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Homophily and In-Group Bias in Pension Game

Abstract. The purpose of this research is to explain the force of homophily and in-group bias that involve some degree of discrimination towards other, in the context of the pension game, a transfer making setting where mutual transfers are efficient, but transfers are individually costly. We study reciprocity, in-group bias and homophily experimentally using three scenarios; first all participants are identical, second participants are assigned randomly to two artificial groups, and third participants can affect their likelihood to be matched with a participant of the same group in an endogenous matching scenario. The second and third scenarios are designed to measure the effects of group identity and group preference on transfer decisions. Although numerous research exists on reciprocity and lately homophily, the experimental setup introduces a sequential matching structure relevant in many social transfer settings such as pension savings. Results show that participants behaved differently in different matching structures, homophily and in-group bias affect the maintenance of a cooperative outcome in case of sequential transfers, participants have transferred nearly 40% more in in-group transfers compared with out-group transfers. Regarding reciprocity, in random matchings, we see that there is higher reciprocity in out-group matches compared with in-group matches meaning higher rewards together with higher sanctions in out-group transfers, but when we allow for preferential matchings, reciprocal behaviour is replaced with an inclination to control the similarity of partners.
Keywords: pension game, forward reciprocity, sequential matching, endogenous matching, homophily, in-group bias

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1. Introduction

Altruism has deep roots in human nature because help and cooperation encourage the survival of our species. In fact, Darwin himself argued that altruism, which he refers to as sympathy or benevolence, is "an important part of social instincts"[1]. The evolution explains altruism through two hypotheses: reciprocal altruism and kin selection. The former is justified as evolution favors organisms who sacrifice for others to receive favors in return, and the latter suggests that individuals are altruistic towards individuals sharing their genes hoping to pass those[2].

It is not possible to explain all charitable behaviours with altruism. Hammond (1975) proposed that charitable behaviour does not stem from altruism, but from selfishness using two particular dynamic variants of the dictator game[3] where mutually dependent individuals interact with each other and there is a tension between individual interest and collective interest. The first is the poverty game played by two players. In the odd-numbered periods, the first (rich) player has a consumption good and the second other (poor) player has not. In the even-numbered periods, the roles are reversed. The game lasts T (even) periods. The consumption good can not be stored and in the absence of transfers between players, there will be successive periods of overconsumption and no consumption. The game consists of the decision on the transfer by the player with the consumption good.

The second is the pension game where each player lives for two periods. In the first period, the (young) player has the consumption good because he produces it. In the second period, this (now old) player has nothing because he cannot produce, he is retired. Player t decides on the transfer to player $t-1$ (previous working generation); player $t+1$ decides on the transfer to player t; and

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so on... As savings is not an option, the only efficient income smoothing in these settings is by intergenerational transfers although a non-cooperative equilibrium exists where purely selfish agents make no transfer at all. Hammond (1975) showed that in these transfer-making games where transfer-making is mutually effective, but transfers are individually costly; if present charitable behaviour can encourage other people to behave charitably when needed and more generally when agents believe that breaking an intertemporal agreement will endanger their future well-being, efficient cooperative intertemporal allocation of resources will be an equilibrium. Cooperation is possible in these transfer giving games through reciprocity. Deferred reciprocity was common in Greek culture and meant offering a person gifts or favors, in the hope that he would repay that favor at another time. Nowadays, most researchers agree that reciprocity refers to a conditional obligation. In a broader perspective, Rabin (1993) also shows that if the behaviour of others is not yet known, the expected behaviour can be responded to. While altruistic behaviour refers to an unconditional obligation in its pure or impure form; reciprocity refers to a conditional obligation through reward and punishment mechanism.

The pension and poverty games reflect real-life scenarios in terms of transfer-making decisions in socially tied networks. In this study, we focus specifically on the pension game, reflecting the PAYG (pay-as-you-go) pension regime, which ensures that each working generation supports the previous one in their retirement. Pension systems are crucial components of social welfare policies, and their reform has become increasingly important due to demographic and economic pressures threatening financial sustainability and retirement income adequacy. Initial reforms proposed shifting from PAYG systems to fully funded models in response to demographic challenges. However, practical difficulties and mixed outcomes led many countries to adopt hybrid systems combining PAYG with voluntary funded components with potentially (and hopefully) higher returns. These, too, faced obstacles such as low contribution levels and behavioural constraints. Today, while reform efforts continue, they have lost momentum, and several countries have reversed earlier measures (Fouejieu et al., 2021). A better understanding of the institutional, social, and psychological forces affecting individual decisions seems to be crucial in the design of pension policies[4]. More importantly, PAYG schemes promoting a social contract between generations remain prevalent globally[5], reflecting continued reliance on this form of income redistribution in retirement. Therefore, it is essential to explore the foundations of this social contract and the factors shaping individual decisions about intergenerational transfers and income security. However, existing data on contributory pensions is insufficient to identify behavioural mechanisms behind individual contributions. Consequently, we have designed an experimental pension game to study the internal validity of forward looking reciprocity (or trust) which leads to individuals contributing today in anticipation of future reciprocity together with their group preferences.

There are various experimental studies on pension decisions[6] and this study contributes to this literature by extending Van der Heijden et al. (1998) which use Hammond's pension game with and without information on the previous period transfer to examine the power of reciprocity and find no evidence of reciprocity[7] as time $t+1$ transfers were unrelated to time t transfers although very high level of transfers and a fairly efficient voluntary social assistance and pension system were still observed. Reciprocity has nevertheless been shown in many experimental variations of dictator game (Falk and Fischbacher, 2006; Charness and Rabin, 2002) to be the motivation for cooperation; then if the reward and punishment mechanism entailed in reciprocity is not enough to create the emergence and maintenance of cooperation in pension game, other types of preferences are necessary to explain the existence of cooperative behaviour that we observe in real

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life. For instance, it has been shown that reciprocity is directly influenced by group dynamics and social identity (Tajfel and Turner, 1979; Yamagishi and Kiyonari, 2000; Fehr and Gächter, 2000; Chen and Li, 2009).

The contribution of this study is to analyse the impact of two types of behaviours inherent in social interactions and involving some degree of discrimination in these interactions on the cooperative behaviour. The first mechanism is ***homophily[8] which is basically the desire to interact with others with similar characteristics***. Homophily has been widely documented in social networks and shown to affect prosocial behaviour, trust, and reciprocity (Lazarsfeld and Merton, 1954; McPherson, Smith-Lovin and Cook, 2001; Currarini et al. 2009). The second is ***in-group bias which refers to the differential treatment of individuals based on group membership, often favouring one's own group***. While homophily is the preference of interaction with similars, in-group bias is the differential behaviour with similars compared with non-similars. This distinction is central in the analysis of cooperation, as agents may display both a preference for similar others and a behavioural bias once interaction occurs.

