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The role of dynamics for trust development. An experimental study

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Abstract

We report results from a trust game applied in a dynamic setting, which enhances investment possibilities and offers higher potential payoff from cooperation. The proposed approach better reflects the predicaments people face in concluding informal contracts and enables to investigate dynamics of cooperation relationships between players. Although, transferred shares of the disposable endowment do not differ significantly across the standard and modified games, in the absolute values people send more in the dynamic context. Our results suggest that the dynamic setting of the relationship, which has been often ignored in previous studies, might be an important determinant of trust.

Keywords: Trust; Repeated games; Laboratory experiment.
JEL Codes: C72, C91.

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1. Introduction

Although writing an entirely complete contract is suggested by the theory on optimal contracting, it is usually impossible. Typical reasons for leaving some aspects in contracts unspecified include transaction costs and bounded rationality. On the one hand, determining all contractual dimensions may be tied to very high costs (see, for instance, Coase, 1937, and Williamson, 1975). On the other hand, contracting parties might be subject to bounded rationality and fail to predict all possible events, or to perceive the necessity of specifying some contract elements (see, for example, Simon, 1981).

Questioning the recommendations following from the theory on optimal contracting, some academics argue that incompleteness might underlie a well-designed contract, which they propose in a concept of relational contracting (Bernheim and Whinston, 1998; Levin, 2003). Relationships between parties often go well beyond the possibilities of contractual specifications, and thus, contracts that take into account their role (i.e. leave some degree of incompleteness relying on the relationships) could benefit from the flexibility to adapt the contract within its duration or ex post.

Therefore, most contracts deliberately leave certain aspects unspecified. In order to obtain efficient outcomes of incomplete agreements, "an essential ingredient" is necessary, namely trust or good faith, as called by Levin (2003, p. 847). Although the importance of trust for fulfilment of contracts relying on personal relationships is unquestionable, less is known about what drives trust. Among experimental studies exploring the problem, for instance, Bohnet et al. (2001) find that contract enforceability impinges on individual's behaviour, and Engle-Warnick and Slonim (2006) conclude that concern for the future affects trust. These results provide valuable knowledge for market designers. Knowing the economic conditions, which enhance trust and trustworthiness behaviours, institutions may create appropriate environments increasing efficiency.

This paper supplements the experimental literature with the empirical evidence on determinants of trust in repeated relationships. The environment, which is analysed with respect to its impact on trust behaviour, corresponds to Levin (2003). The author argues that good faith is important only in a dynamic context, in which future terms of cooperation result from the success of the present interaction. Then, trust may allow to build an effective contractual relationship. By contrast, in static situations when both parties have an outside option, good faith does not play an important role, as a mutually beneficial contract does not have a chance to be developed. This article provides the empirical investigation of trust development in a dynamic setting. Our experiment explores whether environment encouraging development of strong cooperation relationships by offering higher payoff from cooperation influences the success of the interaction.

The study employs a modified version of the trust game originally designed by Berg et al. (1995), which enables to capture the effect of dynamics on the development of trust in relationships. In this game, a first mover (henceforth, a sender) can transfer any part of his endowment to an anonymous partner (henceforth, a receiver). The transferred amount is tripled before reaching the second player. Subsequently, the receiver decides whether she sends back her partner any part of the received transfer. The send and return actions are referred as trust and trustworthiness, respectively.[1]

In our experiment an interaction between two players lasts five rounds, each of which consists of a move of a sender followed by a decision of a receiver. Our approach introduces dynamics into the relationship between partners by accumulation of money over a single interaction. It means that in the dynamic variant a sender is allowed to transfer any amount of his accumulated money within the interaction with the same partner. In contrast, the standard game assumes that the person can maximally send the endowment he arbitrarily gets at the beginning of a round and previous earnings do not affect the amount possible to be transferred. After finishing five rounds with the same partner, players are anonymously matched into new pairs, in which they start playing with equal endowments and capital accumulation begins anew. The dynamic version is compared with a baseline treatment, which is the standard trust game as introduced by Berg et al. (1995) performed in a repeated variant.

The game modification allows to address the question how trust and trustworthiness evolve over time when capital accumulation enables larger investments, and whether the increased potential payoff from cooperation in the dynamic setting affects the behaviour of players. This corresponds to the argument made by Dal Bó and Fréchette (2011) who suggest that if cooperation is to prevail, the payoff from it and the probability of continuing an interaction in the future must be high enough. Our experiment explores empirically the effect of the first factor by enhancing potential gains from cooperation.

Everyday life provide many examples of the dynamic nature of trust, which evolves in long-term relationships, where stakes increase with duration of interactions. Nearly all long lasting commitments between humans include trust in the dynamic sense. Firm partners may serve as a standard example. Initially their level of trust is typically low, as they do not know each other well and need time to develop a cooperation relationship. Hence, their financial engagement in their firm is relatively low at the beginning, as compared to later periods. Development of the relationship and building trust between the partners result in tightening the coopera-

[1] Alternatively, the game of Berg et al. (1995) is called an investment game. With this interpretation, the amount sent by the first mover expresses investment in a risky project.

tion and engaging higher stakes in the common business. A romantic relationship is also a good example of trust dynamics. At the beginning partners treat each other with more distance and do not engage fully, having limited trust to a person who they actually do not know well. As the relationship develops, their engagement increases, so they might decide to marry or want to have children together.

To the best of our knowledge, no previous study offers an approach that enables to capture predicaments people face in a repetitive cooperation interaction where stakes increase over time. This new context, although closely related to the standard game, is likely to influence parties' decisions, because it substantially changes potential payoff from cooperation. The only related investigation of trusting behaviour in a dynamic setting is performed by Greiner et al. (2012)[2]. The researchers also modify the trust game to introduce money accumulation over time, however, what distinguishes their approach from the variant proposed in this study, is that in their experiment partners are randomly and anonymously matched every round. Consequently, the development of cooperation in a single relationship cannot be investigated, which constitutes a fundamental aim of this article.

