Strategic Gaming of Quotas*

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Abstract

Affirmative action quotas are widely used in hiring and promotion, but they may also invite strategic gaming by candidates. In settings with repeated promotion opportunities – such as university faculty careers, corporate advancement, or political candidate selection – quotas incentivize low-chance majority candidates to support minority competitors early to preserve their own later opportunities. Our laboratory experiment demonstrates that participants recognize and exploit these incentives. In the presence of a quota, majority candidates significantly increase early support for minority players. When feasible, participants also engage in reciprocal collusion, and quotas reshape coalition patterns by increasing majority-minority alliances. Both quota-induced strategic gaming and reciprocal collusion reduce allocative efficiency of the promotion process, suggesting that quota design must account for strategic responses.

JEL Codes: C91, C73, J71, J78

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1 Introduction

Affirmative action policies, particularly hiring and promotion quotas for underrepresented groups, have become widespread instruments for addressing inequality in labor markets in academic, political, and corporate settings. More than 100 countries have implemented some form of gender quota in political or corporate leadership (Pande and Ford, 2012). Mandatory board quotas for women have been adopted in several European countries including Norway, France, Belgium, Italy, and Germany (Bertrand et al., 2019), with the E.U. adopting a binding directive in 2022 requiring all member states to implement such quotas. In the United States, affirmative action considerations shape hiring decisions at many universities and corporations, even absent formal quotas. Given their prevalence and the substantial resources devoted to their implementation, it is important to fully understand behavioral responses to quotas.

The goal of quotas is to correct for discrimination and to increase the supply of underrepresented candidates by signaling opportunity (Coate and Loury, 1993; Fryer Jr and Loury, 2005). Experimental evidence on gender quota effectiveness is mixed: some studies document increased entry of women into competition and improved efficiency (Balafoutas and Sutter, 2012; Niederle et al., 2013; Maggian et al., 2020). Others identify harmful side effects on presumed competence (Heilman et al., 1992; Coate and Loury, 1993) and self-confidence (Heilman et al., 1990; Heilman and Alcott, 2001) of selected women, and reduced cooperation with group members promoted by a quota (Mollerstrom, 2012; Dorrough et al., 2016) or even their strategic sabotage (Leibbrandt et al., 2018). However, existing research has focused primarily on how quotas affect the behavior and outcomes of *minority* candidates, and ex-post attitudes towards them. Less is known about how quotas alter the ex-ante strategic incentives of *majority* candidates, particularly in settings with repeated competition and opportunities for collusion.

In this paper, we identify and experimentally investigate a novel strategic channel through which quotas can be gamed: majority candidates may strategically support minority candidates to improve their own future prospects. This mechanism is relevant in any institutional setting where (1) promotion opportunities recur over time, (2) candidates can influence outcomes through supporting others, and (3) affirmative action policies create differential treatment of majority and minority candidates. Such environments are prevalent across a range of institutional settings. Consider academic promotions: departments regularly face promotion and tenure decisions where junior faculty must decide whether to compete or support colleagues, decisions that occur in a context where affirmative action and diversity considerations play an important role and often influence final outcomes (Smith et al., 2004; Holzer and Neumark, 2000). Similarly, corporate boards operate under recurring promotion and appointment decisions where board composition matters (Matsa and Miller, 2013) and where lower levels may influence nomination outcomes. In political parties, candidate selection for winnable seats recurs each election cycle, and parties often face formal or informal diversity requirements (Bagues and Campa, 2021). In all these settings, a majority candidate who anticipates low probability of success in the current period may rationally choose to support a minority candidate, ensuring the quota is filled now and thereby increasing their own chances in future rounds.

We examine such strategic behavior with the help of a controlled laboratory experiment that isolates the core incentives involved in a minimalist setting. Participants engage in a *Promotion*

Game: groups of three players (two majority, one minority) compete across two sequential stages for valuable promotions, with randomly assigned initial ability endowments determining baseline winning chances. We allow for using ones own endowment to promote another candidate. Using a two-by-two between-subjects design, we independently vary whether players can make return transfers (enabling reciprocity-based collusion) and whether a quota mandates that the minority player must win at least one stage. The quota treatment creates a pure strategic incentive for a low-endowment majority player to support the minority player in stage one, thereby preserving their own opportunity for promotion in stage two. The transfer treatment allows us to study whether collusion emerges endogenously and how quota constraints shape coalition formation.

Our results reveal three key findings. First, quotas induce substantial strategic gaming by majority candidates: when their own winning chances are low, majority players increase their support for minority players to improve their prospects in the second stage. This gaming is rational and predicted, but it represents a qualitatively different behavioral response than previously documented quota effects. Second, when reciprocal transfers are possible, participants engage in collusion through mutual support. The introduction of a quota significantly increases majority-minority collusion relative to baseline, demonstrating that the incentives created by quotas shape the pattern of reciprocal behavior. Third, both strategic quota gaming and collusion reduce outcome efficiency. When both are possible, allocative efficiency (the likelihood that the respective highest-ability person is promoted in each stage) is reduced significantly, suggesting that in more complex environments, strategic responses to quotas may partially offset their intended benefits.

Our findings make several contributions to the quota literature and practice. First, we extend the research on unintended consequences of affirmative action policies by identifying a new strategic mechanism. While Leibbrandt et al. (2018) show that quotas can trigger sabotage of minority candidates, and Mollerstrom (2012) and Dorrough et al. (2016) document reduced cooperation with quota-promoted members, we demonstrate that quotas can also induce majority candidates to strategically *support* minority candidates for self-interested reasons. This distinction matters: support-based gaming may appear benign or even beneficial in the short run, but our results on allocative efficiency suggests otherwise. In addition, this mechanism operates through forward-looking strategic behavior rather than through psychological responses like resentment or stereotype threat, indicating that even well-intentioned majority candidates may contribute to quota gaming. Our findings thus identify a form of discrimination that is a strategic response to institutional rules and thus distinct from taste-based or statistical discrimination.