The psychological basis of in-group bias is grounded in social identity theory (Tajfel, 1974) positing that individuals' perceptions and behaviours are shaped by the social groups to which they belong and when individual and group identities align, people tend to favour their own group over others in order to preserve a positive social identity (Tajfel, 1982). This phenomenon known as intergroup bias is shaped not only by personal identification but also by the structure of social relationships formed in everyday life, from professional interactions to intimate ties. Crucially, group identities need not reflect deep-seated beliefs; they can be externally imposed or even arbitrarily assigned and studies using the minimal group paradigm and even arbitrary groupings can trigger strong in-group favoritism (Tajfel, 1970; Tajfel et al., 1971; Turner et al., 1987). Currarini and Mengel (2016) offers a behavioural approach to homophily in experimental settings by measuring individuals' willingness to pay for in-group matching, revealing a preference for interacting with members of their own group and provides evidence for homophily and in-group bias in variants of some of the games described in Charness and Rabin (2002) under bilateral matching. However, Yamagishi, Jin and Kiyonari (1999) found that players in a simultaneous prisoner's dilemma game cooperate more with in-group members, but this effect disappears in sequential games where direct reciprocity is possible. This study considers how endogenous partner selection operate in *intergenerational transfers* where the reciprocity is indirect: the reward for an act of kindness comes not from the recipient but rather from a third party observing the act (Alexander, 1987). Under the sequential matching structure of the pension game, players in working position make transfers in anticipation of receiving transfers in retired position. This type of reciprocity is *downstream indirect* or *forward-looking* (Cabral et al., 2014).

We have allowed participants to express their preferences of the group of their opponents in two different treatments; either they could affect the group of their opponents in case they are receiving transfers or making transfers. By using artificial grouping, we have found that homophily and in-group bias affect the maintenance of a cooperative outcome in case of intergenerational transfers. There is evidence for in-group bias in this artificial grouping setup and regarding their behaviours towards their group compared with the other group, we have observed that they have transferred nearly 40% more in in-group transfers compared with out-group transfers. Regarding reciprocity, in random matchings, we see that there is higher reciprocity in out-group matches compared with in-group matches meaning higher rewards together with higher sanctions in out-group transfers but when we allow for preferential matchings, reciprocal behaviour is replaced with an inclination

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to control the similarity of partners. This shows that contrary to the standard economic analysis of decision-making based on individual incentives, group identity plays an important role in optimal social contract design[9]. We find that homophily is positively associated with individual risk aversion, suggesting that some participants prefer to match with similar others as a way to mitigate uncertainty in social exchange. This is consistent with previous findings that homophily is linked to trust and cooperation in uncertain or asymmetric environments (Charness et al., 2007; Currarini et al., 2009). Together, these results suggest that group identity and homophily jointly enhance cooperation in dynamic settings, particularly when individuals are given the opportunity to act on their social preferences.

In what follows, we present the design and procedures of our experiment and review the essence of theoretical literature to define the hypothesis of our experiment. While in Section 3 we reveal the results of our study with the implications and extensions thereof. Finally, in the last section we draw our conclusions.

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2. Experimental procedures and hypothesis

2.1. Experimental design

The present experiment consists of dividing agents randomly into two artificial groups and analysing whether this will encourage them to behave more favorably towards members of their own group, showing so-called in-group bias or intra-group favoritism. In addition, we offer participants the opportunity to be matched with an opponent from their own group in return for a fee following the procedure proposed by Becker et al. (1964). In this way, we expect to reveal homophily whereby agents are willing to interact with similar agents. We expect to see whether homophily and in-group bias will increase the chances of reciprocity to occur, thus inducing cooperative giving.

A simple pension game forms the basis of the experiment. Each time, groups of 8 players $(P_1, P_2, \ldots, P_8)$ play the dictator game *sequentially*. This matching and play structure are designed to mimic an overlapping generations environment. An experimental standard has not yet been developed on how to deal with the overlapping generations design. We follow the design described in Van der Heijden et al. (1998). In the overlapping structure of the pension game, one round consists of consecutive periods played by each player and the game is played once. Each player will be one period Decider (working) and one period Receiver (retired). The first player in the sequence, P_1 plays only the role of Receiver. The last player in the sequence P_8 only plays the role of Decider. In the experiment, the first period consumption of P_1 is set to the basic endowment of 2 units. The transfer that P_8 receives has been set equal to the average transfer to all previous Receivers (rounded up). This starting and ending rule is arbitrary to capture the infinite horizon game setup.

When player P_i is matched with player P_{i-1} in the sequence, P_i is Decider (working) and P_{i-1} is Receiver (retired). P_i chooses the transfer p_i to be given to P_{i-1}. In the following period, this time, P_i becomes Receiver (retired), P_{i+1} becomes Decider (working), and P_{i+1} chooses the transfer p_{i+1} to be given to player P_i. In every period, Decider is endowed with 9 units, Receiver is endowed with 1 unit. We only allow integers for the choice of transfers and transfers can not exceed 7 units. Together with transfers, endowments determine the "consumption" of players in

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both periods. If player P_i gives the transfer p_i, he will be left with $9 - p_i$ to consume and then if player P_i receives the transfer p_{i+1}, he could consume $1 + p_{i+1}$. The utility of player P_i is given by the product of consumption in two periods:

$$U_i = (9 - p_i) \times (p_{i+1} + 1) \quad (1)$$

The form of the utility function incentivizes players to smooth consumption over two periods, and this can only be achieved by transfers. Table 1 provides with the payoff of player P_i based on transfer made p_i and transfer received p_{i+1}. If players selfishly made no transfers, they would end up at the upper left of the payoff matrix with lower payoffs, although the Pareto optimal result can be achieved when all players make a transfer of 4.

		p_{i+1}: transfer received by player P_i							
		0	1	2	3	4	5	6	7
p_i: transfer made by player P_i	0	9	18	27	36	45	54	63	72
	1	8	16	24	32	40	48	56	64
	2	7	14	21	28	35	42	49	56
	3	6	12	18	24	30	36	42	48
	4	5	10	15	20	25	30	35	40
	5	4	8	12	16	20	24	28	32
	6	3	6	9	12	15	18	21	24
	7	2	4	6	8	10	12	14	16

Table 1: All Possible Payoffs

There are 4 treatments in the experiment for the pension game. In each treatment, participants play 10 rounds of the pension game. When players are making a decision in CONT treatment, they can see all previous transfers that have been made in the particular game before deciding on their transfer. In EXO treatment, all of the participants are randomly divided into two groups, RED and BLUE, and the pension game with full information is played. In addition to the previous transfer decisions, the players can also see the group of the player that they are making a transfer or receiving a transfer from. In ENDO treatment, participants are randomly divided into two groups, RED and BLUE, but before transfer decisions, participants are asked to specify their willingness to pay (WTP) to be matched with a partner from the same group. We have designed two types of ENDO treatments because a player who is placed at any position in the sequence other than the first and the last will play Decider for a player and Receiver for another one. In the experiment, which we call ENDO-R, players indicate their willingness to pay to be matched with a partner to receive a transfer from, from the same group (on the right side of the sequence). In ENDO-L, players indicate their willingness to pay to be matched with a partner to give a transfer to, from the same group (on the left side of the sequence).

