individual rationality because of the possibility of the reduction of social distance associated with the decision to meet the other player.
2. *Desire to meet the other player in case one must pay the penalty in the game*. It is the case of a player who wants to have the occasion to (negatively) reciprocate by manifesting her disappointment during the meeting in case she has to pay a sanction because of the counterpart's declaration. The comparison between the meeting opportunity cost and the satisfaction associated with the possibility to reciprocate determines the decision to meet the counterpart. Also for these players the decision to meet the counterpart should increase the

probability to deviate from the individual rationality because of the reduction of social distance.

3. *Desire to meet the other player in order to have a good time with her*. In this case, we define subjects who opt for the encounter as socially oriented subjects, by meaning that their utility function includes the enjoyable time spent with others. Let us define REL the relational goods which may be produced and consumed during a meeting. The utility function of a socially oriented player is U=aX-wT+bREL where X is the game payoff, T is the time lost in case of meeting and w the opportunity cost of time. We make three key assumptions related to this motivation to opt for the meeting. The first is that it applies only if players trust that also the counterpart is socially oriented. One may decide not to invest time in the encounter if she does not trust that the player she will meet is interested in consuming relational goods. The second assumption is that the value of the relational goods produced during the meeting positively depends on the dispositions of agents who meet[18]. Finally we assume that players' disposition towards the counterpart is affected by the result of the game. In particular, we assume that each player may affect other's disposition by playing "generously" in the Traveler's Dilemma, which means by trying to avoid that a sanction against the other player arises. Given these assumptions we may say that REL=f(C(B), GENTRUST) where REL depends on the choice in the game (C), given the belief in the other's behaviour (B), and on the player's level of generalised trust (GENTRUST) which incorporates her expectation on the other player in terms of social orientation. According to our opinion, generalized trust in others may approximate players' trust that the counterpart is a social oriented subject. Socially oriented players whit high level of generalized trust should depart from individual

[18] The value of relational goods depends on the characteristics of people sharing the goods (Sacco and Vanin 2000) and is increased by *fellow feeling*. With this respect, one could prefer to share time with people she trusts or she finds friendly. For this reason, the expected value of relational goods' consumption depends on the disposition that agents have on the personal characteristics of people they are going to meet. A good disposition increases the probability that agents enjoy the encounter and, consequently, the quality of the relational good produced (and consumed) by it. On the contrary, feelings such as rancour or envy can interfere with their production (and, consequently, with their consumption).

rationality for two resons: because of the reduction of social distance and because of the willingness to create an agreeable atmosphere in the meeting.

As a whole, we may rewrite our hipotheses:

- H1: the move from the BT to the CET design increases the likelihood of departure from the Nash rational behavior because of the reduction of social distance;
- H2A: the move from the BT to the VET design increases the likelihood of departure from the Nash rational behaviour for players who choose to meet the counterpart for curiosity because of the reduction of social distance;
- H2B: the move from the BT to the VET design increases the likelihood of departure from the Nash rational behaviour for players who choose to meet the counterpart in order to negatively reciprocate in case the counterpart behaves in a opportunistic way because of the reduction of social distance;
- H2C: the move from the BT to the VET design increases the likelihood of departure from the Nash rational behaviour for players who choose to meet the counterpart in order to consume relational goods both because of the reduction of social distance and because of the willingness to create an agreeable atmosphere in the meeting.

Making reference to our four hypotheses, we perform non parametric rank tests on them. To do so we create a dependent variable which takes the value of one when C>B-1. By construction our dependent variable captures three behaviors different from individual rationality (team rationality if C=B, one shot cooperation if C=B=200 and "irrationality" when C>B). It may then be regarded as identifying *departure from individual rationality*.