Two main findings on trust behaviour follow from our study. Firstly, in the dynamic context, which extends investment possibilities through capital accumulation, people transfer significantly more when absolute values are considered. However, transferred proportions of the entire disposable endowment are statistically indistinguishable between standard and modified games, indicating that people do not decide to go beyond a certain, self-determined limit of transferred shares. Hence, the transferred amounts, although larger in the dynamic setting in the absolute values, always constitute a similar fraction of the disposable endowment. Secondly, the experiment shows stronger reciprocity in the actions of players in the dynamic context when transfers are treated in absolute values. More responsive behaviour induced by the dynamic game might be related to the fact that reciprocity serves as a tool to persuade the partner to behave cooperatively, and thus, its impact is stronger when cooperation has a greater value, i.e. it is related to higher potential payoff.

The paper is organised as follows. Section 2 proceeds with a description of the experimental design and procedures, and introduces research hypotheses based on the existing literature. Section 3 presents the results and provides statistical verification of the hypotheses. The final discussion and conclusions are included in Section 4.

[2] In a repeated setting, trusting behaviour has been examined experimentally with the use of the trust game by many researchers, to which, for example, Anderhub et al. (2002), Bohnet and Huck (2004), and Engle-Warnick and Slonim (2004, 2006) belong. However, none of those studies investigates development of trust in a single relationship in a dynamic context.

2. Experimental design and hypotheses

2.1. Experimental design and procedures

The research focuses on the development of trust in a dynamic setting, which could be expected to promote cooperation, since it offers enhanced profit possibilities. We develop a modification of the trust game introduced by Berg et al. (1995) to include money accumulation, so that senders are not limited in their investments to the endowment they receive each period. The modified version (henceforth, dynamic) is compared with the standard repeated trust game (henceforth, static).

At first, participants are randomly assigned to the roles of a sender or a receiver (in the instructions referred as Person A and Person B, respectively), which stay the same for the entire experiment to allow for gaining experience and inspire learning. Senders and receivers are anonymously matched into pairs to play every game (called a supergame), which consists of five rounds. Within a supergame, partners play in the same pairs. Across consecutive supergames participants are always randomly and anonymously matched into groups.

Each round begins with all players receiving 100 points. In a static treatment the game reflects the standard approach designed by Berg et al. (1995), but in a repeated setting. A sender is a first mover in every round and he decides how much of the received 100 points he transfers to his partner in a pair. If a sender chooses to send nothing, the round ends with each player earning 100 points. However, when a sender decides to transfer a part or all of his endowment, the amount sent is tripled and given to the receiver. Then, the receiver chooses how much of the tripled amount received she sends back to her partner. She can choose any whole number from the interval between 0 and the tripled amount sent. The round ends with the decision of the receiver. Each round in the static treatment looks identical and participants play five consecutive rounds in the same pairs. After completing five rounds, i.e. after finishing one supergame, senders and receivers are again randomly and anonymously matched into new pairs, in which they play the next supergame.

A dynamic treatment introduces a possibility for senders to transfer any number of points from the whole sum that they have accumulated in previous rounds of an interaction with the same partner. Similarly to the static treatment, at the beginning of each round all participants get 100 points and then, a sender decides how much of his endowment to transfer to his partner. The difference from the static version is that he is not constrained to send 100 points maximally, but he can transfer up to the entire amount of points he has accumulated in the previous rounds of the supergame. What is crucial, the points do not accumulate across different supergames, which means that at the beginning of each supergame all players are in the same situation, i.e. endowed with 100 points. After a decision being taken by the sender, the receiver chooses how much of the received tripled amount she sends back. The round ends with the decision of the receiver. In the next round of the same supergame, senders can transfer to a partner up to 100 points plus what they have already accumulated in this supergame. After completing five rounds, like in the static treatment, subjects are again randomly and anonymously paired into new groups.

The experiment uses a between subject design, so subjects participate only in one of the two treatments, which reduces the probability of the experimenter demand effect. Anonymous matching of participants into pairs excludes the possibility of reputation building across supergames, an effect of which has been widely discussed in the context of trust behaviour (Charness et al., 2011; Keser, 2002). Moreover, as subjects cannot identify each other, the impact of race, nationality and other background characteristics, which Glaeser et al. (2000) and Fershtman and Gneezy (2001) observe, can be eliminated. The potential impact of inequality aversion on the behaviour of participants (documented, for example, by Anderson et al., 2006) is also foreclosed across different supergames, since accumulation of money in the dynamic treatment is possible only within one supergame and each interaction with a new partner starts with equal endowments. Players are also not informed about their partner's results from previous supergames.

Two experimental sessions were conducted in May and June 2013 in the Vienna Centre of Experimental Economics at the University of Vienna. In total 36 subjects took part in the experiment, equally divided between the two treatments. The static game consisted of 10 supergames in each session, however, due to the time limit, participants of the dynamic game played 6 supergames in May and 12 in June. The session in May lasted 50 minutes, whereas the one in June 70 minutes. The experiment was computerised with the use of Zurich Toolbox for Readymade Economic Experiments (z-Tree). Participants received a show-up fee of 5 euros plus individuals' earnings from randomly selected supergames[3] converted according to the exchange rate: 1 euro = 500 points.[4]

In both treatments subjects knew only the results of the games they have played. The procedures were common knowledge to participants and were described in paper instructions. All subjects within a treatment received the same set of instructions. Questions were answered in private. The experiment began with two control questions allowing to verify understanding of the game rules by subjects and ended with a short questionnaire on socio-demographic characteristics.