More specifically, we can describe the willingness to pay (WTP) revelation mechanism as follows: participants are asked to reveal their willingness to pay to be matched with a partner from the same group by specifying a number from 0 to 10 indicating how much they want to pay to be matched

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with this group. Then, a number is drawn randomly from a uniform distribution in [0,10] and WTP is compared to this randomly determined number. If WTP is greater than the randomly drawn number, then the participant is matched with a partner from the same group; if WTP is less than the randomly drawn number then the participant is randomly matched with another participant[10]. Therefore, a high WTP increases the likelihood to be matched with a participant from the same group. The payoffs are comparable in all treatments since WTP does not have any effect on endowments[11].

The revelation mechanism is a variant of Becker-DeGroot-Marschak mechanism (BDM) and has the same (dominant strategy) incentive as the Vickrey auction played with an unknown bidder[12]. The probabilistic nature of this mechanism is central to its incentive compatibility, as participants cannot gain by overstating or understating their preferences. Our methodological choice is supported by empirical evidence provided by Burchardi et al. (2021) testing variants of BDM and showing that comprehension is very high and their performance is similar and Cole et al. (2020) comparing the performance of BDM to other demand elicitation techniques and concluding that it is "a viable and valuable choice for experimentalists looking to elicit complete demand curves for low cost". A deterministic or forced-choice elicitation (e.g., "own group" vs. "other group") could lead to inflated values (Harrison and Rutström, 2008; List and Gallet, 2001).

At the beginning of each round in ENDO treatments, participants are asked their WTP. In this way, parallel to their sequential transfer decisions, we can observe their sequential WTP choices reflecting the evolution of their preferences for an in-group matching. In ENDO treatments, participants were shown both the group identity and transfer history of their counterpart similar to EXO treatment. This ensures comparability across treatments.

2.2. Experimental procedures

We have designed the experiment with the experimental software O-tree[13] and deployed to the internet via Heroku which is a cloud application platform. 8 students participated at each session with 80 students in total playing different treatments of the pension game experiment. The experiment lasted 40-60 minutes in the laboratory or online (due to the pandemic conditions). None of the subjects participated in a related experiment before and they have not participated in the experiment more than once. For the experiments carried out in the laboratory, the experiment was carried out with a random computer. The instructions were distributed and explained by the experimenter. Then, subjects were given time to study the instructions more carefully and ask questions. They have also been given the payoff matrix showing their earnings according to transfer made and transfer received. After a few explanatory practice rounds, subjects played 10 rounds of one of the treatments. 10 experimental sessions in total were conducted first in May 2020 (4 sessions), in April 2021 (2 sessions) then April 2022 (4 sessions) where 80 participants played the pension game. 24 participants played control treatment, 16 EXO, 16 ENDO-L and 24 ENDO-R. The instructions are provided in Appendix A.

After the experiment, participants completed an anonymous questionnaire on their socio-demographic characteristics and preferences. A simple measure of risk aversion is implemented by simple lottery choice questions as in Holt and Laury (2002) to elicit risk preferences. Socio-demographic characteristics and further details on participants' preferences are provided in Appendix B. The earnings in money was determined by multiplying the earnings in points by 5 kurus and adding to this amount the participation fee of 10 TL[14]. We ensured the anonymity of the

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design such that participants knew whether they interacted with someone from their own group, or another group, but not whom.

2.3. Hypothesis

Hammond (1975) shows that there will be no transfers in the finite game and that will lead to a non-cooperative equilibrium. If the horizon is endless, as long as each player cooperates, there can be an efficient cooperative outcome. As savings is not an option, each player would like to smooth consumption in these settings. The only way to achieve this is by exchanging transfers: to give when rich (working) and to receive when poor (retired). If a player breaks the self-enforcement agreement, the equilibrium collapses completely. Therefore, if every player believes that the other will not cooperate, the transfer will not take place even if there is a cooperative equilibrium. So there may still be a non-cooperative equilibrium. There is an incentive for a player i to set the transfer level to $p_i = 0$. The absence and presence of information does not affect this game-theoretical prediction[15]. We formulate this prediction as follows:

Hypothesis 1 (Selfish Rationality): There is no transfer in any treatment ($p_i = p_j = 0$).

If $p_i = p_j = 0$, each player has only 9 utility. If a binding agreement was possible, transfers would be optimally set to $p_i = p_j = 4$ where a Pareto optimal result would be achieved providing perfect consumption smoothing with 25 utility which is nearly three times the utility with no transfer. Hence, there are important incentives to achieve some kind of implicit cooperation.

Agents may act fair or unfair to other agents and this is referred to as "reciprocity". We have ***positive reciprocity*** if agents respond with kindness towards kind actions and ***negative reciprocity*** if agents are unkind towards hostile actions. Reciprocity may then induce players to choose suboptimal strategies as positive reciprocity may prevent taking advantage of exploiting others and negative reciprocity leads to punishing defectors at own cost (Guala, 2012). In our context, reciprocity exists when the transfer p_i of player P_i increases monotonously with the transfer p_{i-1} of player P_{i-1}. As it can easily be seen in Equation 1, the utility is maximized at $p_i = 4$ subject to $p_i = p_{i-1}$.

Hypothesis 2 (Reciprocity): The level of transfers are positive ($p_i > 0 \ \forall i$) and the p_i of player P_i is positively associated with the transfer p_{i-1} of player P_{i-1}.

As we have previously mentioned, homophily is basically the desire to interact with others with similar characteristics. In our abstract design of groupings, as the choice of a WTP greater than zero does not affect the utility negatively, the revelation of WTP expresses the desire for in-group matching, thus it as a measure of homophily. Participants will make payments to be matched with opponents of the same group in the presence of homophily (Hypothesis 3a).

Definition 1. *As homophily is a desire to interact with similars, we can define a **strictly homophilous** agent as an agent with a strictly positive willingness to pay for an in-group match at each round and a **neutral** as an agent with a zero willingness. A **weakly homophilous** agent has a non-negative willingness to pay i.e. WTP may be zero at some rounds for a weakly homophilous agent. Currarini and Mengel (2016) have conducted a systematic study on the relationship between homophily and in-group bias using this methodology. Although they have found strong evidence of in-group favoritism when participants were exogenously matched; in-group favoritism disappeared when participants were matched endogenously because of self-selection and*

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behavioural change. The difference with their experiment is that participants are asked to reveal their preferences for an in-group matching at each round, thereby the difference of the definition of different types of homophily in our setting.

Hypothesis 3 (Homophily and in-group bias):

a. Participants show an interest in being matched with a participant from the same group even though it does not affect their utility $WTP > 0$.

b. Participants are more generous to their group members. They are making more transfers than the transfer level without groupings.

c. Participants are more reciprocal for members of their group compared to those who are not from their group.

Previous experiments indicate that people behave more favourably to other people if they are similar. This widespread phenomenon is referred to as in-group bias (ingroup favoritism) (Hypothesis 3b). Here we explore to what extent ingroup bias is driven by preferences concerning the welfare of ingroup over outgroup members, vs. beliefs about the (future) behaviour of ingroup and outgroup members.