Table 3 clearly shows that the first three hypotheses (H1, H2A and H2B) are rejected since there is no significant difference in terms of departure from individual rationality between baseline and CET (H1) and between baseline and VET when we consider only players who simply opt for the encounter (notice that in our test we are not able to disentangle between curiosity and desire to negatively reciprocate). To test the fourth hypothesis we create a dummy which takes value of one when the player opts for meeting the counterpart in the VET and, at the same time, declares a level of generalized trust above median. In this case we find that hypothesis 4 is not rejected at 5% both when we perform the test on the overall sample and in the restricted sample of players participating to the VET

Tab.3

Hypothesis	Wilcoxon rank-sum test
H1	z = 0.000 Prob > |z| = 1.000
H2A and H2B	z = 0.06 Prob > |z| = 0.952
H2C (control sample: the rest of participants to the voluntary meeting treatment)	Z=-2.70 Prob > |z|=.005
H2C (the rest of participants to the compulsory and voluntary treatments)	Z=-2.54 Prob > |z|=.001
H2C (the rest of the sample)	Z=-2.47 Prob > |z|=.013

Two preliminary conclusions are: i) in the Traveller's Dilemma the pure reduction of social distance does not seem to affect players' strategy. It seems to be a pretty interesting result which generates a puzzle given the several contributions which show a significative role of the reduction of social distance on players' decisions; ii) the reduction of social distance affects players' strategy in the Traveller's Dilemma only if players are characterized by social oriented preferences.

In order to deeper investigate our second result, we conduct cconometric estimates which may add value to our analysis in two respects by: i) controlling for strategic belief declarations; ii) controlling for socio-demographic factors which may affect our between subject design; iii) analysing the effects of the combination of generalised trust and willingness to meet the counterpart with a discrete and not a dicotomous (0/1) variable.

We therefore regress our dependent variable (which takes the value of one when C>B-1) measuring departures from individual rationality on the following controls: *Vol-meeting* (a dummy which takes value 1 if the subject plays the VET); *Yes-meeting* (a dummy which takes value 1 if the subject opts for the meeting in the VET treatment in which the option is available) and value 0 if the subject does not opt for the meeting in that treatment or participates in a different treatment); *Male* (a gender dummy taking the value of one if the subject is a male); *Numexp* (the number of experiments to which the subject has already participated in the past); *Baseline* (a dummy which takes value 1 if the subject took part to the baseline treatment); *Compuls-meeting* (a dummy which takes value 1 if the subject took part to the (CET) treatment in which the meeting is compulsory), *Gentrust* (the level of generalised trust declared by the player). We finally introduce a dummy (*D190*) which takes value 1 when the expected bid is 190, since we take into account that, in this case, the expected bid may be strategic (due to the +/- 10 tolerance of our reward on expected bid guess) and not coincident with the true one.

We build two different specifications for our base model. In the first we include the level of generalised trust declared by the individual player[19] (*Gentrust*). In the second we introduce both the level of generalised trust and an interaction variable (*Trustmeeting*) in which such level is multiplied by a dummy which takes the value of one if the individual chooses to meet the counterpart in the VET design and zero otherwise.

The main results of the two tested specifications (Table 4) show that departure from individual rationality is significantly and positively affected by gender and generalised trust. When we introduce the interacted *trustmeeting* variable we find that the latter is strongly significant while the generalised trust regressors loose significance. These findings are consistent with non rejection of our fourth hypothesis. When looking at the magnitude of the significant coefficients we observe that the magnitude of the gender effect is not negligible and implies that male gender raises by 24 percent probability of being we-rational. In the second specification, the marginal effect of the trust-willingness to meet interaction variable is of around 14 percent.

The gender result may appear unexpected. The literature on gender effects in experimental games is quite mixed, even though a partial consensus seems to exist on the fact that women tend to behave more socially in less risky situations (which does not contradict our finding given the risky

[19] The question which measures the level of generalized trust is the usual one: "Generally speaking do you believe that others should be trusted?" Answers range is from 10 (highest level of trust) to 0.

characteristic of the game).[20] Consider, however that, in our specific sample, when looking for gender differences in questionnaire variables we find that the only significant case is the reduced availability of women to lend money to friends.[21] Hence, women in our sample reveal to be less trustful than men. A potential explanation for this effect is that, given that our players are all students, we may expect that male players are significantly more willing to depart from individual rationality because they hope to meet a woman at the end of the encounter. This "flirting" rationale does not explain however the phenomenon since the gender effect remains significant if we limit the sample to the baseline treatment where there is full anonymity .[22]