[3] In the static treatment earnings from five randomly selected supergames were added to the show-up fee, whereas in the dynamic game only one randomly chosen supergame was taken into account. Final payoffs were determined by different numbers of selected supergames in the two treatments in order to equalise the expected payoffs between the two versions of the game.

[4] Financial support for the experiment was provided by the Department of Economics at the University of Vienna.

2.2. Hypotheses

At first, it is important to emphasise, the main idea motivating our investigation is not to test any particular theory, as no theory that encompasses the complex dynamics exists, but to propose an alternative, experimental approach to capture the dilemmas contracting parties face when a dynamic nature of trust is taken into consideration. Our experiment is actually the first step in the direction of examining the behaviour of contracting parties in the dynamic setting, since ultimately the game should also allow for an infinite time horizon.

In the one-shot trust game Nash Equilibrium predicts no transfer and no return. The theoretical prediction for the repeated game is also straightforward, as the only equilibrium of any finitely repeated, sequential game is a repetition of one of the stage game equilibria (Piccione and Rubinstein, 1993). According to the Folk Theorem, a cooperative equilibrium in a trust game may emerge only in the case of an infinite time horizon. Thus, by backward induction, no trust and no trustworthiness is expected in the finite, dynamic game, assuming perfect rationality and selfishness of players.

Nevertheless, the reality shows that people do not act like *homo economicus*. Numerous empirical studies display cooperative behaviour between players (see Camerer, 2003, for the review). The literature gives several explanations why cooperative outcomes appear. Berg et al. (1995) assigns them to players' sentiments to trust and trustworthiness. Kreps et al. (1982) claim that cooperation results from incomplete information about motivation and behaviour of other players. People participating in trust games do not know the type of their partner – whether he is altruistic, prosocial or has other-regarding preferences, as suggested by Fehr and Schmidt (1999). Another explanation of cooperative behaviour suggested in the literature is that players try to acquire a reputation or imitate that they are altruistic, and hence, choose cooperative actions. Kreps and Wilson (1982) argue that cooperation in the early stages of a game might be a rational choice, since players can pretend in this way that they are cooperative types and use the opportunity to increase their payoffs until cooperation unravels at the end of the game.

Consequently, it is expected that sent and returned amounts will diverge from the theoretical prediction of null in our research. As the two analysed treatments differ only with respect to the lack or the possibility of money accumulation, the experiment allows to verify whether enhanced potential payoff from cooperation influences players' willingness to send and return money (thus, to cooperate). As indicated by Dal Bó and Fréchette (2011), cooperation requires favourable conditions to prevail: (1) high probability of future interactions and (2) high possible payoff from cooperation. Our experiment provides treatments different with respect to the latter aspect, hence, we expect higher sent and returned values in the dynamic game, which promotes cooperation in the sense suggested by Dal Bó and Fréchette (Hypothesis 1).

Moreover, the learning effect is considered. Investigating finitely and indefinitely repeated trust games, Engle-Warnick and Slonim (2004) conclude that actions undertaken by inexperienced subjects do not differ significantly across the two kinds of games, however, when players gain experience, they behave differently in finite and indefinite interactions. Accordingly, the decisions of inexperienced players in our experiment are expected not to be significantly different across the static and dynamic games, and the differences in cooperation levels are likely to appear in later periods (Hypothesis 2).

Furthermore, a difference between the treatments is supposed to occur with regard to the strength of reciprocity, i.e. the decisions of players rewarding the kind behaviour of a partner and punishing the unkind one. As suggested by Levin (2003), in ongoing interactions contracting parties condition future terms of their investment relationship on the current realisation. Since the dynamic treatment offers higher potential earnings, players might be more strongly motivated to encourage their partner to a cooperative play. Reciprocity can serve as a tool for persuasion to cooperative actions. Thus, it is expected that the decisions of players in the dynamic treatment will be influenced to a greater extent by the actions of their partners (Hypothesis 3).

Additionally, the results are expected to be influenced by the end-game effect, which means that typically cooperation obtained during the entire interaction unravels at its end (Bornhorst et al. 2004; Selten and Stoecker, 1986). As both treatments are characterised by the same finite time horizon, which is known to the experiment participants, no difference with this respect is supposed to occur across the static and dynamic games (Hypothesis 4).

3. Results

3.1. Aggregate data

Figure 1 shows the evolution of average send and return rates over the course of the experiment. The send rate in a single round is defined as the amount the sender transfers to the receiver divided by the whole amount that could be sent. In other words, it expresses the transferred (invested) fraction of the disposable endowment. Analogically, the return rate measures the returned proportion of the maximum amount the receiver could send back. Hence, it is the amount returned divided by 3 times the amount the sender transferred.[5]

[5] When a receiver gets nothing from her partner, a missing value is assigned to the return rate.