Definition 2. ***In-group bias*** *is the difference of behaviour in the context of in-group and out-group matches. Hewstone, Rubin and Willis (2002) describe in-group bias as "the systematic tendency to evaluate a person's own group (in-group) members more favorably than another group (outside group) members" (Balliet and Van Lange, 2013; Chen and Li, 2009; Kuwabara et al., 2007; Morton, Ou and Qin, 2019). The average transfer decisions under in- and out- group matchings can be calculated. In-group bias is taken to be the difference between these measures.*

Hypothesis 3c is about more reciprocity for in-group members than out-group members. First, in terms of social preferences, reward and punishment mechanisms of positive and negative reciprocity work in a way to make in-group bias more evident: it was observed that in-group members are rewarded more for prosocial behaviour than out-group members (Chen and Li, 2009) and in-group members can be punished more for selfish behaviour than out-group members (Shinada et al., 2004). Second, in terms of beliefs, reciprocity confirms in-group bias which can be seen from different perspectives: the expectations of reciprocity from in-group members (Rabbie et al., 1989), reputational concerns in group membership and social norms which is anticipated as would never be violated[16].

According to Yamagishi et al. (1999), the expectation of widespread reciprocity on the part of in-group members creates intra-group favoritism. They have shown in a simultaneous game of prisoner's dilemma, that the players cooperate more with an in-group member than with an out-group member, but this group effect disappears in the sequential game when direct reciprocity is possible.

3. Results

3.1. Selfish rationality

The average transfer level is 2.25 and average payoff is 18.86. Remember that the socially efficient strategy is transferring 4 procuring a utility of 25 while without transfers, participants would have a utility of 9. On average, $\frac{18.86-9}{25-9} \times 100 = 61.62\%$ of the possible efficiency gains from transfers are actually realized, which is more than the efficiency gains realized in Van der Heijden et al. (1998). 197 out of 700 times participants have decided to transfer nothing (28.14%)[17].

Result 1 Contrary to hypothesis 1 (selfish rationality), we observe in general positive transfer levels[18].

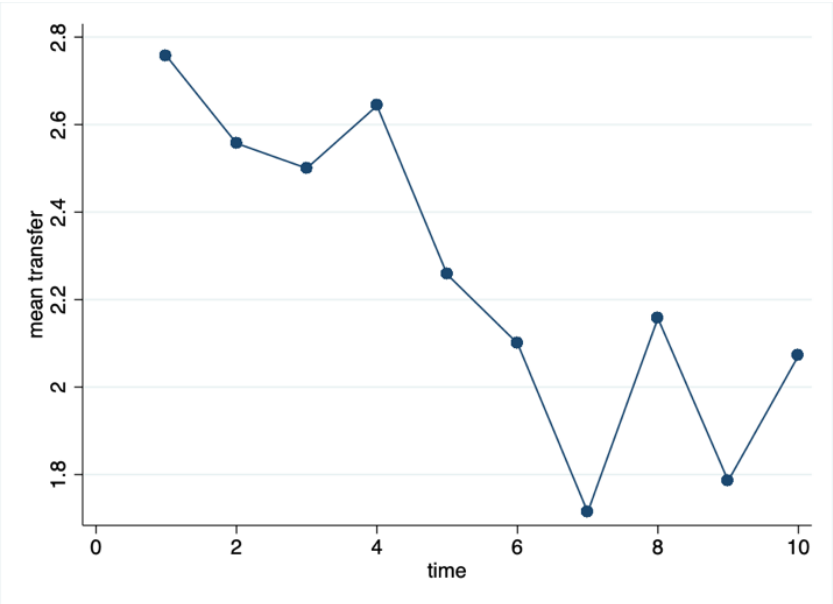


Figure 1: Average transfers at each round

Participants played the game repeatedly at different positions in the sequence in pension experiment. The backward induction might induce them to transfer less and less in the sequence and the repeated interaction, on the other hand, might induce them to learn and adapt. Stable cooperation in finitely repeated public-goods experiments with anonymous interactions and stable group membership is not a common result according to Ledyard (1995) as in most cases, there is substantial cooperation in the first few periods, over time this decreases. In Figure 1 despite the declining trend in cooperation in the first periods, there is a visible increase in cooperation in the last rounds, which points out to learning of cooperative outcome. In what follows, we will study different motives that might trigger this pattern strictly in pension treatments.

3.2. Reciprocity

The overlapping matching structure of pension game requires the analysis of the link between the average transfer by generation R player in the sequence (p_R) and generation $R+1$ player (p_{R+1}). Table 2 shows that in different treatments of pension game and in pension game in general, p_R is lower than p_{R+1} on average. The correlation between p_R and p_{R+1} is positive for different treatments of pension game and significant at 10% for all treatments and at 5% for EXO and ENDO-R treatments.

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Table 2: Average transfers by subsequent players (p_R and p_{R+1})

	General	CONT	EXO	ENDO-L	ENDO-R
Mean p_R	2.20	2.13	2.13	1.71	2.62
Mean p_{R+1}	2.27	2.17	2.23	1.74	2.74
Spearman's Rank Corr. Coef.	0.24	0.14	0.44	0.17	0.23
Significance	0.00	0.06	0.00	0.07	0.002

Figure 2 illustrates average transfers by different generations for each treatment and shows that these transfers first decrease through mid-generations then increases except for the control treatment. Table 3 provides the average transfer (over time) sequence from the first to the eighth player i.e. generation 3 player has given 2.34 and received in return 1.86 on average. As a general remark, we can say that reciprocal behaviour is observed near the extremities while in the middle of the sequence there is no significant relationship.

Result 2a The link between p_R and p_{R+1} is positive and statistically significant for EXO and ENDO-R treatments.

Table 3: Average transfers by subsequent players (p_R and p_{R+1}) through generations

Generation	1	2	3	4	5	6	7
Mean transfer	2.56	2.34	1.86	2.03	2.46	2.37	2.11
Spearman's Rank Corr. Coef.		0.31	0.34	0.09	0.12	0.34	0.23
Significance		0.00	0.00	0.39	0.25	0.00	0.02

Participants were asked about the transfer that they were expecting from their partners after making a transfer. When we compare mean transfers and mean expected transfers in Table 4, we see that expectations are higher on average than transfers realized and there is a significant positive relationship between transfers and expectations (Spearman's rank correlation coefficient is 0.32 with $p < 0.05$). This is in line with Rabin (1993) arguing that if the behaviour of other agents is not yet known, the person responds to expected behaviour.