In a robustness check we want to verify whether our findings remain significant when we reduce the variability of designs. We therefore reestimate the three specifications ruling out observations: i) from the compulsory meeting treatment; ii) from the baseline treatment and iii) including only observations from the voluntary meeting design (Tab. 5). Results are robust and confirmed under all of the three different reduced samples. When we eliminate CET observations we still have a significant gender effect (with a magnitude which gets larger up to 34 percent) and a significant interaction effect between generalised trust and decision to meet the counterpart (a magnitude of 17 percent). When we eliminate baseline observations both effects are significant with 29 and 15 percent quantitative effects respectively. The final robustness check reduces the sample to observations from the VET treatment only. The two effects remain strongly significant and grow in magnitude (35 and 22 percent respectively).

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[20] Eckel and Grossman (2001) show that, in ultimatum games, there is no significant difference between women and men that play as proposer, while women reject less frequently when they play as responders. Solnick (2001) shows that both women and men expect higher offers by a female proposer and offer more to a male responder. Bolton, Katok and Zwick (1998) and Bohnet and Frey (1999) do not observe any gender effect in dictator games. In their experiment on third party punishment Eckel and Grossman (1996) observe that, for women, the frequency of punishment is a decreasing function of the cost of punishment. Andreoni and Vesterlund (2001) show that in a dictator game with asymmetric information men are more selfish. In his well known survey on public goods game experiments Ladyard (1995) concludes that there is not any significant difference between the choices of men and women. According to Eckel and Grossman (1998) women behave like men in more risky situations, like ultimatum games, but are more socially oriented in less risky situation, like dictator games (see also Eckel and Grossman, 2008 and Eckel, 2008). This is confirmed by Croson and Buchan's (1999) experiment based on a trust game. They find that women behave like men when they play as trustor but they are more generous when play as trustee. Finally, Ortman and Tichy (1999) observe that in a repeated prisoner's dilemma, women are more cooperative, but only in the first round.

[21] The non parametric Wilcoxon rank-sum (Mann-Whitney) test identifies a significant gender difference in such direction ($z= -2.081 \text{Prob} > |z| = 0.038$).

[22] Results are omitted and available from the author upon request.

By considering our taxonomy of types, we must consider that our dependent variable does not rule out in absolute strategic behaviour. If the expected bid is 200 I may decide to play 200 because I'm a strategic one-shot cooperator. If we want to check whether our findings apply also excluding this possibility we have to remove observations in which B=200 from our estimates. We do that and find that results are substantially unchanged (Tab. 6).

To verify what is behind our results, we look at correspondences between values of the *Trustmeeting* variable and the difference between choice and belief. A relevant descriptive result, which confirms our empirical findings, is that, for all players declaring a level of trust above median and choosing to meet in the VET, the difference between choice and belief is nonnegative. All of them therefore depart from the individually rational behaviour.

5.1 Interpretation of econometric findings

To interpret the significance of the *Trustmeeting* variable we consider that in the VET, by giving the possibility to meet the other player, we introduce in our experiment the possibility to consume relational goods through a personal interaction that agents will share after having played the game. Each player can affect the disposition that the counterpart has towards her by showing herself "generous (i.e. by trying to avoid the sanction against the other)". A "generous" contribution reveals the willingness to create a cooperative relation with the other player and creates positive conditions for the production of relational goods after the game. On the social and economic point of view, such contribution entails a monetary risk for the player which may traded off by nonmaterial benefits generated by the relational good consumed during the encounter.