Second, we contribute to understanding coalition formation under institutional constraints, bridging the literature on affirmative action and quotas with the one on reciprocity and (workplace) collusion (e.g., Fehr et al., 1997; Maas and Yin, 2022). The theoretical and empirical literature on quotas has primarily focused on how quotas affect individual incentives to invest in skills and on employers' hiring standards (Coate and Loury, 1993; Fryer Jr and Loury, 2005), with little attention to strategic interactions between candidates competing for the same positions. We show that when candidates can collude, quotas fundamentally alter which collusive coalitions are stable. The combination of a binding quota and the possibility of reciprocal exchange shifts coalition formation towards across-group (majority-minority) patterns. This result connects to the broader literature on favoritism and group identity (Chen and Li, 2009; Shayo, 2009), suggesting that institutional design can cut against natural affiliation patterns.[1]

Third, we introduce the experimental study of sequential promotion opportunities with affirmative action policies. While previous experimental work has examined quota effects in single competitions (Balafoutas and Sutter, 2012; Niederle et al., 2013) or sabotage in individual contests (Leibbrandt et al., 2018), we study repeated promotion settings where the temporal structure creates distinct strategic incentives. This allows us to identify forward-looking gaming behavior that cannot emerge in one-shot environments. Our sequential design also speaks to the empirical interpretation of field data: observed support for minority candidates under quota regimes may reflect strategic self-interest rather than prosocial motivations, suggesting that minority support observed in real-world settings should be interpreted with caution.

Our findings carry implications for the design of affirmative action quotas. The existence of strategic gaming suggests that quotas may be less effective in settings with repeated competition and opportunities for collusion than in one-shot or fully competitive environments. Policymakers may have several institutional levers at their disposal to mitigate gaming without sacrificing quota benefits. These include term limits, rotation requirements, or restrictions on candidate coordination. Fundamentally, our results suggest that the temporal structure of promotion opportunities matters: discrete promotion rounds, each with its own quota, reduce strategic gaming incentives compared to sequential (possibly endogenously timed) opportunities governed by a quota that applies across multiple periods. Beyond these specific design features, our results highlight that quotas operate not in isolation but within strategic environments where all participants respond to changed incentives. Evaluating quota effectiveness requires accounting for these strategic effects.

The remainder of the paper is structured as follows. In Section 2 we present the experimental design of the promotion game, derive hypotheses, and describe our experimental procedures. In Section 3 we present the experimental results, while in Section 4 we provide a discussion and conclude.

2 Experimental Design and Hypotheses

We ran a laboratory experiment to test whether participants strategically respond to quotas. In the experiment, we aimed to implement the basic quota gaming incentives in the simplest environment possible.

2.1 The Promotion Game

The *Promotion Game* has three players, $\mathcal{P} = \{A_1, A_2, B\}$ where A_1 and A_2 are type A players and B is a type B player. The game consists of two stages ($s = 1, 2$). At the beginning of every stage, endowments $e_{i,s} \in \{2, 3, 4\}$ are randomly assigned without replacement to each player

[1] We do not find, as originally hypothesized, a higher incidence of collusion between majority candidates in the baseline treatment, based on homophily / the minimal group paradigm (Ibarra, 1997; Hederos et al., 2025). This may be due to a rather weak induction of group membership ("A" or "B") without quotas. However, it does not affect our result of the quota shaping reciprocal pattern towards majority-minority collusion.

$i \in \mathcal{P}$.[2] In the following, we will denote the A player with the higher endowment in Stage 1 as A_H and the A player with the lower endowment in Stage 1 as A_L.

In each stage, participants can transfer any number of points from their endowment to the other two players. We use $T_{ij,s} \in \{0, 1, ..., e_{i,s}\}$, with $i \neq j$, for player i's transfer to player j in Stage s. Player i's net points after transfers in Stage s are then:

$$x_{i,s} = e_{i,s} - \sum_{j \neq i} T_{ij,s} + \sum_{j \neq i} T_{ji,s}$$

In Stage 1, the player with the most points $x_{i,1}$ wins the stage, $W_1 = \arg\max_{i \in \mathcal{P}} x_{i,1}$. The Stage-1-winner W_1 is promoted and receives a bonus of 30 points in both Stage 1 and Stage 2. In Stage 2, the process is repeated. The outcome, however, depends on the existence of a quota ($Q \in \{0, 1\}$). If there is no quota present, then of the two players who did not win Stage 1, the player with the most points $x_{i,2}$ wins the stage. If a quota is present and player B did not win Stage 1, then player B must win Stage 2. Thus,

$$W_2 = \begin{cases} B & \text{if } Q = 1 \text{ and } W_1 \neq B \\ \arg\max_{i \in \mathcal{P} \setminus \{W_1\}} x_{i,2} & \text{otherwise} \end{cases}$$

In case of a tie in Stage 1 or Stage 2, W_s is randomly selected among the top scorers.

Player i's total game payoffs π_i are given by

$$\pi_i = \begin{cases} x_{i,1} + x_{i,2} + 30 + 30 & \text{if } i = W_1 \\ x_{i,1} + x_{i,2} + 30 & \text{if } i = W_2 \\ x_{i,1} + x_{i,2} & \text{otherwise} \end{cases}$$

In our experiment, we use a two-by-two, between-subject design to vary the rules of the Promotion Game along the following two dimensions. Firstly, we vary whether there is a quota on the type of Stage 1 and 2 winners: in the Quota (Q) conditions, $Q = 1$, such that at least one of the two stages must be won by the B player. In the No-Quota (NoQ) conditions, $Q = 0$, such that the player type is inconsequential for determining the Stage 1 or Stage 2 winner. This variation allow us to study the effect of a minority quota on transfers between players and game outcomes.

Secondly, we vary whether transfers between players are possible in Stage 2: In the Stage-2-Transfers (S2T) conditions, players can transfer any number of points from their Stage 2 endowments to the other two players in Stage 2. In the No-Stage-2-Transfers conditions (NoS2T), transfers between players are not possible in Stage 2, i.e. $T_{ij,2} \equiv 0$. This treatment variation

[2] We interpret these endowments simultaneously as a players' ability (determining their initial chance of being promoted) and their social capital which they may use to support another player. Alternative approaches include modeling ability and social capital as separate random endowments (or using a constant social capital endowment), or setting Stage 2 endowments equal to Stage 1 endowments plus a random shock. With the experimental implementation in mind, we decided for the environment that is the simplest to understand by participants and still captures the incentive structure we are interested in.

allows us to control whether reciprocal transfers are possible or not.