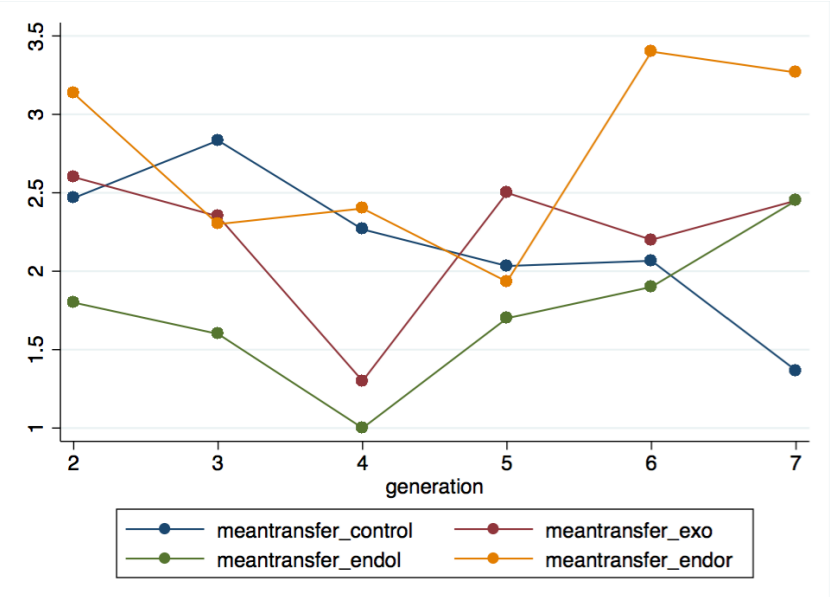


Figure 2: Comparison of average transfers by players in different positions

Table 4: Average transfers and expectations

	General	CONT	EXO	ENDO-L	ENDO-R
Mean transfer	2.25	2.18	2.21	1.75	2.70
Mean expectation	3.29	3.61	2.63	2.77	3.76
Spearman's Rank Corr. Coef.	0.32	0.14	0.38	0.36	0.39
Significance	0.00	0.07	0.00	0.00	0.00

Result 2b The analysis of different pension treatments show that in EXO and ENDO treatments, expectations have a higher and more significant correlation with transfers made compared with the control treatment. This result shows that with grouping, agents expect a more reciprocal outcome.

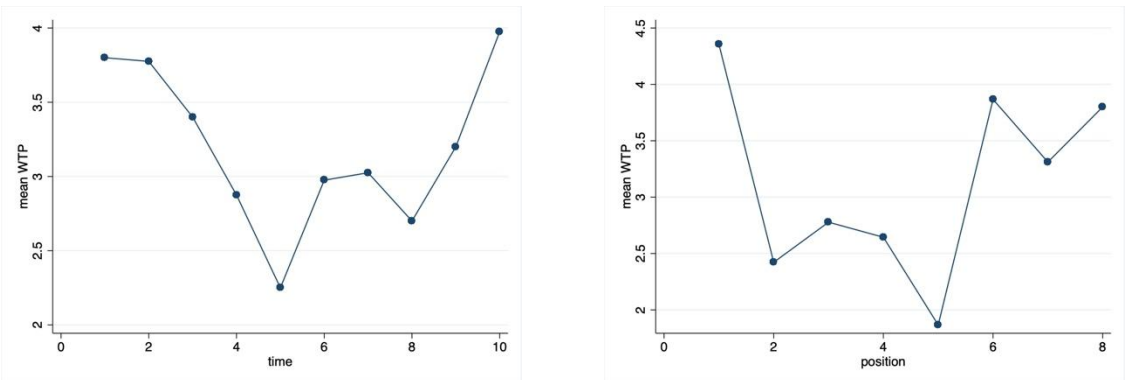
3.3. Homophily

Weak homophily is more widespread in the sample. Nearly 9% of the participants playing the ENDO treatments are neutral and the remaining 91% are weakly homophilous and of all participants, 23% are strictly homophilous[19]. We have in Figure 3a, average levels of WTP throughout endogenous pension treatments by time. Average levels are in the interval [2.25,3.98]. We can interpret higher WTP selections in the last rounds as expectation of participants for more reciprocity as the game will end soon. We can combine this result with the findings of Table 3 about reciprocal behaviour and argue that there is a relationship between homophilous tendencies and reciprocal attitude.

Result 3a Regarding the definition of homophily, the fact that there are 91% of agents interested in being matched with a participant from the same group, is consistent with Hypothesis 3a. The average WTP levels are also higher for strictly homophilous agents confirming that they are more willing to be matched with an opponent of the same group.

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In the overlapping structure of the pension treatment, players cannot have a direct reciprocal interaction, thus they are creating an environment to connect with the other players through different means. This can be seen in Figure 3b providing average levels of WTP throughout endogenous pension treatments by position in previous round. We can see that near the extremities, mean WTP levels are higher. Participants who have been in these positions feel more vulnerable and less in control.



(a) Average WTP choices through rounds (b) Average WTP by previous positions

Figure 3: WTP averages by position and time

3.4. In-group bias in exogenous and endogenous treatments

In EXO and ENDO treatments, participants played either with an opponent from the same group (in-group matching) or with a participant from the other group (out-group matching). Although homophily is detected by the preference to interact with one's own group, in-group bias is seen in the difference of behaviour towards one's group and other groups. Then, in-group bias can be seen by comparing the behaviour when matched with a participant from the same group and the behaviour when matched with an opponent from the other group.

Result 3b Participants transferred on average 2.72 in in-group matches and 1.95 in out-group matches. Participants made significantly higher transfers in in-group matches compared with out-group matches. This result is in line with Hypothesis 3b. Decisions were influenced by group identity, and a more favorable attitude was observed in general when participants played with similars. A comparison of EXO and ENDO treatments reveal that in EXO treatments, participants have given slightly and insignificantly less on average in out-group matches while in ENDO treatments, in group bias is significant as participants have transferred on average significantly more to their own group compared with their transfers to the other group (Table 4). Disintegrating the results to treatments shows that the significant difference between in-group and out-group transfers stems from endogenous matching treatments where participants had the opportunity to affect the group of their partners.

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Table 5: Average in-group and out-group transfers

	General	EXO	ENDO-L	ENDO-R
In-group p_t	2.72	2.27	2.25	3.26
Out-group p_t	1.95	2.18	1.38	2.19
Mann-Whitney	0.00	0.84	0.01	0.00

In these results, when defining the similarity, we have used the similarity of the decider to the receiver. Note that in ENDO-R treatment, participants have the opportunity to affect the group of their partners that they are receiving transfers from. Table 5 shows that this difference of matching procedure had an impact on the average level of in-group transfers. When agents can affect the group of the next generation (that they will receive transfers from), in-group transfer levels increase. Note that although out-group transfer levels on average in ENDO-R treatment is close to those in EXO treatment, in group transfer is higher.

Result 3c The reciprocal behaviour changed when participants were paired with a participant from their group. When we look at the link of p_R and p_{R+1} in in-group and out-group matches, we see that it is positive, significant and equal to 0.258 and 0.347 respectively in general; 0.401 and 0.496 in EXO treatment. ***There are higher reward and higher sanction in out-group transfers.*** In-group and out-group correlation values for p_R and p_{R+1} are positive but not significant for ENDO-L treatment. For ENDO-R treatment, only out-group transfers are significantly and positively correlated while in-group transfers are positively correlated but the correlation is insignificant[20]. This result makes more sense when it is read together with the above result on average levels of in-group and out-group transfers. The higher reward and sanction in out-group matches push average out-group transfers closer to in-group levels. ***However, in ENDO treatments where participants can control the groups of their partners, they focus more on being matched with a partner from their group instead of controlling out-group transfers with rewards and sanctions.***

3.5. Econometric analysis

This section explores forward-looking reciprocity and strategic transfer decisions by examining whether transfers received are influenced by the transfers made. First, a regression model is estimated (Model I) to explain the level of transfers received using transfers made as the main explanatory variable[21]. Next, we extend the model by incorporating perceived similarity with the opponent (Model II), followed by the inclusion of the interaction of the willingness to pay (WTP) for in-group matching with treatments (Model IIa)[22].