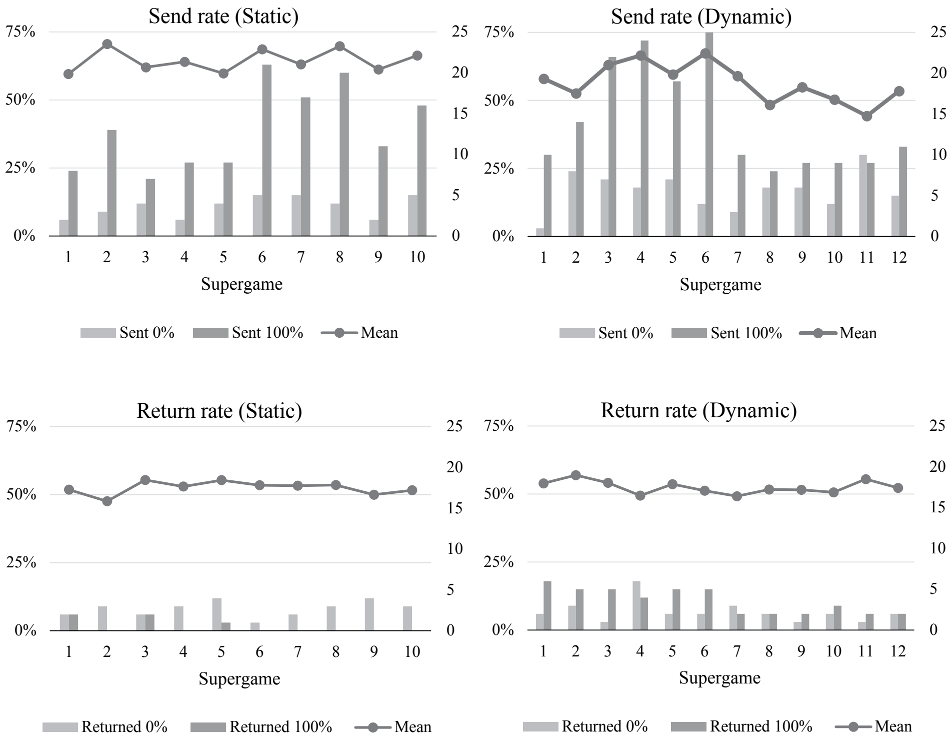

Figure 1. Average send and return rates over supergames.

Note: The left axis shows the values of the rates, while the right axis indicates the number of players who transferred 0% or 100%.

Figure 1 shows that the Nash equilibrium predictions, according to which send and return rates should be equal to 0%, are undoubtedly rejected. Senders transfer on average 40-70% of their entire endowment, while receivers return a little smaller shares, oscillating around 50%. The average values of transferred rates suggest that neither does the variant of the game influence the players' choices significantly, nor the behaviour of players depends on the elapsed time of the experiment, indicating that experience accumulation does not play an important role in taking decisions.

Analysis of the extreme decisions of players, to transfer everything or nothing, suggests that the two treatments induce different behaviour, in particular in the case of senders. In the static version, 100% send rates appear much more often in later supergames in comparison to early periods. This contrasts with the senders' behaviour in the dynamic treatment, where the frequency of sending the entire disposable endowment increases till the 6th supergame and is much rarer in the second half of the experiment. It might imply that in the dynamic setting accumulated experience incentivises senders to withdraw from possible cooperation, which contradicts with the expectation that the dynamic game would encourage players to tighten their relationships. Nevertheless, in total decisions to transfer 100% are taken in a greater number in the dynamic treatment, as Table 1. indicates. At the same time, the table presents that in the dynamic game more senders resign from investing by choosing to send nothing. Clearly, the extreme decisions of senders to transfer 0% and 100% of their endowments appear more frequently when the interaction is dynamic.

Table 1. Shares of participants transferring 0% or 100%

	Static		Dynamic	
	0%	**100%**	**0%**	**100%**
Senders	8%	29%	15%	38%
Receivers	6.5%	1%	8%	11%

Turning to the behaviour of receivers, no apparent dependence of their extreme choices on the elapsed time of the experiment exists. When the game as a whole is considered, evidently, much fewer receivers decide to return everything in the static treatment, as Table 1 presents. Regarding receivers' choices of 0% transfers, their number does not differ substantially across the two variants of the game, nonetheless, slightly more players decide not to return anything in the dynamic version. Similarly to the conclusion following from the analysis of senders' behaviour, receivers also take the extreme decisions more often in the dynamic game.

The dynamic context seems to encourage taking the extreme choices, as the shares of participants transferring 0% or 100% of their disposable endowment are in each case larger for the dynamic treatment in comparison to their counterparts for the static game. This is potentially tied to higher potential payoff from cooperation in the dynamic setting. Transfers of the entire endowment open the possibility to develop highly productive relationships, while zero-transfers might serve as a tool to punish uncooperative behaviour of a partner. Consequently, these two types of extreme decisions occur more often in the dynamic game, as expected.

Whereas the proportions transferred are similar across the two treatments, in the absolute values the transfers obtain higher levels in the dynamic game, which Figure 2 depicts. Both senders and receivers send substantially more in the modified trust game, meaning that senders take the opportunity of having greater endowments for investment and send higher amounts. Furthermore, the graphs confirm the negligible role of experience for the players' choices. In the static game the average sent and returned amounts are almost indistinguishable across supergames. In the dynamic treatment much more volatility is observed, although, no clear pattern exists.