Our factorial design yields four treatment conditions: NoQ-NoS2T, Q-NoS2T, NoQ-S2T, and Q-S2T, independently manipulating the presence of a quota and the possibility of reciprocity. The minimalist Promotion Game captures key features of the promotion scenario we are interested in studying, while abstracting from confounding factors. Participants have a sequentially repeated chance of winning a large prize. Their chances of winning vary every round, such that participants have to make a strategic decision whether to compete or to support another candidate in each stage. We consider winning a stage as representing getting a desired promotion, and endowed points to represent both the level of qualification for the promotion and the amount of social influence a candidate has on the promotion outcome. Supporting other candidates is costly. The experimental setting allows us to abstract from any context-dependent factors, such as reputation, seniority, gender, etc., which introduce additional complexity and make it difficult to study the strategic incentives introduced by a quota in the field.

2.2 Hypotheses

In this section we derive our hypotheses for the *Promotion Game* experiment. Since participants in the experiment are anonymous and matched with new players every round, strategies that span more than one round are not feasible. Thus we analyze the one-shot game in our theoretical considerations.

2.2.1 Strategic Incentives and Reciprocity

We begin by assuming purely self-interested preferences; that is, each player i maximizes π_i with respect to $T_{ij,s}$.

Consider first Stage 2: In the NoS2T conditions, $T_{ij,2} \equiv 0$ is implied. In the S2T conditions, for a self-interested player $\frac{\partial x_{i,s}}{\partial T_{ij,s}} < 0$ for all players i and in all treatment conditions, and thus $T^*_{ij,2} = 0$.

Next, consider Stage 1: When $Q = 0$, i.e., when there is no quota, given $T^*_{ij,2} = 0$ Stage-1-transfers $T_{ij,1}$ do not influence a player's chances in Stage 2 in case she does not win Stage 1. As a result – and since transfers are costly – her payoff is strictly decreasing in Stage-1-transfers, $\frac{\partial \pi_i}{\partial T_{ij,1}} < 0$, implying $T^*_{ij,1} = 0$ for all players.

When there is a quota, $Q = 1$, incentives for Stage 1 transfers depend on player type. Player B will automatically win one of the two stages, and strictly prefers to win Stage 1, so B's best strategy is to make no transfers in Stage 1 independent of their endowment, $\frac{\partial \pi_B}{\partial T_{Bj,1}} < 0$ and $T^*_{Bj,1} = 0$. Similarly, player A_H is either winning herself or player B is winning the first stage, such that $\frac{\partial \pi_{A_H}}{\partial T_{A_H j,1}} < 0$ and $T^*_{A_H j,1} = 0$.

For player A_L, incentives are different. If $e^1_B = 4$, i.e., B is winning stage 1 without transfers, and the Stage 2 winner is randomly determined among A_L and A_H by their Stage-2-endowments. Therefore, $Pr(A_L = W_2) = 0.5$ irrespective of $T_{A_L j,1}$, so A_L will make no transfer, $\frac{\partial \pi_{A_L,1}}{\partial T_{A_L j,1}} < 0$ and $T^*_{A_L j,1} = 0$. If on the other hand $e_{B,1} < 4$, i.e., A_H has the highest endowment and either B is in second and A_L in third place, or A_L is in second and B is in third place, then if player A_H wins Stage 1, player B will win Stage 2 due to the quota rule, and A_L has no chance of winning either Stage 1 or Stage 2. If A_L transfers her endowment to B, player B will win Stage 1, and player A_L has still a chance of winning Stage 2. In other words, $Pr(A_L = W_2) = 0$ unless A_L transfers $e_{A_L,1}$ to B, in which case $Pr(A_L = W_2) = 0.5$. As a consequence, under the promotion profits we use in our experiment, A_L maximizes her expected payoff with $T^*_{A_L B,1} = e_{A_L,1}$.

We thus derive the following hypothesis:

1. For cases $e_{B,1} < 4$, $T_{A_L B,1}$ in Q-NoS2T and Q-S2T is larger than $T_{A_L B,1}$ in NoQ-NoS2T and NoQ-S2T, respectively.

Next, we consider transfer incentives under reciprocal preferences. A reciprocal player may entertain a utility function that incorporates her monetary payoff π_i but also a reciprocity term that depends on the difference between her transfer to another player and that player's transfer to here, e.g.,

$$U_i = \pi_i - \sum_{j \neq i} \lambda_{ij} |T_{ij,2} - T_{ji,1}|.$$

We assume that λ_{ij} is a function of both player j's transfer in the first stage and its effect on the target player i. In particular, $\lambda_{ij} > 1$ if player i's endowment was not the highest, $e_{i,1} < 4$, player j's Stage 1 transfer to player i was positive, $T_{ji,1} > 0$, and player i consequently won Stage 1, $i = W_1$. That is, we particularly model the reciprocal feeling towards a another player who helped a player to win Stage 1 and obtain the highest game payoff. In addition, we assume an in-group bias in reciprocity, $\lambda_{AA} > \lambda_{AB}$. Research in Psychology on social identity and in-group bias has found that people have stronger social preferences towards members of their in-group (e.g., Tajfel, 1970; Tajfel et al., 1971; Brewer, 1979).

In the NoS2T conditons, $T_{ij,2} \equiv 0$, and thus predictions under reciprocity preferences are equivalent to those with purely self-interested preferences. In the S2T conditions, for $\lambda_{ij} > 1$, as long as it does not keep her from winning Stage 2 and given her budget constraints, in Stage 2 a reciprocal player i characterized by the utility function above would return any points she received from j in Stage 1: $T^*_{ij,2} = min(T_{ji,1}, e_{i,2})$. If i received points from two players in Stage 1 to help her win, given $\lambda_{AA} > \lambda_{AB}$ she would first return the points to players of her own type before returning points to players of a different type.

In Stage 1 in NoQ-S2T, a reciprocal relationship may be initiated from any player to any other player who is not the player with the highest endowment, giving up points and thus the chance to win Stage 1 in expectation for a reciprocal gift and thus chances to win Stage 2. If an A player receives Stage-1-transfers from both a B player and an A player that help her win Stage 1, she will first reciprocate to the A player in Stage 2. As a result, we expect within-group collusion between A players to be more frequent than across-group collusion between an A and a B player. In Q-S2T, collusion between A players is effectively prevented since the B player must win one of the two promotion stages, but reciprocal relations between A players and player B are still possible. Since player A_L has additional strategic incentives to support player B whenever B does not have the highest endowment in Stage 1, we expect collusion between A_L and B to be more frequent than between A_H and B. Based on these considerations we derive the following testable hypotheses.

2. In NoQ-S2T and Q-S2T, the sum of Stage 1 transfers is larger than the sum of Stage 1 transfers in NoQ-NoS2T and Q-NoS2T, respectively.