The definitions of the independent variables are as follows: **transfer given** (ranging from 0 to 7) represents transfer given in working role, **similarity** takes on the value 1 if the participant receiving the transfer belongs to the same group as the opponent making the transfer and 0 otherwise, **WTP** the willingness to pay for an in-group matching takes on the value 1 if the participant is willing to pay more than the mean WTP and 0 otherwise, and finally **generation** (a categorical variable ranging from 2 to 7) is the position in the sequence. We have included a treatment dummy to account for endogenous partner selection treatments: **ENDO-L** variable taking on the values 1 if treatment is ENDO-L and 0 otherwise; and **ENDO-R** taking on the values 1 if treatment is ENDO-R and 0 otherwise. Lastly, the dependent variable **transfer received** (ranging from 0 to 7) represents transfer received in retired role.

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Table 6: Forward looking reciprocity and group preferences in pension game

Transfer received	Model I	Model II	Model IIa
Transfer given	0.2542***	0.3090***	0.2121***
	(0.0562)	(0.0673)	(0.0638)
3^{rd} generation	-0.5041*	-0.1655	0.2211
	(0.2673)	(0.2989)	(0.3461)
4^{th} generation	-0.3102	0.1372	0.4753
	(0.2768)	(0.3242)	(0.3696)
5^{th} generation	0.0276	0.4748	1.1915***
	(0.2742)	(0.3156)	(0.3883)
6^{th} generation	0.0415	0.6466*	1.0026**
	(0.3058)	(0.3470)	(0.4111)
7^{th} generation	-0.2636	-0.2458	-0.0224
	(0.3078)	(0.3485)	(0.4105)
Similarity		0.5200**	0.4924*
		(0.2167)	(0.2557)
WTP × ENDO-L			-1.2729***
			(0.3296)
WTP × ENDO-R			0.7823**
			(0.3472)
R-squared (within)	0.0526	0.1033	0.0963
Observations	600	420	300
Entities	80	56	40

Notes: Fixed effects model is used to estimate Model I and II. Models include entity fixed effects with robust standard errors. Model IIa is estimated with pooled OLS. Robust standard errors in parentheses $^{***}\ p < 0.01$, $^{**}\ p < 0.05$, $^{*}\ p < 0.1$.

Results of Model I using data from all treatments of pension game show that transfer received are significantly affected by transfer given (Table 6). We can see that this result is prevalent and it is highly significant across all specifications. **Forward looking reciprocal behaviour significantly influences transfer strategy in general**. Model II is run using data of EXO and ENDO treatments and focus on the impact of the similarity of transferring player. **There is evidence of in-group bias as participants significantly transferred more in in-group matchings than out-group matchings**. Model IIa accounts for the impact of behavioural differences between EXO and ENDO treatments. In EXO treatments, participants can not affect the group of their partners. These results are in accordance of our previous findings in previous subsections.

However, in ENDO treatments, there is endogeneity: the motivation to be matched with a partner from the same group may also be the reason to be more reciprocal with them. **When we control for the willingness to pay for similarity, in-group bias diminishes and is less statistically significant**. This suggests that participants not only express a preference for similarity but may also adopt broader group-related strategic behaviours—such as anticipating reciprocity, enforcing group norms, or signaling loyalty—when given the opportunity to influence their matching. More

importantly, an increase in willingness to pay (WTP) for in-group matching has asymmetric effects depending on the procedure. In ENDO-L treatments, higher WTP is associated with a decrease in transfers received, whereas in ENDO-R treatments, it leads to an increase in transfers received. This suggests that a participant who expressed a stronger preference for being matched with an in-group opponent as a future recipient was more likely to benefit from generous transfers. In contrast, a participant who expressed the same preference as a current giver was subsequently less rewarded. **These findings indicate that forming a bond with a future opponent reinforces sequential reciprocity**. Participants appear to reward those investing in future in-group matching, while potentially punishing those who prioritized present in-group matching instead. **Thus, making a bond with the future opponent strengthens sequential reciprocity**[23].

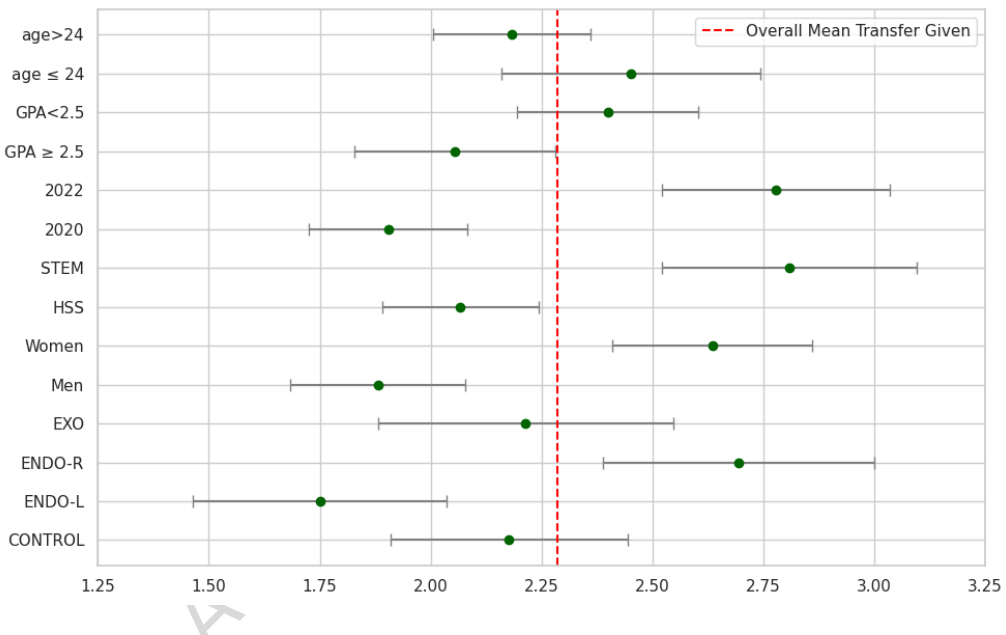


Figure 4: Average transfers by socio-demographic attributes as covariates with 95% confidence intervals

Since WTP decisions may reflect underlying individual traits —such as risk preferences, beliefs, or identity-related motivations— we will analyze these decisions in more detail in the following section. Before doing so, however, we first provide a general overview of how transfers vary with socio-demographic characteristics and with the risk, environmental, and belief-related preferences that were controlled in our estimations. Participants were mainly undergraduate social sciences students (95%) aged under 24 with a mean GPA in the interval 2.00-2.50. In general, players with higher GPAs transferred less and STEM students transferred more, women and older participants transferred more. The experimental sessions took place in two different periods. First in 2020, two months after the declaration of COVID as a pandemic, in May 2020 and second in April 2022 after the ease of restrictions. In Figure 4, we see that transfer levels are significantly higher after the ease of restrictions compared with the beginning of the outbreak.