Another important issue is why socially oriented attitudes (gift giving or team rational behaviour) need to be related to the level of generalised trust. Our *a priori* (implied in hypothesis H2C) is that socially oriented individuals first formulate an assumption on whether counterparts can be socially oriented as well and, only if they deem so, decide to depart from individual rationality. The added value of the (generalised trust/willingness to meet) interacted variables may therefore be interpreted in two ways: the more I trust people, the more i) I expect that the counterpart will appreciate my gift making it more productive in terms of creation of a positive relational environment for the meeting; ii) I am confident on the complicity of the counterpart when I am team rational.[23]

A natural consideration which may arise is that, by allowing players to make a choice in the treatment, we depart from the random selection typical of experiments and introduce an element of selection bias. On this point consider that, given the specific focus of our paper (investigation of nature and causes of behaviours different from individual rationality), we are not specifically interested in the causality link between the departure from individual rationality and the design which reduces social distance and allows for the creation of relational goods. In other terms, it is not essential to know here whether the opportunity of the meeting creates the gift giving, or the team rational, behaviour in the player, or whether non individually rational types find an opportunity to express themselves due to the VET design. The core finding is that with this design we observe that a reduction of social distance associated with the desire to consume relational goods generates a reduction of the individually rational behaviour. Toghether with it we observe the association of generalised trust, willingness to meet the counterpart and the gift.

Finally, even though in the *trustmeeting* variable we relate an experiment outcome to a variable measured in the ex post experiment survey, we feel confident that our finding does not depend from an ex post players rationalisation of their choices. Assume in fact that players with choices higher than expected bids or, more generally, players who depart from individual rationality, rationalise themselves ex post as people with very high level of generalised trust. In such case there should be a correlation between the two variables, irrespective of the treatment design. On the contrary, we find that the pairwise correlation is not significant and extremely small, in general (.06) in the two treatments without voluntary meeting.

[23] Consider that the latter reasoning should be strictly applied when expected bids are very high. We however observe that the average belief of those who choose to meet the counterpart is not higher than that of the rest of the sample (with no significant relationship between the variable and the design). Furthermore, our results are robust when we rule out expected bids equal to 200 and therefore the possibility that departure from rationality is strategic.

6. Conclusions

Traveler's Dilemma experiments have been run so far in a rigorously anonymous setting. Even though the logic of the experiment and the original story told when the dilemma was first formulated have different lifes, it is nonetheless worth noting that the imposed anonymity characteristic contradicts the story. The two travellers located in different rooms by the airline company officier know each other very well, and will meet again after the bid. Even if they were game theorists and therefore the NE were common knowledge among them, lack of anonymity is a powerful motivation for deviating in such circumstances from the NE outcome. It is therefore possible that they would bid high because they guess that the counterpart will do the same or because they do not want to create an embarassing unfriendly situation when they will soon meet again. Bringing this argument to a limit case, our assumption is that minimal departures from the anonymity assumption standardly assumed in TD experiments (and not fully correspondent with the story behind it) may contribute to trigger non Nash rational behaviour.

To test our general proposition, we evaluate the effect of removal of anonymity with three different treatments: baseline (BT), compulsory meeting ex post (CET) and voluntary meeting ex post (VET). The characteristics of our two last original designs are that players meet ex post without preplay communication or possibility to coordinate their strategies ex ante. The standard baseline treatment therefore becomes the limit case of lack of social interaction and the two modified treatments may be a framework which magnifies social norms which are also present, but less visibile, in the standard design when we observe deviations from individual rationality in it. As a consequence, pro-social, team rational or gift giving motivations, eventually emerged in the modified treatments, may also apply in smaller scale to the limit case of the baseline treatment if we assume that anonymity does not eliminate them completely. On the basis of our general proposition we formulate four hypotheses on the probability to deviate from the individual rationality by considering the effect of the compulsory and voluntary encounter treatment and by distinguishing among the possible motivations behind the decision to meet the counterpart.

After illustrating with our descriptive findings deviations from NE and individual rationality similar to those found in other works, we try to explain the paradox by defining a taxonomy of types which includes “one-shot-cooperators”, “individually rational”, “team-rational” and, apparently, “irrational” (i.e. players who declare a number higher than their belief on the counterpart) types.

The main point we make here is that there are at least two different motivations (corresponding to two different types) to play the highest choice instead of the NE one.

In the first the player aims to maximise the outcome of both players (the team) and not just her personal one. As in other social dilemmas, in the Traveller’s Game it is extremely convenient if both players are of the we-rational type. With our payoff structure the meeting of two we-rational types yields an output which is ten times higher than that which can be obtained when both players follow Nash rationality.