2a. In NoQ-S2T, the increase in the sum of Stage 1 transfers compared to NoQ-NoS2T comes mostly from an increase in $T_{A_L A_H,1}$ and $T_{A_H A_L,1}$ (i.e., transfers between the two A players).

2b. In Q-S2T, the increase in sum of Stage 1 transfers compared to Q-NoS2T comes mostly from an increase in $T_{A_L B,1}$ (transfers between A_L and B).

2c. In both treatments NoQ-S2T and Q-S2T, there is a positive correlation between received and returned transfers (i.e., $T_{ij,1}$ and $T_{ji,2}$ for players i and j).

2.2.2 Efficiency

Further, keeping our assumptions on U_i, we can make predictions about outcome efficiency. For this purpose we define an efficient outcome as one in which the most qualified candidate, i.e., the candidate with the highest initial stage endowment among those eligible, gets the promotion. This definition allows us to compare efficiency losses across conditions, comparing the effect of a quota to that of gaming and collusion.

Table 1: Expected ability and allocative efficiency (probability of top players winning) under different Quota conditions and reciprocity assumptions

	Expected ability (points)			Expected allocative efficiency		
	S1	S2	S1+S2	S1	S2	S1+S2
No quota, no reciprocity	4.00	3.67	7.67	1.00	1.00	1.00
No quota, A-A reciprocity	3.67	3.44	7.11	0.67	0.83	0.55
Quota, no strategizing, no reciprocity	4.00	3.22	7.22	1.00	0.67	0.67
Quota, strategizing, no reciprocity	3.00	3.67	6.67	0.33	1.00	0.33
Quota, strategizing, A-B reciprocity	3.00	3.22	6.22	0.33	0.67	0.22

We consider two measures of efficiency: The share of stages which are won by the player with the highest endowment (excluding Stage 1 winners), which we call *allocative efficiency*, and the points of the winner, which we call *expected ability.* Both measures lead to comparable conclusions. In Table 1 we calculate the expected points of the winner as well as the probability of the player with the greatest endowment winning in Stage 1 and Stage 2 under different Quota conditions and reciprocity assumptions. In the case with no quota and reciprocity (as in NoQ-NoS2T, where no quota is present and reciprocal transfers are prevented by design), both Stage 1 and Stage 2 are always won by the eligible player with the highest stage endowment. Thus efficiency is 100% in both stages. Allowing for reciprocal preferences (NoQ-S2T) and assuming a strict in-group bias, such that the two majority players engage in a reciprocal relationship when the minority player has the highest Stage-1 endowment, reduces expected allocative efficiency in Stage 1 and Stage 2 to 67% and 83% respectively (Stage 1 is always won by an A player, and Stage 2 always by an A player if he helped out in Stage 1). Table 1 row 3 shows the effect of a minority quota when no strategic transfers or reciprocal actions take place.[3] Compared to the NoQ-NoS2T baseline, a quota mechanically reduces allocative efficiency in Stage 2 to 67% (where the B player wins for sure if not winning Stage 1), but not in Stage 1 (where the player with the highest endowment wins). When a quota is present without reciprocity possibilities, and A_L players engage in strategic transfers (in treatment Q-NoS2T), then allocative efficiency is reduced to 33% in Stage 1 (as player B always wins Stage 1), but remains at 100% in Stage 2 (where the A player with the highest endowment will win). Finally, when there is a quota and a pair of A and B players engage in reciprocal behavior, then expected allocative efficiency is lowest: 33% and 67% in Stage 1 and Stage 2 respectively (player B always wins Stage 1, while the Stage 2 result is possibly biased by reciprocal transfers).

In summary, our theoretical considerations yield the predictions that (1) reciprocity reduces efficiency, (2) a quota reduces efficiency, (3) when there is a quota, strategizing further reduces efficiency, (4) while a pure quota (without strategizing) would lead to more efficient outcomes in Stage 1 than in Stage 2, strategizing leads to less efficient outcomes in Stage 1 than in Stage 2. Based on these predictions, we formulate the following hypotheses.

3. Both Q and S2T reduce efficiency.
   - 3a. In NoQ-S2T, efficiency over both stages is lower than in NoQ-NoS2T.
   - 3b. In Q-NoS2T, efficiency over both stages is lower than in NoQ-NoS2T.
   - 3c. In Q-S2T, efficiency over both stages is lower than in Q-NoS2T.
   - 3d. In Q-NoS2T, Stage 1 efficiency is lower than Stage 2 efficiency.

2.3 Experimental procedures

We conducted the experiment between June and October 2025 at WULABS at WU Vienna. Altogether 315 participants were recruited with ORSEE (Greiner, 2015), with 59% being female and a mean age of 24 years. The experiment was programmed in oTree (Chen et al., 2016).

In the experiment participants participated in the *Promotion Game* for 30 rounds, with random rematching of participants to groups (within matching groups of nine participants) but constant role assignment (As stay As and Bs stay Bs, to allow for within-role learning). In the instructions (see Appendix B), we refrained from using terms like "promotion", "quota", "majority", "minority", or similar in the experiment, in order to study the behavior induced by the strategic incentives of the game without real-world connotations biasing behavior.

At the end of the experiment, two rounds were randomly selected for payoff, and all participants received their game income from these two rounds at an exchange rate of 6 points = EUR 1. The experiment sessions lasted about 45 minutes per session and participants earned on average EUR 12.00 (SD = EUR 6.51) plus a EUR 5 show-up fee.

[3]Note that this would correspond to a treatment condition in our experiment with a quota but where we prevent any transfers (and thus strategic player decisions) in Stage 1 and Stage 2. For obvious reasons there is no point in running this treatment, but it serves as an interesting theoretical benchmark to compare against.

3 Results

We first present our results on Stage 1 transfers between players and how they are shaped by strategic incentives. Second we will examine Stage 2 transfers and the reciprocal patterns between players. Last we will turn our attention to the effects of these behaviors on overall allocative efficiency in the promotion game. Unless indicated otherwise, in this section we report the results of panel regressions on the participant level with round fixed effects and standard errors clustered at the independent matching group level.

3.1 Strategic Incentives and Transfers

The mean Stage 1 transfer across all players and rounds is 0.42 ($SD = 0.73$) in NoQ-NoS2T, 0.51 ($SD = 0.92$) in Q-NoS2T, 0.75 ($SD = 1.04$) in NoQ-S2T, and 0.82 ($SD = 1.11$) in Q-S2T. Figure 1 disaggregates these mean transfers by treatment condition and sender and receiver type.