3.6. Notes on sources of homophily

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Our findings suggest that a preference for interacting with similar others is a key driver of in-group bias. In the context of the pension game, cooperation can emerge through both forward-looking reciprocity and group identity. The experimental results indicate that reciprocity plays a significant role in explaining transfer behaviours that exceed the predictions of purely self-interested rationality. We now turn to the underlying drivers of this homophily, examining how socio-demographic characteristics, preferences, and beliefs shape individuals' willingness to interact with in-group members.

The survey that we have conducted, includes questions on environmental preferences because environmental preferences (except the one about littering) may indicate altruistic concerns as they entail a preference to preserve current environment for future generations and to cut current consumption or satisfaction for future well-being and they can help us look for signs of altruism[24]. There are also questions related to beliefs. Instead of directly inquiring about participants' religious affiliation or practices, we sought to capture their underlying belief systems by assessing their perceived control over uncertain outcomes[25].

We have used this data on personal characteristics to explore the decision of willingness to pay for an in-group matching (WTP). The estimation results[26] suggest a positive relationship between risk aversion and WTP. This may reflect a behavioural tendency to invest in identity-driven interactions under potential strategic uncertainty. Similarly, Kets and Sandroni (2019) argue that "while there may not be any direct payoff benefits associated with interacting with the same group, there may be strategic advantages, in the form of a reduction of strategic uncertainty." We have found above that participants behave more altruistically in the group (Table 5) and expect higher reciprocity (Table 4) under endogenous matching structure. Therefore, in uncertain environments, they are more likely to behave homophilously.

The negative and significant coefficients on mid-level position in the sequence of players indicate that early positioning within the game's sequence may reduce perceived reciprocity benefits or alter social signaling incentives. Figure 3a and 3b where WTP increases near both extremities of the sequence of players and near the end of the experiment confirm this result as participants in these positions are less in control. Income is negatively associated with WTP, implying that individuals with higher economic security may place less value on identity-based matching or derive less utility from social proximity in the experimental setting.

The statistically significant negative coefficient of the variable capturing concern for environmental resource preservation indicates that participants with stronger pro-environmental attitudes were, on average, less willing to pay to be matched with someone from their own group. This suggests that such individuals were less inclined to discriminate between participants based on group identity. In contrast, the variable reflecting support for restrictions on residential construction has a statistically significant positive sign. This question may not have reliably captured pro-environmental attitudes because there is a general dissatisfaction with the broad and prolonged scope of ongoing urban renewal project. The significant positive sign of littering when nobody is around may imply the belief that moral obligations are often bounded by group membership rather than universal principles. Overall, the results align with the theoretical view that identity-based preferences are not merely situational but reflect deeper dispositional traits and belief systems.

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4. Conclusion

In social interactions, group formation fosters a sense of belonging and identity, which in turn shapes individuals' behavioural norms and decision-making. This study explored how forward-looking reciprocity is influenced by social identity, how group-based affiliations affect the dynamics of reward and punishment, and whether feelings of belonging promote cooperation in a transfer-making game with a sequential matching structure. Our findings reinforce the results of Currarini and Mengel (2016), who provide evidence of homophily in bilateral matching environments, and are consistent with Adnan et al. (2022), who show that the opportunity to select among social categories increases both economic donations and investment behaviour.

The experimental evidence suggests that participants generally did not behave in a purely strategic manner—similar to findings by Van der Heijden et al. (1998)—and achieved payoffs closer to the socially efficient level. This may reflect an implicit norm of cooperation in intergenerational transfer systems, where the sequential structure creates a tacit link of trust between generations. However, despite this tendency toward efficiency, transfer levels did not reach the social optimum. This indicates that such implicit cooperation may be fragile and could potentially unravel without credible mechanisms of commitment. In overlapping generations settings, such as the pension game studied here, sustaining trust appears to require guarantees that the working generation, which currently finances retirees, will in turn be supported by future cohorts.

The comparison across treatments reveals that in both EXO and ENDO settings, participants' expectations are more strongly and significantly correlated with actual transfers than in the CONT condition. Group-based matching appears to elevate expectations of reciprocity; importantly, our data shows a significant disparity between in-group and out-group transfers. Given that pay-as-you-go pension systems are prevalent in many countries, these findings offer potential policy relevance: fostering commitment and reinforcing group-based solidarity may contribute to the long-term stability and fairness of intergenerational redistribution mechanisms, *though the scalability of such laboratory-induced identities to complex national systems requires further investigation*.

We find evidence of homophily in participant behaviour, even though preferential matching does not directly affect utility in this experimental design. Transfers were significantly higher in in-group matches and substantially lower in out-group matches. Although gains from cooperation were realized to a great extent, grouping further contributed to the cooperative outcome. Notably, even minimal, artificially induced group identities enhanced reciprocity within in-group pairings compared to out-group ones. In line with social identity theory (Tajfel and Turner, 1986), when individuals perceive themselves as members of a group that shares a common fate, they appear more likely to prioritize group interests over individual considerations. The possibility of group-based interaction thus appears to activate norms of reciprocity and cooperation. These findings are consistent with prior research showing that in-group bias may arise both as punishment for in-group norm violations (Shinada et al., 2004; Mendoza et al., 2004) and as positive reciprocity through preferential treatment of group members (Chen and Li, 2009). Moreover, our results extend this literature by highlighting the role of forward-looking reciprocity, wherein participants anticipate future interactions or rewards and condition their current behaviour.

Finally, this study explored how personal characteristics shape behaviour. The survey data included measures of environmental concern, belief in destiny and fate, and risk attitudes, which

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were incorporated into econometric estimation to explain variation in WTP for in-group matching. For instance, higher risk aversion was associated with stronger homophilous preferences, while stronger pro-environmental concern predicted a lower willingness to discriminate between in-group and out-group members. While our study controls for several personal traits, it is important to acknowledge that broader psychological dispositions could also shape responses to group identity and reciprocity. Future research could benefit from incorporating validated measures of social preferences or trust to better isolate the mechanisms underlying in-group cooperation and forward-looking reciprocity. Additionally, due to pandemic-related constraints, our participant pool was limited in size. Although the sample size is relatively modest, the experimental design allowed for rich within-subject variation across multiple decision rounds, providing a high volume of behavioural data to support robust inference. The granularity of this data provides strong empirical leverage for understanding identity-driven cooperation, though future studies with larger, more diverse samples could further validate the scalability of these findings to complex, real-world national pension systems.

Despite these insights, several limitations should be noted. First, the use of an online experimental platform and a specific participant demographic may limit the immediate generalizability of these findings to the broader, more age-diverse population involved in actual national pension systems. Second, the "pension game" is a deliberate abstraction; real-world systems involve complex legal frameworks and macroeconomic fluctuations that were not captured in this laboratory setting. Future research could investigate whether these homophilous tendencies persist when the "cost" of cooperation is higher, or how varying degrees of social distance between groups impact the stability of intergenerational transfers.

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Ethical Approval

This research was conducted in accordance with the principles of the Declaration of Helsinki. The experimental protocol was reviewed and approved by the Ethics Committee of Galatasaray University (Decision Number: 2392). Approval was granted on 16 March 2020. All experimental procedures were performed in strict adherence to the guidelines and regulations established by the approving committee.