The second type who may choose the highest bid is the one-shot cooperator. Such type does not care about the counterpart payoff as the we-rational individual does. She however thinks that, if the other player will be cool enough to choose the highest value, this will be good for both. The tiny difference between the two types is that the we-rational player sincerely cares for the counterpart payoff or dislikes payoff inequality. This is demonstrated concretely by the fact that, if her belief on the counterpart is below the maximum choice, she will choose the same and not a lower value to undercut the opponent.

In the descriptive statistics part of the paper we generally observe that a large number of couples of choice-beliefs are consistent with one-shot cooperation, team rationality or irrationality. With respect to the effect of the three treatments on the likelihood of departure from individual rationality we formulate four hypotheses and show that the fourth one is not rejected: only in the VET, and only for those who express high levels of generalised trust and the willigness to meet the counterpart, we observe significant departures from individual rationality.

In the econometric part of the paper we control the robustness of this finding and confirm that, together with a male gender effect, the interaction of generalised trust and decision to meet the counterpart in the VET design affect positively and significantly the probability of departing from individual rationality and assuming a team rational or “irrational” (gift giving) attitude.

In order to interpret this finding, we observe that, if we introduce preferences for relational goods, we may easily convert again the “irrationality” into a different type of “gift giving” rationality based on the popular knowledge saying that “*you should never go bare handed into other people house*”. Those who voluntarily choose to meet the counterpart may want to enjoy a relational good and try to create an agreeable (avoid a disagreeable) athmosphere at the moment of the encounter. They know that such agreeability is function of the difference between their choice and the choice of their counterpart (which is proxied by their beliefs). This last finding is more a relational good than a removal from anonymity effect. In the second case, the difference between choice and belief should be significant also in the compulsory treatment dummy, while this is not the case.

This interpretation helps to understand the significance of the interaction between decision to meet and generalised trust on the departure from individually rational behaviour. The more I trust on others, the more I expect that my gift will be appreciated and that the quality of the relational good created in the meeting will be high.

Even though we do not obviously rule out the possibility of purely irrational or random plays, the lesson we can draw from our experiment is that heterogeneous behaviour need not to be termed as irrational since there are different forms of rationality with their inner logic. First, the adoption of we-rationality is the optimal adaptation of players to the characteristics of the game. Second, gift giving rationality may be an optimal way to maximise individual preferences which include social arguments.

Further research in this direction should evaluate how these conclusions are affected by changes in the penalty or other elements of the game. It is reasonable to predict that higher penalties would increase the tendency toward standard NE rational behaviour without eliminating the heterogeneity of types and their sensitiveness to changes in the experiment design (removal of anonymity, introduction of the possibility of consuming relational goods).

Table 4. The determinants of the departure from individual rationality

Method	*Logit*	*Logit*
Gentrust	0.174	0.051
	(0.100)*	(0.114)
Trustmeeting		0.613
		(0.308)**
Yes-meeting	0.246	-2.643
	(0.579)	(1.514)*
Male	1.263	1.372
	(.414)***	(0.424)***
Numexp	0.103	0.120
	(0.097)	(0.098)
D190	0.551	0.512
	(0.429)	(0.432)
Baseline	-0.368	-0.389
	(0.561)	(0.562)
Compuls-meeting	-0.317	-0.348
	(0.555)	(0.555)
Constant	-1.231	-0.658
	(0.670)*	(0.716)
Pseudo R^2	0.113	0.141
Prob > χ^2	0.004	0.001
Number of obs.	139	139

Legend: the dependent variable is a (0/1) dummy which takes the value of one when C>B-1 (C being the player's bid and B her belief on the counterpart's choice); *Gentrust*: agreement (from 1 to 10) on the following statement: "Generally speaking, people can be trusted"; *Yes-meeting*: dummy which takes value 1 if the subject opts for the meeting in the (VET) treatment in which the option is available and value 0 if the subject does not opt for the meeting in that treatment or if the subject participates in a different treatment; *Trustmeeting*: *gentrust***Yes-meeting*; *Male*: gender dummy taking the value of one if the subject is a male; *Numexp:* Number of experiments the subject has already participated in the past. *D190*: a dummy which takes value of 1 when the expected bid is 190; *Baseline:* dummy which takes value 1 if the subject took part to the baseline treatment; *Compuls-meeting:* dummy which takes value 1 if the subject took part to the (CET) treatment in which the meeting is compulsory. *Vol-meeting:* dummy which takes value 1 if the option of the meeting is available for individuals participating in the experiment. * Significant at 10%; ** significant at 5%; *** significant at 1%; Standard errors in brackets.