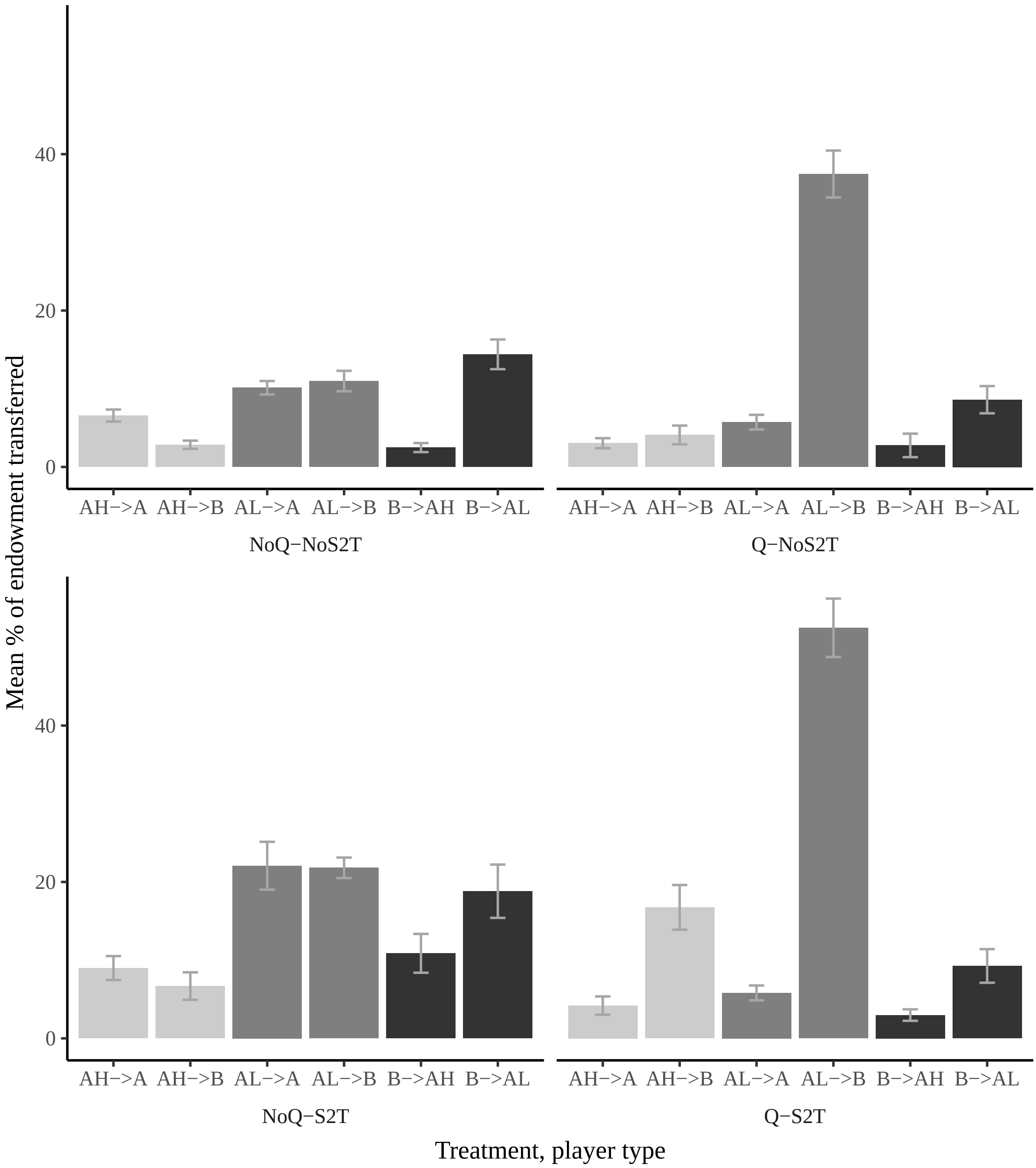
Our main research question is whether a quota leads majority players to strategically support minority players in order to improve their own chance of winning. To test this hypothesis, we compare Stage 1 transfers made from A_L to B ($T_{A_L B,1}$) in the Quota treatment conditions and the No-Quota conditions. In Table 2 column (1) we regress $T_{A_L B,1}$ on the treatment conditions in cases where B does not have the highest Stage 1 endowment ($e_{B,1} \neq 4$). These are the cases where A_L has a strategic incentive to support B in Stage 1, because if B does not win Stage 1, the quota dictates that B wins Stage 2 and A_L wins neither stage. When there is a quota, A_L players transfer 0.85 more points to B than when there is no quota ($p < 0.01$). This is in support of Hypothesis 1. Low-endowment majority players transfer significantly more points to the minority player when this is strategically meaningful. We also find that when Stage 2 transfers are possible, allowing for reciprocity, A_L players transfer 0.21 more points to B than otherwise ($p < 0.01$). In column (2) we include an interaction term between the treatment conditions Q and S2T. It is not significantly different from zero; i.e., while there is a higher level of initial transfers when Stage-2-transfers are possible, the increase in transfers from A_L to B due to the quota is about equal in NoS2T and S2T.

3.2 Collusion and Reciprocity

Next we have a look at whether players collude when reciprocal transfers are possible. To test this we regress the sum of Stage 1 transfers made by a participant in each round on treatment conditions in Table 2 column (3). In line with Hypothesis 2, we find that when Stage 2 transfers are possible, participants transfer 0.31 points more to other players in Stage 1 than otherwise ($p < 0.01$).

Are there in-group preferences when there is no quota? Our Hypothesis 2a states that when Stage 2 transfers are possible, there are more Stage 1 transfers between A players, in particular $T_{A_L A_H,1}$, than between A and B players. Figure 1 shows a breakdown of Stage 1 transfers by treatment and sender and receiver. Comparing NoQ-NoS2T with NoQ-S2T (the top left and the bottom left panels in Figure 1) we see that $T_{A_L A_H,1}$ and $T_{A_L B,1}$ increase roughly equally. In NoQ-S2T, A players reciprocate slightly more on average to other A players (0.67 points)

Figure 1: Mean Stage 1 transfers by treatment and player type



Note: Mean Stage 1 transfer relative to endowment by sender and recipient type. Error-bars indicate bootstrapped standard errors clustered on matching groups.