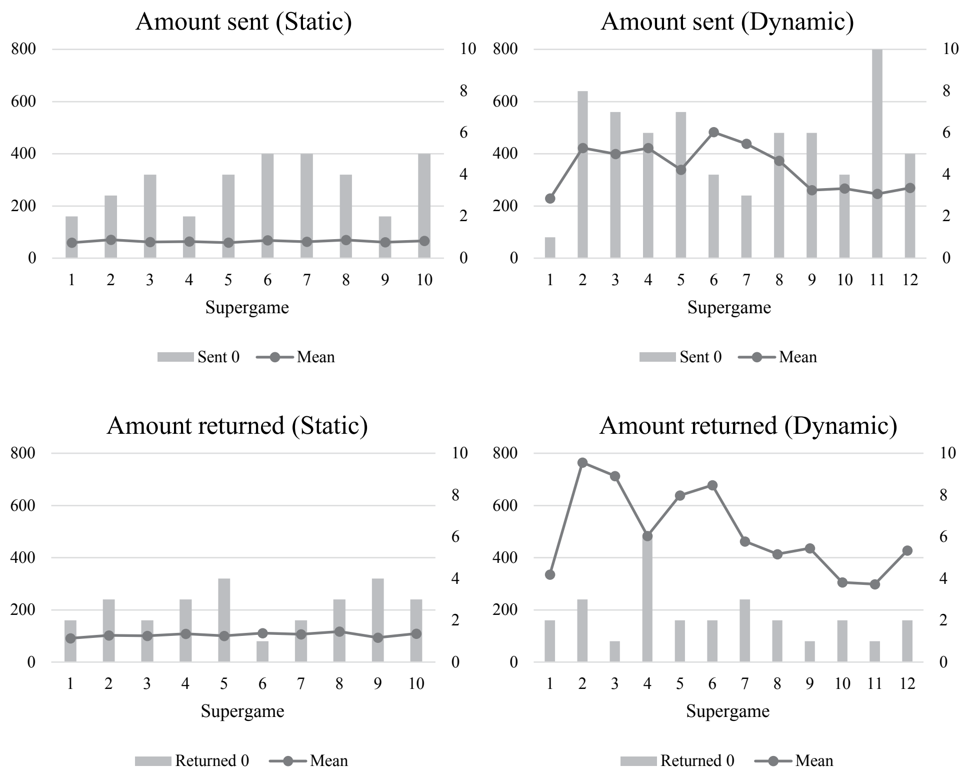

Figure 2. Average amounts sent and returned over supergames.

Note: The left axis shows the values of the rates, while the right axis indicates the number of players who transferred nothing.

Figures 3 and 4 illustrate the actions of players over rounds with respect to the proportions and the absolute values transferred, respectively. Considering the average send and return rates, subjects seem not to be influenced by the setting. For receivers the two lines depicting their behaviour across the two treatments almost perfectly coincide. The average send rates also obtain similar values in the static and dynamic games, yet players' choices in later rounds diverge slightly, indicating by little lower transfers of senders in the dynamic game in the last round in comparison to the static version.

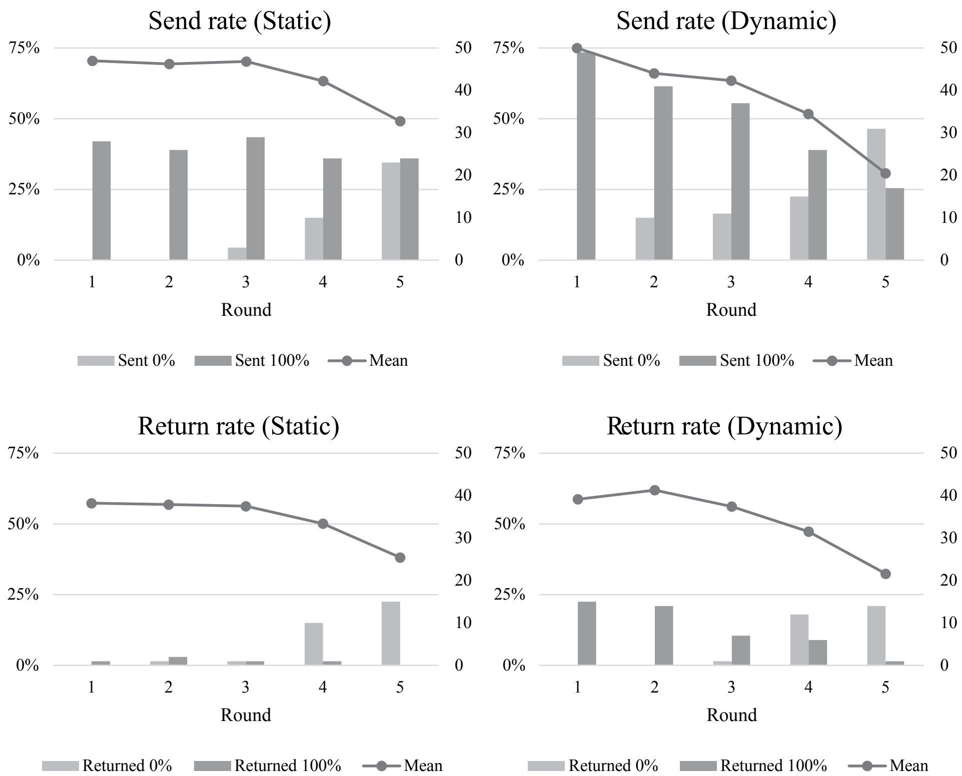

Figure 3. Average send and return rates over rounds.

Note: The left axis shows the values of the rates, while the right axis indicates the number of players who transferred 0% or 100%.

Turning to the extreme choices of players, some differences between the two treatments appear, especially with regard to 100% transfers. Focusing on senders participating in the static game, the number of players sending everything appears constant over rounds and oscillates around 25, which strongly contradicts the assumption of human rationality. The graph depicting senders' behaviour in the dynamic setting implies by littler higher rationality of their choices, as the share of subjects sending the entire endowment decreases over rounds, though, it does not reach zero in the last round. Clearly, in the dynamic treatment much more senders decide to transfer 100% of their disposable endowment in early rounds, as compared to the static version.