Tab.5 The determinants of the departure from individual rationality (robustness check)

Method	*Logit if Incobbl=0*	*Logit if Incobbl=0*	*Logit if Baseline=0*	*Logit if Baseline=0*	*Logit if Incvolo=1*	*Logit if Incvolo=1*
Gentrust	0.210 (0.127)*	-0.035 (0.159)	0.146 (0.110)	-0.018 (0.130)	0.203 (0.152)	-0.259 (0.225)
Trustmeeting		0.789 (0.349)**		0.673 (0.315)**		1.044 (0.400)***
Yes-meeting	0.248 (0.604)	-3.544 (1.740)**	0.231 (0.575)	-2.962 (1.552)*	0.230 (0.616)	-4.805 (1.997)**
Male	1.504 (0.533)***	1.669 (0.556)***	1.182 (0.489)**	1.349 (0.508)***	1.605 (0.739)**	1.927 (0.818)**
Numexp	0.394 (0.183)**	0.477 (0.189)	0.053 (0.102)	0.074 (0.102)	0.371 (0.221)*	0.538 (0.243)**
D190	0.212 (0.554)	0.125 (0.569)	0.585 (0.523)	0.558 (0.534)	0.185 (0.799)	0.2814 (0.880)
Baseline	-0.396 (0.601)	-0.398 (0.611)				
Compuls-meeting			-0.283 (0.557)	-0.340 (0.563)		
Constant	-1.819 (0.799)**	-0.736 (0.895)	-0.992 (0.717)	-0.226 (0.788)	-1.766 (0.935)*	0.205 (1.155)
Pseudo R^2	0.181	0.232	0.094	0.139	0.170	0.285
Prob > χ^2	0.001	0.000	0.054	0.011	0.019	0.001
Number of obs.	99	99	100	100	60	60

Legend: the dependent variable is a (0/1) dummy which takes the value of one when C>B-1 (C being the player's bid and B her belief on the counterpart's choice); *Gentrust*: agreement (from 1 to 10) on the following statement: "Generally speaking, people can be trusted"; *Yes-meeting*: dummy which takes value 1 if the subject opts for the meeting in the (VET) treatment in which the option is available and value 0 if the subject does not opt for the meeting in that treatment or if the subject participates in a different treatment; *Trustmeeting*: *gentrust***Yes-meeting*; *Male*: gender dummy taking the value of one if the subject is a male; *Numexp:* Number of experiments the subject has already participated in the past. *D190*: a dummy which takes value of 1 when the expected bid is 190; *Baseline:* dummy which takes value 1 if the subject took part to the baseline treatment; *Compuls-meeting:* dummy which takes value 1 if the subject took part to the (CET) treatment in which the meeting is compulsory. *Vol-meeting:* dummy which takes value 1 if the option of the meeting is available for individuals participating in the experiment. * Significant at 10%; ** significant at 5%; *** significant at 1%; Standard errors in brackets.