Table 2: OLS regressions of transfers

Dep. var.	S1-Transfer A_L to B $T_{A_L B,1}$		S1 transfers sum $\sum T_{ij,1}$		S2 transfers $T_{ij,2}$
	(1)	(2)	(3)	(4)	(5)
S2T	0.207**	0.217***	0.313***	0.327***	
	(0.069)	(0.046)	(0.049)	(0.064)	
Q	0.845***	0.855***	0.085	0.100	−0.046
	(0.069)	(0.098)	(0.049)	(0.055)	(0.034)
S2T × Q		−0.020		−0.029	
		(0.138)		(0.098)	
Received ($T_{ji,1}$)					0.281***
					(0.042)
Sample	$e_{B,1} \neq 4$	$e_{B,1} \neq 4$	All	All	S2T conditions
Stage	1	1	1	1	2
Observations	2,099	2,099	9,450	9,450	9,540
Adj. R^2	0.188	0.187	0.026	0.026	0.110
Within R^2	0.167	0.167	0.028	0.028	0.111

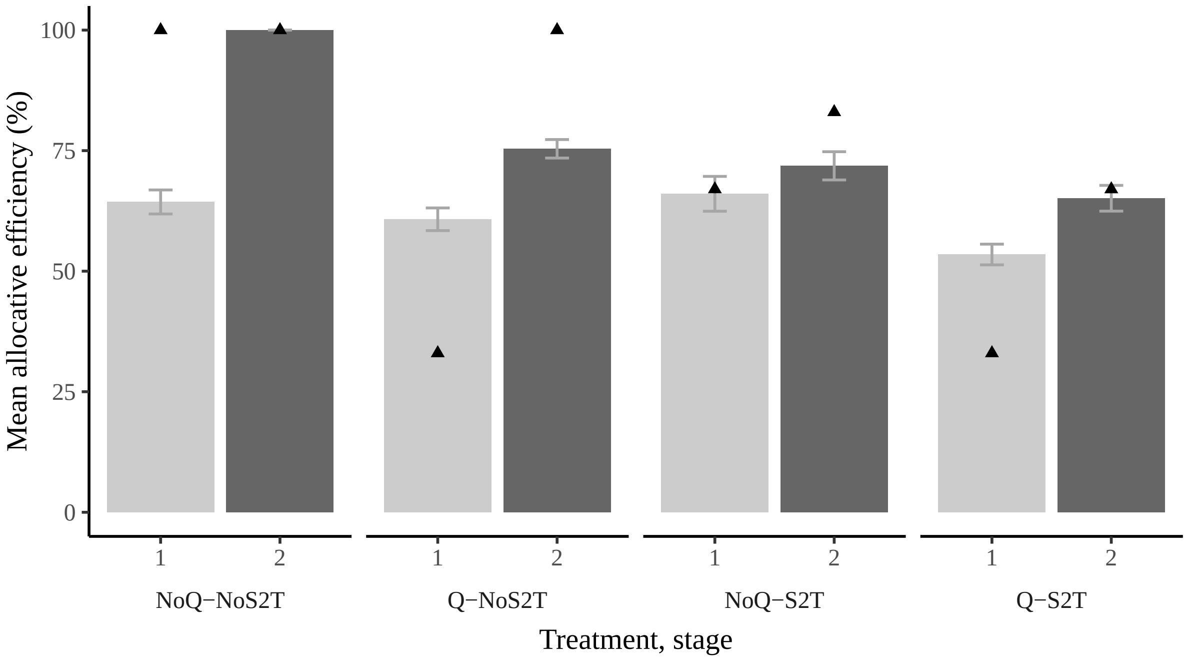
Note: Coefficient estimates from OLS regressions with round fixed effects and standard errors clustered by matching group ID. Significance codes: *p<0.05; **p<0.01; ***p<0.001.

than to B players (0.61 points) conditional on receiving a transfer in Stage 1, but the difference is statistically not significant. Thus, we do not find evidence suggesting in-group preferences in this setting (Hypothesis 2a).

When there is a quota, A-A collusion is hindered but A-B collusion is not. In line with this, we observe very few transfers between A players in the quota treatment conditions. Comparing Q-NoS2T and Q-S2T (the upper right and lower right panels of Figure 1), we see that there is a large increase in transfers from A_L to B, in line with Hypothesis 2b. Interestingly though, we also observe an increase in transfers from A_H to B, that is also A_H players try to collude with B but to a lesser extent. This may be rational if they expect due to A_L's transfers B will be the Stage-1 winner and that with Stage-1-transfers they may maintain a chance of B's reciprocal transfers in Stage 2.

Is there reciprocal behavior? Assuming pure payoff-maximizing preferences predicts that no (return) transfers are made in Stage 2. Contrary to this, the average transfer in Stage 2 in S2T treatment conditions is 0.51 points. In column 5 of Table 2 we regress the amount transferred from player i to player j in Stage 2 ($T_{ij,2}$) on the amount i received from j in Stage 1 ($T_{ji,1}$). In support of Hypothesis 2c, we find a positive and significant correlation between amount received and amount returned, suggesting reciprocal behavior. Figre A.6 in Appendix A shows Stage 2 transfers by sender and recipient type. In Q-S2T we observe a large share of Stage 2 transfers from B to A_L, suggesting reciprocity for transfers from A_L to B in Stage 1. In Appendix Table A.1 we regress $T_{ij,2}$ on $T_{ji,1}$ interacted with indicators for transfers from A to B and from

Figure 2: Mean allocative efficiency by treatment



Note: Percentage of stages won by the player with the greatest endowment (excluding the Stage 1 winner in Stage 2). Triangles indicate theoretical predictions (see Table 1). Error-bars indicate bootstrapped standard errors clustered on matching groups.

B to A. We do not find evidence in support of stronger reciprocal behavior between A players than between A and B players.