Informed Consent

Informed consent was obtained from all participants involved in the study via an electronic consent interface. Before participating in the online experiment, all individuals were presented with information detailing the study's objectives, the voluntary nature of participation, and the

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guaranteed anonymity of the collected data. Participants were required to actively select a "consent" checkbox to confirm they had read the information and agreed to take part before they could proceed to the tasks. Data collection took place online between May 5, 2020, and May 4, 2022. This process ensured that informed consent was documented for every respondent. No personally identifiable information were stored, ensuring the full confidentiality of all participants.

[1] These beliefs are supported by evidence from neuroscience, which suggests that the mesolimbic reward system in the brain, typically activated by stimuli like sex, drugs, food, and receiving money, is also triggered when individuals make charitable donations (Moll et al., 2006). In other words, the act of altruistic giving wires contentment in humans.

[2] See Hamilton (1963), Nowak and Sigmund (2005), Alger and Weibull (2013) and Laslier (2020) for explanations of altruistic behaviour in evolutionary context.

[3] In the dictator game, a player dictates a split of an endowment with another player. Despite the lack of strategic interaction between players, this configuration is called the dictator game. As it can help elicit social preferences, the dictator setup is used widely in experimental procedures. For a detailed overview and analysis of 200 dictator game treatments, see List (2007). This study follows the literature on sequential treatments of the dictator game investigating reciprocity in temporally ordered environments in the literature (Cason and Mui, 1998; Banerjee and Chakravarty, 2021).

[4] Van Dalen et al. (2010) argue that trust in pension institutions (pension funds, banks, insurance companies, and governments), social forces, and psychological dispositions affect the adequacy of retirement savings.

[5] See OECD (2021), Pensions at a Glance 2021.

[6] See Van der Heijden et al. (1998), Guth et al. (2002), Cabrales, Nagel and Rodriguez-Mora (2012) on the investigation of the emergence of an efficient, redistributive social contract; Fatás, Lacomba and Lagos (2007) the efficiency of lump-sum payment rather than annuity benefits in delaying the retirement decision; Fatás et al. (2013) pension saving and risk aversion; d'Albis, Attanasi and Thibault (2020) on ambiguity aversion to uncertain survival probabilities and investment choice.

[7] See also Guth et al. (2002) using an overlapping-generations experiment with two types of intergenerational transfers -voluntary transfers to the previous generation like PAYG contributions and transfers to the next generation like private investment- to investigate the relationship between intergenerational transfers throughout generations and between private investment and future intergenerational transfers to answer the question "is a generation (when old) rewarded for how it treated its parents and/or for how it treated its children?" and find that both relationships are rather weak, and conclude that the subsistence of intergenerational transfers cannot be explained by reciprocity.

[8] Lazarsfeld and Merton (1954) distinguished between status homophily, based on demographic and structural characteristics such as age, gender, and education, and value homophily, which reflects similarity in beliefs, attitudes, or values.} which is basically the desire to interact with others with similar characteristics}

[9] See also Henrich et al. (2001) showing that behaviour vary more across societies and this variation of behaviour across societies can be explained by group-level differences in economic organization and the degree of market integration.

[10] This assignment of participants to groups satisfies the "minimal group paradigm" methodology proposed by Tajfel et al. (1971) which include the minimum conditions required for discrimination to occur between groups. Experimental studies using a minimal paradigm have found that intra-group favoritism is not only motivated by stereotypes, prejudices and racism, but that agents tend to identify with groups in response to weaker motivations. For example, Chen and Li (2009) compared an ad-hoc categorization separated by two trials (maize and blue) and categorization separated by preferences for the paintings of different artists. They have found that although both procedures did not have a significant impact on the size or direction of intra-group bias, the procedure led to intra-group bias.

[11] We have used hypothetical WTP's. This method "relies on the assumption that people often know how they would behave in actual situations of choice, and on the further assumption that the subjects have no special reason to disguise their true preferences" as Kahneman and Tversky (1974) suggests. Although it is possible to add monetary incentives in the setup, this would make the comparison of different treatments difficult since in ENDO treatments, this would

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make the experiment a sequential decision-making environment (first period WTP declarations and second period transfer choices). Instead, we have use WTP as a preference elicitation mechanism with hypothetical initial units. According to our results, 68% of the times, participants used strictly positive WTP's to affect matching.

[12] Since the experiment had a finite number of participants, there was a small chance for the possible impossibility of this mechanism. In this case, we randomly matched the participants.

[13] See Chen et al. (2016) for information on software.

[14] This payment scheme has allowed participants to earn on average 19.4 TL. The payments allowed participants to buy a coffee and a snack on average from Starbucks, a popular alternative among students and a more expensive one.

[15] Provision of information can affect the outcome of the game. For instance, Offerman, Potters and Verbon (2001) proposed a multi-generation pension game with infinite horizon with two treatments: one where subjects made choices and recorded their strategies for all possible histories and another where there were also recommendations by the experimenter on what actions subjects ought to choose following the grim trigger strategy for the cooperative outcome. Results show a low rate of cooperation in both treatments, although recommendations increased the use of the grim trigger strategy.

[16] Fehr and Fischbacher (2004) review evidence on the role of sanctions for norm enforcement.

[17] 2 players out of 80 have made no transfer at all.

[18] Transfers made are in the interval [2.10,2.41] with 95% confidence.

[19] This means that 9% of the participants never declared a WTP different than 0. These were not interested by being matched with a partner from the same group; on the other end, 23% of the participants always declared a WTP different than 0 at each round.

[20] In case of ENDO-L treatment, Pearson correlation coefficient is 0.109 with $p = 0.475$ for in-group transfers and 0.125 with $p = 0.284$. In case of ENDO-R treatment, Pearson correlation coefficient is 0.26 with $p < 0.01$ for out-group transfers 0.166 with $p = 0.155$ for in-group transfers.

[21] The individual characteristics such as risk aversion or pro-environmental attitudes may or may not influence the outcome and/or predictor variables. The fixed effects model allows us to control for these individual characteristics. The F-test for individual-specific effects yields 1.6835, with $p = 0.0005$, confirming that individual fixed effects are statistically significant.

[22] The individual fixed effects are statistically significant for Model II as the F-test for individual-specific effects yields \$1.6056\$, with \$p = 0.0063\$. However, for Model IIa, the F-test for F-test for poolability was \$1.1505\$, with \$p = 0.2599\$ and we have made used a pooled OLS to estimate Model IIa.

[23] Note that participants invested more in future in-group matching on average, as the mean WTP in ENDO-R (4.07) was more than twice the mean WTP in ENDO-L (1.89).

[24] Several studies have shown the search for personal benefits such as better living environment, health and psychological gratification as the main motivation for pro-environmental behaviours (Daube and Ulph, 2016; Hartmann et al., 2017) while several others have found altruism at the root (Clark et al., 2003; Griskevicius et al., 2010) and pro-environmental principles (Eom et al., 2019).

[25] The survey is described in more detail in Appendix B.

[26] Appendix C provides with the estimation results.