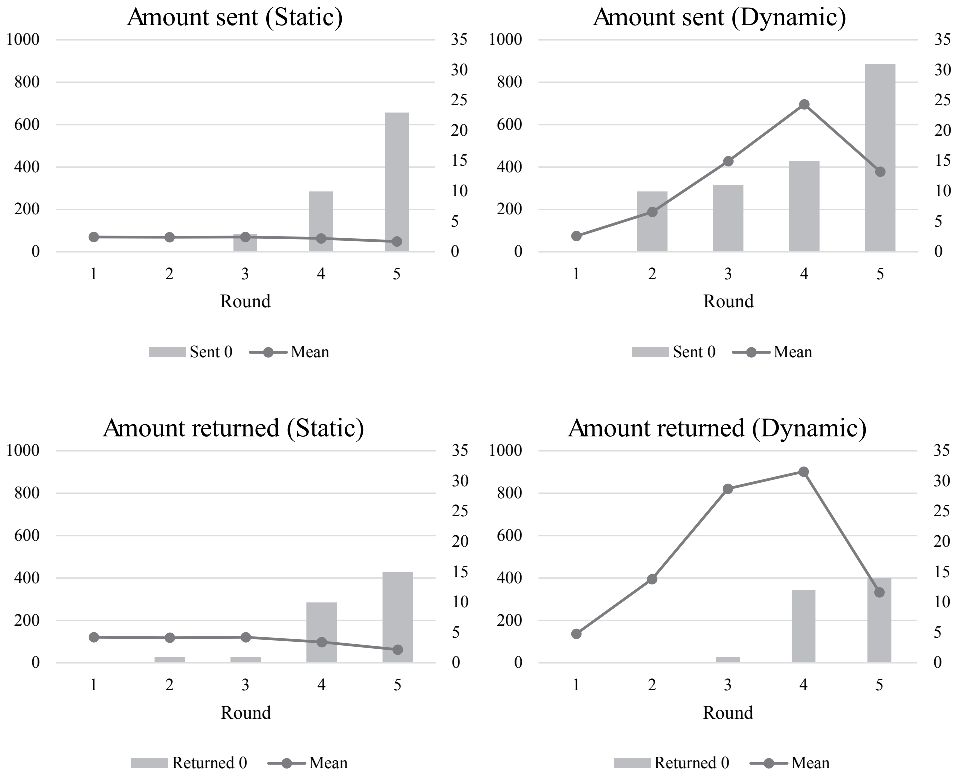

Figure 4. Average amounts sent and returned over rounds.

Note: The left axis shows the values of the rates, while the right axis indicates the number of players who transferred nothing.

Among receivers, the extreme choices are by far less common, as compared to senders. Figure 3 indicates an evident difference in the behaviour of receivers between the treatments. While almost no receiver decides for 100% transfer in the static game, in early rounds of the dynamic treatment nearly 20% of subjects returns everything. This corresponds to expected tighter cooperation between senders and receivers in the dynamic setting, where trust and trustworthiness behaviour might be related to higher payoffs than in the static game.

In the absolute values players send and return on average significantly more in the dynamic treatment. The initial transfer in the first round does not differ across the variants of the game, since the players' investment possibilities are identical at that moment of the interaction, however, the means of transferred amounts in subsequent rounds show that the behaviour diverge substantially. An inverse U-shaped relationship is observed in the case of the modified game, which contrasts with the linear, slightly decreasing line representing the average amounts transferred in the static treatment.

Both Figures, 3 and 4, suggest that the end-game effect is present, as the co-operation unravels at the end of the interaction leading to a decrease in sent and returned amounts. At the same time, however, the graphs show that subjects do not behave as it would be expected from a selfish and perfectly rational *homo economicus*. Positive amounts (on average) are sent and returned even in the last round of the interaction when there is no further possibility to develop cooperation in the future.

The presumptions following from the descriptive analysis are verified with the use of statistical methods, which the next section presents. The subsequent investigation provides the basis for a formal test of the research hypotheses.

3.2. Individual decisions

To examine whether the dynamic setting influences trust and trustworthiness behaviours, i.e. if it impinges on the possibility to develop highly productive cooperation relationships, individual decisions regarding the value sent or returned are regressed on a set of independent variables. Separate random effects models are estimated in order to capture the impact of individual factors on the proportions and on the absolute amounts. Each regression accounts for the unobserved heterogeneity between participants and clusters the observations on the level of experimental subjects. As the dependent variable is the proportion or the absolute amount transferred, receivers who do not get anything from their partners in a particular round are excluded from the sample, since they do not make any choice and the round ends with the decision of the sender. The estimations are based on the assumption that individuals' decisions are independent, which is unlikely to be true, given the matching procedure. We do not have a sufficient number of observations to fully account for such interdependence. Therefore, the results must be treated with caution, as a general indication of possible effects only.

Firstly, the focus is directed towards the factors influencing players' behaviour analysed the relative values, i.e. the explained variable is either the send or return rate. Separate models are estimated for each player type (senders and receivers) and for every treatment (static and dynamic), which yields four regressions. The results are presented in Table 2.

The main result is striking – the dynamic context has an almost negligible impact on the proportions sent or returned. Confidence intervals for the estimated coefficients for the two treatments overlap almost for each variable, with two exceptions observed only with respect to senders. The only factors that differently influence their behaviour between the two treatments are the partner's return rate from the previous round and the supergame number. In the static treatment, a 1% increase in the partner's return rate encourages senders to transfer by 0.67% more in the subsequent period, while in the dynamic game the partner's behaviour occurs not to play an important role in taking a decision. The supergame number affects senders' choices in the opposite direction – the longer the experiment lasts, the less they transfer in the dynamic treatment, whereas none of such effect happens in the static game.

Table 2. Random effects models of send and return rates (separate for each player type and every treatment).