3.3 Efficiency

Next we consider the impact of a quota and collusion possibilities on efficiency. We consider efficiency from the point of view of the employer who wants the most qualified candidate to get the promotion. In the context of the promotion game, a player's points represent both their ability and their social capital. We thus consider the outcome to be efficient when the player with the greatest endowment wins a stage (excluding the Stage 1 winner in Stage 2). We measure efficiency in two ways: (1) the proportion of stages won by the player with the greatest endowment (*allocative efficiency*) and (2) the average endowment of the stage winners (*average ability*). Table 3 shows coefficient estimates from OLS regressions (linear probability models) of allocative efficiency.[4]

The theoretical considerations in Section 2.2 predict that both a quota and reciprocity reduce efficiency. Figure 2 shows the mean allocative efficiency in both stages by treatment, with the theoretical predictions indicated by the triangle symbol. Table 3 column (1) shows regression estimates of allocative efficiency on treatment conditions. Compared to NoQ-NoS2T, a quota reduces allocative efficiency over both stages by 14.1 percentage points ($p < 0.01$) and and Stage 2 transfers reduce efficiency by 13.2 percentage points ($p < 0.01$). This is in support of Hypotheses 3, 3a, and 3b. The interaction coefficient between Q and S2T is not significantly

[4]Table A.2 in Appendix A shows the same regressions with average ability (winner endowment) as the dependent variable, yielding comparable conclusions.

different from 0, that is a quota reduces efficiency over both stages about equally when there Stage 2 transfers are possible compared to when they are not. This is in line with Hypothesis 3c. Table 3 columns (3) and (4) estimate efficiency effects for Stage 1 and Stage 2 respectively. This reveals that the efficiency loss occurs almost entirely in Stage 2. Columns (4) through (7) estimate the difference in efficiency between Stage 1 and Stage 2 in each treatment condition. Theory predicts that when there is a quota, strategizing leads to lower Stage 1 than Stage 2. In line with Hypothesis 3d, allocative efficiency is 14.6 percentage points lower in Stage 1 than in Stage 2 in Q-NoS2T ($p < 0.01$). Also in line with theoretical predictions, efficiency in Q-NoS2T is lower in Stage 1 and greater in Stage 2 than the theoretical benchmark of a quota without strategic behavior (60.8% in Stage 1 and 75.4% in Stage 2 in Q-NoS2T versus 100% and 67% in the theoretical benchmark). Further, we find statistically significantly lower Stage 1 efficiency in NoQ-NoS2T and Q-S2T, but not in NoQ-S2T. When we use the winner's endowment as efficiency measure (*average ability*) in Appendix Table A.2 Stage 1 efficiency does not fall below Stage 2 efficiency in the Quota conditions. This is because strategic behavior less consistent than theory predicts. While theory predicts that B always wins Stage 1 in the Quota conditions, in practice B only wins 53.7% of the time an NQ-NoS2T and 61.9% of the time in Q-S2T (compared to 30.1% in NoQ-NoS2T and 32.3% in NoQ-S2T). Appendix Figure A.2 shows allocative efficiency by treatment over the 30 rounds: Efficiency levels remain fairly stable across rounds.

Stage 1 efficiency in NoQ-NoS2T is 64.4%, which is well below our theoretical prediction of 100%. This is because theory predicts that no Stage 1 transfers are made in NoQ-NoS2T, yet we observe transfers in 29.5% of cases (compared to 28.6% in Q-NoS2T, 39.6% in NoQ-S2T, and 41.3% in Q-S2T). In Appendix A Figure A.5 shows Stage 1 transfers by treatment and sender and recipient endowment. The top left panel shows that transfers in NoQ-NoS2T occur primarily between the two low-endowment players (endowments 2 and 3) with the largest share of transfers being from endowment 2 to 3. This suggests a form of collusion between low-endowment players based on generalized reciprocity across rounds (Yamagishi and Kiyonari, 2000; Dufwenberg and Kirchsteiger, 2004). We also observe some transfers from endowment 4 to 2. This could be the result of inequality-aversion.

4 Discussion and Conclusion

We study the strategic incentives that arise from affirmative action quotas in repeated promotion environments. Using a laboratory experiment, we test how people behave (1) when a quota creates incentives to strategically support minority candidates, and (2) how these behavioral effects are moderated by the possibility to collude through mutual support.

Our results show that participants not only understand but actively exploit the strategic incentives introduced by quotas. When a quota ensures that at least one minority candidate must be promoted, low-chance majority players transfer more resources to minority competitors in early stages, thereby preserving their own eligibility for later promotions. This forward-looking gaming behavior emerges even without communication or long-term interaction, and implies that quota-induced support may not reflect genuine prosocial preferences or fairness considera-

Table 3: OLS regressions of allocative efficiency on treatment condition and stage

Dep. var.	Allocative efficiency						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
S2T	-0.132***	0.017	-0.281***				
	(0.027)	(0.043)	(0.028)				
Q	-0.141***	-0.036	-0.246***				
	(0.012)	(0.033)	(0.019)				
S2T × Q	0.044	-0.090	0.179***				
	(0.035)	(0.053)	(0.043)				
Stage 1				-0.356***	-0.146**	-0.058	-0.117***
				(0.024)	(0.044)	(0.045)	(0.021)
Conditions	All	All	All	NoQ-NoS2T	Q-NoS2T	NoQ-S2T	Q-S2T
Stages	1 + 2	1	2	1 + 2	1 + 2	1 + 2	1 + 2
Observations	6,300	3,150	3,150	1,560	1,560	1,620	1,560
Adj. R^2	0.030	0.007	0.099	0.214	0.019	0.004	0.009
Within R^2	0.031	0.010	0.101	0.220	0.025	0.004	0.014

Note: Coefficient estimates from OLS regressions with round fixed effects and standard errors clustered by matching group. Significance codes: *p<0.05; **p<0.01; ***p<0.001.

tions. Instead, quotas can unintentionally foster opportunistic alliances that distort promotion outcomes. These strategic responses are qualitatively distinct from previously documented quota effects such as reduced cooperation with quota beneficiaries (e.g., Mollerstrom, 2012; Dorrough et al., 2016) or sabotage (Leibbrandt et al., 2018). Rather than hostility, we observe self-interested cooperation that is instrumentally motivated and efficiency-reducing.

When reciprocal transfers are possible, we observe mutual support consistent with collusion based on reciprocal preferences (Fehr et al., 1993, 1997). Even in an anonymous and non-repeated setting with random rematching, where neither communication nor reputation can sustain cooperation, participants return support to prior benefactors. While reciprocity is typically viewed as socially beneficial, it can also undermine meritocratic outcomes. In the field, where actors interact repeatedly, can communicate, and reputational incentives are strong, such collusive patterns are likely to be even more pronounced.

Combining these mechanisms, we find that both quotas and reciprocity substantially reduce allocative efficiency, and that their interaction amplifies this effect. Thus, efficiency losses arise not only from the mechanical constraint imposed by quotas, but also from behavioral adaptation to those constraints. The introduction of a quota shifts collusive interactions from within-group (majority-majority) to across-group (majority-minority) alliances.