Tab.6 The determinants of the departure from individual rationality when B<200

Method	*Logit*	*Logit*	*Logit if Incobbl=0*	*Logit if Incobbl=0*	*Logit if Baseline=0*	*Logit if Baseline=0*	*Logit if Incvolo=1*	*Logit if Incvolo=1*
Gentrust	0.159	0.007	0.284	0.030	0.065	-0.151	0.181	-0.253
	(0.118)	(0.138)	(0.152)*	(0.190)	(0.124)	(0.155)	(0.163)	(0.235)
Trustmeeting		0.674		0.799		0.785		1.045
		(0.355)*		(0.417)*		(0.356)**		(0.446)**
Yes-meeting	0.258	-3.015	0.113	-3.830	0.331	-3.513	0.215	-4.949
	(0.614)	(1.783)*	(0.669)	(2.120)*	(0.603)	(1.796)*	(0.653)	(2.257)**
Male	1.461	1.571	2.302	2.486	1.016	1.179	1.841	2.184
	(0.488)***	(0.503)***	(0.663)***	(0.696)***	(0.562)*	(0.594)**	(0.816)**	(0.908)**
Numexp	0.183	0.218	0.482	0.564	0.105	0.149	0.360	0.505
	(0.128)	(0.134)	(0.211)**	(0.218)**	(0.133)	(0.143)	(0.224)	(0.246)**
D190	0.455	0.451	-0.240	-0.298	0.790	0.826	0.193	0.273
	(0.487)	(0.496)	(0.655)	(0.685)	(0.569)	(0.595)	(0.826)	(0.905)
Baseline	-0.179	-0.244	-0.289	-0.378				
	(0.633)	(0.640)	(0.712)	(0.729)				
Compuls-meeting	-0.371	-0.417			-0.249	-0.322		
	(0.666)	(0.676)			(0.665)	(0.691)		
Constant	-1.376	-0.676	-2.391	-1.240	-0.780	0.219	-1.746	0.155
	(0.748)*	(0.810)	(0.942)**	(1.042)	(0.779)	(0.890)	(0.995)*	(1.212)
Pseudo R^2	0.141	0.173	0.264	0.306	0.090	0.150	0.174	0.279
Prob > χ^2	0.004	0.001	0.000	0.000	0.136	0.023	0.026	0.002
Number of obs.	114	114	86	86	82	82	54	54

Legend: the dependent variable is a (0/1) dummy which takes the value of one when C>B-1 (C being the player's bid and B her belief on the counterpart's choice); *Gentrust*: agreement (from 1 to 10) on the following statement: "Generally speaking, people can be trusted"; *Yes-meeting*: dummy which takes value 1 if the subject opts for the meeting in the (VET) treatment in which the option is available and value 0 if the subject does not opt for the meeting in that treatment or if the subject participates in a different treatment; *Trustmeeting*: *gentrust*Yes-meeting*; *Male*: gender dummy taking the value of one if the subject is a male; *Numexp:* Number of experiments the subject has already participated in the past. *D190*: a dummy which takes value of 1 when the expected bid is 190; *Baseline:* dummy which takes value 1 if the subject took part to the baseline treatment; *Compuls-meeting:* dummy which takes value 1 if the subject took part to the (CET) treatment in which the meeting is compulsory. *Vol-meeting:* dummy which takes value 1 if the option of the meeting is available for individuals participating in the experiment. * Significant at 10%; ** significant at 5%; *** significant at 1%; Standard errors in brackets.

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APPENDIX 1 - Timing of the experiment

BASELINE TREATMENT (BT)

T_1	T_2	T_3	T_4	T_5
The experimenter reads the instructions about the game	Control questions; checks and corrections by the experimenters	Subjects play the Traveler's dilemma	The experimenter reads the instructions about the survey (beliefs, risk attitude, socio-demographics)	Subjects fill the survey

COMPULSORY ENCOUNTER R TREATMENT (CET)

T_1	T_2	T_3	T_4	T_5	T_6
The experimenter reads the instructions about the game. Subjects are informed about the encounter	Control questions; checks and corrections by the experimenters	Subjects play the Traveler's dilemma	The experimenter reads the instructions about the survey (beliefs, risk attitude, socio-demographics)	Subjects fill the survey	Encounter

VOLUNTARY ENCOUNTER TREATMENT (VET)

T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
The experimenter reads the instructions about the game. Subjects are informed about the encounter option	Control questions; checks and correction by the experimenters	Subjects decide whether to meet or not the counterpart	Subjects play the Traveler's Dilemma	The experimenter reads the instructions about the survey (beliefs, risk attitude, socio-demographics)	Subjects fill the survey	Subject learn the counterpart's decision about encounter	Encounter