		Static		Dynamic	
		Coefficient	**95% Conf. interval**	**Coefficient**	**95% Conf. interval**
Senders	Round 2	-0.819	(-1.026; -0.612)	-0.697	(-0.887; -0.507)
	Round 3	-0.801	(-0.983; -0.619)	-0.681	(-0.829; -0.533)
	Round 4	-0.870	(-1.134; -0.605)	-0.752	(-0.925; -0.579)
	Round 5	-0.917	(-1.178; -0.656)	-0.889	(-1.088; -0.690)
	Send rate in the previous round	0.603	(0.507; 0.699)	0.697	(0.524; 0.869)
	Partner's return rate from the previous round	0.667	(0.372; 0.963)	0.144	(-0.118; 0.406)
	Supergame number	0.002	(-0.010; 0.013)	-0.004	(-0.009; 0.000)
Number of obs.		437		414	
Wald-Chi²		3,182.06		15,219.95	
R^2		0.385		0.494	
Receivers	Round 2	-0.223	(-0.318; -0.129)	-0.332	(-0.412; -0.251)
	Round 3	-0.236	(-0.350; -0.121)	-0.381	(-0.512; -0.249)
	Round 4	-0.308	(-0.442; -0.174)	-0.443	(-0.622; -0.264)
	Round 5	-0.424	(-0.524; -0.324)	-0.523	(-0.708; -0.338)
	Return rate in the previous round	0.381	(0.159; 0.604)	0.576	(0.385; 0.767)
	Partner's send rate	0.048	(-0.048; 0.144)	0.048	(-0.064; 0.160)
	Supergame number	-0.001	(-0.005; 0.003)	-0.003	(-0.009; 0.003)
Number of obs.		413		375	
Wald-Chi²		160.33		563.50	
R^2		0.270		0.327	

Note: Random effects are calculated on the level of experimental subjects.

These results indicate the rejection of Hypothesis 1 that the dynamic setting promotes cooperation by leading to higher sent and returned values, as it is evident that this game modification plays almost no role for the transferred relative amounts. Confidence intervals overlap to a great extent. Moreover, the estimates suggest the rejection of Hypothesis 3 about stronger reciprocity in the dynamic game, since the partner's behaviour does not appear an important factor determining player's decisions in the dynamic context neither in the case of senders, nor for receivers.

Hypothesis 2 assumes an increasing divergence in the behaviour of players between the two treatments as the experiment proceeds and no significant difference in the decisions undertaken by inexperienced players. The effect has been investigated with various model specifications, including dummies for experienced and inexperienced players, separate binary variables for each supergame, or interactions of the supergame number with the number of a round. The final version in Table 2 presents only the impact of the supergame number treated as a continuous variable. None of the enumerated approaches serving for the test of Hypothesis 2 indicates significant influence of the experience accumulated within the experiment, with the exception of its weak impact for senders in the dynamic treatment. Hence, Hypothesis 2 is rejected.

We also verify the end-game effect, according to which cooperation should unravel as the interaction approaches its end. Separate dummies for consecutive rounds reveal that the upcoming end of the game is an important determinant of the actions undertaken by subjects, which is in line with the conclusions drawn from Figure 3. This confirms Hypothesis 4, which predicts the presence of the end-game effect and no difference with its respect between the two treatments.

The differences in the behaviour of players between the static and dynamic games are also investigated in the absolute values, which is captured in the regressions presented in Table 3, where the dependent variable is the amount sent or returned. Again four separate models are estimated for each player type (senders and receivers) and for every treatment (static and dynamic). These regressions indicate that the dynamic setting influences the transfer decisions of both, senders and receivers, differently in comparison to the standard static game.

Focusing at first on the choices of receivers, the models show their significantly different behaviour over rounds between the two treatments. In the standard repeated trust game, the amounts transferred decrease as the interaction between players approaches to the end, so cooperation unravels gradually since the beginning of the interaction. In the modified game the transfers reveal an inverse U-shaped relationship as the supergame proceeds. Till the third round the values sent increase and then start to decrease, though, the effects for the last two rounds occur insignificant. It indicates that the peak of cooperation happens exactly in the middle of the time for one interaction. Evidently, the dynamic treatment enhances cooperation between players, which is indicated by the high transfers in the third round. At the same time, both models suggest the presence of the end-game effect, however, the confidence intervals for the dummy for the last periods do not overlap, implying divergent influence between static and dynamic versions. Hence, with respect to absolute values, Hypothesis 4 is rejected, because the end-game effect appears much stronger in the dynamic setting.

Table 3. Random effects model of amounts sent and returned (separate for each player type and every treatment).

		Static		Dynamic	
		Coefficient	95% Conf. interval	Coefficient	95% Conf. interval
Senders	Round 2	-81.923	(-102.605; -61.241)	-561.072	(-866.363; -255.781)
	Round 3	-80.082	(-98.301; -61.864)	-382.726	(-580.067; -185.385)
	Round 4	-86.965	(-113.443; -60.486)	-133.113	(-339.712; 73.486)
	Round 5	-91.714	(-117.831; -65.597)	-547.303	(-705.541; -389.065)
	Amount sent in the previous round	0.603	(0.507; 0.699)	0.492	(0.102; 0.883)
	Partner's return rate from the previous round	66.746	(37.226; 96.267)	1084.405	(602.151; 1,566.659)
	Supergame number	0.152	(-1.033; 1.337)	-2.689	(-13.019; 7.640)
Number of obs.		437		414	
Wald-Chi^2		3,182.06		1,322.26	
R^2		0.385		0.442	
Receivers	Round 2	-14.457	(-28.582; -0.331)	196.114	(49.726; 342.503)
	Round 3	-13.826	(-30.345; 2.693)	490.065	(142.183; 837.947)
	Round 4	-30.066	(-53.455; -6.676)	286.590	(-381.442; 954.622)
	Round 5	-50.137	(-80.023; -20.251)	-140.687	(-705.157; 423.782)
	Amount returned in the previous round	0.115	(-0.029; 0.259)	0.773	(0.102; 1.444)
	Partner's send rate	151.457	(122.737; 180.178)	741.835	(479.469; 1,004.200)
	Supergame number	0.512	(-0.567; 1.591)	-14.978	(-46.735; 16.779)
Number of obs.		413		375	
Wald-Chi^2		1,267.04		339.63	
R^2		0.660		0.416	

Note: Random effects are calculated on the level of experimental subjects.

The estimated coefficients reveal slightly different behaviour of senders over rounds in comparison to receivers. The estimates for the dummies for consecutive rounds exhibit differences in the decisions undertaken by senders across the two treatments. During the static game, senders transfer smaller and smaller amounts as the interaction proceeds (with the exception of the third round, although the effect is very similar to the second round), indicating that cooperation unravels gradually. In the dynamic game, sent amounts are much lower in the second round as compared to the first period, though, in the third and fourth rounds transfers substantially increase in comparison with the proceeding period, still being lower than in the first round. The coefficient value for the last round confirms the end-game prediction, however, interestingly, the effect is weaker than the impact of the second round. These results provide a basis for the rejection of Hypothesis 4, because the dummy for the fifth period indicates significantly different behaviour across the two types of games. In the dynamic variant, the last round plays a much greater role in the senders' decisions.

Regarding the reciprocity, the estimation results show that the behaviour of the partner is a significant determinant of the player's decision, and influences positively the transferred value, meaning that the more the partner sends (or returns), the more the player returns (or sends, respectively). Moreover, the dynamic game appears to amplify the effect, which suggests that players respond to the partner's actions to the greater extent in the modified setting, where the payoff from cooperation is enhanced. This confirms the predictions encompassed in Hypothesis 3.

Similarly to the regressions on relative values, the role of experience accumulation as the experiment proceeds has been examined with various approaches – through dummies for being an experienced player, various forms of including the variable "supergame number" in the models, which include its squared value or a discrete representation, or interactions of the supergame with round numbers. However, none of the specifications occurs to explains significantly the sent amount. Hence, Hypothesis 2 is rejected.

To conclude, the statistical analysis of send and return rates suggests the rejection of Hypothesis 1 about higher levels of trust and trustworthiness in the dynamic game, however, with respect to absolute amounts transferred, players send and return higher values in the dynamic context. Hypothesis 2 regarding the significant impact of experience accumulation for the undertaken actions is rejected, as both models, on relative and absolute values, imply that gained experience do not influence players' behaviour. On the other hand, the regressions on absolute values provide evidence in favour of Hypothesis 3, which assumes stronger reciprocity in the dynamic setting. The estimation results for the proportions sent and returned corroborate Hypothesis 4 about similar end-game effects across the two treatments, while the investigation of the players' decisions in the absolute values shows that the dynamic context intensifies this effect.

4. Discussion and conclusions

The main message following from the experiment might be encompassed in the following statement: people do not behave selfishly and rationally. Several features of the players' behaviour observed in the experiment confirm this claim.

Firstly, not surprisingly, the send and return rates are far from the Nash equilibrium prediction, which assumes that *homo economicus* should not transfer anything in the trust game with a finite time horizon. Nevertheless, it could be justified on the grounds of the subjects' willingness to obtain gains from cooperation. What emphasises the irrationality of the behaviour is that players do send and return positive amounts even in the last period of the interaction when there is no chance to develop the cooperation relationship in the future. This might be ascribed to the reasons suggested in previous studies, for example, that people gain utility from altruism, or have other-regarding preferences.

Apart from this widely documented phenomenon, this experiment suggests another aspect of irrationality – players do not take the enhanced investment opportunity offered in the dynamic game. The proportions people transfer do not differ significantly across the standard (static) and modified (dynamic) variants of the trust game. This stays in contrast with the conclusion of Dal Bó and Fréchette (2011) that in the conditions of (1) high possible payoff from cooperation and (2) high probability of future interactions cooperation prevails. This experiment shows that providing enhanced possible payoff from cooperation is not enough for cooperation to prevail. What is more, it does not even provide enough favourable conditions for cooperation to develop. The result might be related to the definite time horizon.

Engle-Warnick and Slonim (2004) also investigate a trust game, and they provide evidence for the other condition for cooperation suggested by Dal Bó and Fréchette (2011), i.e. they compare the behaviour of players in finite and indefinite time horizons. The authors observe that cooperation does not unravel in the indefinite one, which implies that the probability of future interactions might play the crucial role. A subsequent study should investigate the interaction of both, dynamic and indefinite games, to assess the role of the factors in determining trust, especially that such conditions would offer a setting closer reflecting the real predicaments of contracting parties.

Another modification of the dynamic game that could provide important insights into the investigation of trust determinants is introducing the possibility of more interactions between players. The experiment under discussion allowed to observe the behaviour of senders and receivers maximally in twelve consecutive interactions. However, it might be too short time for a learning effect to appear, as suggested by the statistical analysis. Including more supergames, thus, allowing for broader experience accumulation, could reveal greater differences between the static and dynamic games.

The major factor that differently influences the actions of players across the static and dynamic variants of the game appears to be reciprocity, particularly in the case of senders, which is fully justified, as the dynamic treatment mainly influences the investment opportunities of senders. Regardless of the type of a game, receivers always decide how much to return from the tripled amount got, and the capital accumulation plays the greatest role for senders. Evidently, they respond to the behaviour of receivers so as to reward the kind actions and punish the unkind ones when the absolute values of transfers are analysed. The estimation of the proportions sent reveals that the effect of the reciprocity is weaker in the dynamic game, suggesting that an increased transfer from the receiver influences positively the next move of the sender, however, to a much smaller extent. This may imply that subjects probably look mainly at the absolute values than the relative ones when taking their decisions.

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