Our findings have direct implications for the design of affirmative action policies. In repeated promotion systems, such as academic tenure processes, corporate advancement ladders, or political candidate selection, policy makers must anticipate strategic and collusive adaptations to quota rules. Quotas that apply across multiple promotion rounds or depend on cumulative outcomes create intertemporal incentives for gaming. Designing quotas that apply to single, discrete promotion rounds, or that are combined with restrictions on mutual endorsement or voting rights, can mitigate such distortions. Similarly, strictly separating decision-making authority from candidate pools reduces the scope for reciprocal exchange. More broadly, our results underscore that institutional interventions do not operate in isolation: even when fairness norms are well established, strategic actors will endogenously adapt to the incentive structure.

Our study provides a first experimental test of quota gaming in sequential promotion environments. We implemented a deliberately minimalist design to isolate strategic incentives. Future work could study how quota gaming evolves when candidates interact repeatedly and can build reputations with room for long-term reciprocity. Also, communication may affect the pattern of strategic support and reciprocity. Other studies could explore how observers (mis)interpret observed actions of support for minorities as strategic or altruistic. While in our laboratory experiment we assigned minority and majority group members to the participants, one may also consider testing these mechanisms in an environment with real-world group identities and gender or status differences. Lastly, experimental research could explore the effects of institutional interventions such as rotating decision roles or alternative diversity targets affect strategic gaming and the balance between equity and efficiency. Addressing these questions would further our understanding of how affirmative action interacts with strategic behavior and cooperation, and would help design quota systems that achieve representation without compromising meritocratic outcomes.

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Appendix

A Additional figures and tables

Table A.1: OLS regressions of transfers in Stage 2 (conditional on S2T = 1)

Dep. var.	S2 transfers ($T_{ij,2}$)	
	(1)	(2)
Received ($T_{ji,1}$)	0.234***	0.259***
	(0.034)	(0.032)
Q	−0.049	−0.093
	(0.040)	(0.056)
A->B	−0.003	−0.003
	(0.015)	(0.025)
B->A	−0.018	−0.087
	(0.035)	(0.049)
Received ($T_{ji,1}$) × Q	−0.052	−0.187**
	(0.074)	(0.053)
Received ($T_{ji,1}$) × A->B	−0.006	−0.001
	(0.052)	(0.063)
Received ($T_{ji,1}$) × B->A	0.134*	0.043
	(0.059)	(0.056)
Q × A->B		0.004
		(0.031)
Q × B->A		0.164**
		(0.056)
Received ($T_{ji,1}$) × Q × A->B		−0.007
		(0.078)
Received ($T_{ji,1}$) × Q × B->A		0.199
		(0.097)
Sample	S2T conditions	S2T conditions
Stage	2	2
Observations	9,540	9,540
Adj. R^2	0.115	0.124
Within R^2	0.117	0.125

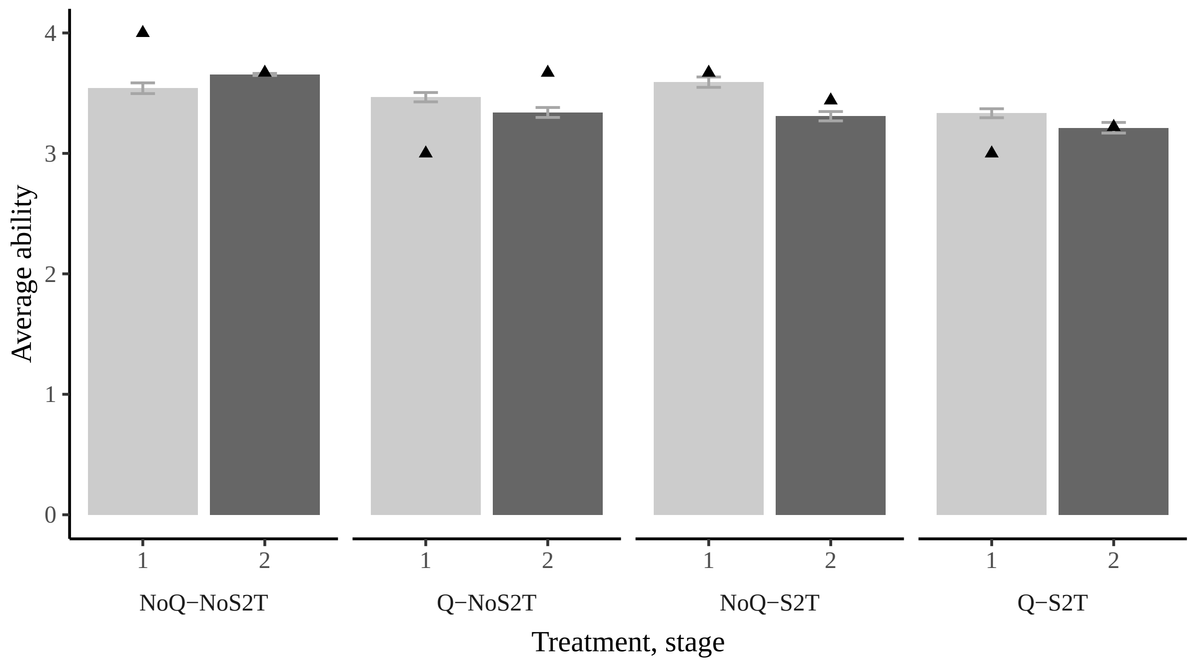
Note: Coefficient estimates from OLS regressions with round fixed effects and standard errors clustered by matching group ID. Significance codes: *p<0.05; **p<0.01; ***p<0.001.

Table A.2: OLS regressions of winner ability on treatment condition and stage

Dep. var.	Average ability ($e_{W_s,s}$)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
S2T	-0.148***	0.050	-0.346***				
	(0.041)	(0.059)	(0.038)				
Q	-0.195***	-0.074	-0.315***				
	(0.025)	(0.057)	(0.040)				
S2T × Q	0.018	-0.184*	0.220**				
	(0.054)	(0.079)	(0.069)				
Stage 1				-0.114*	0.127	0.283***	0.121*
				(0.044)	(0.077)	(0.041)	(0.042)
Conditions	All	All	All	NoQ-NoS2T	Q-NoS2T	NoQ-S2T	Q-S2T
Stages	1 + 2	1	2	1 + 2	1 + 2	1 + 2	1 + 2
Observations	6,300	3,150	3,150	1,560	1,560	1,620	1,560
Adj. R^2	0.026	0.017	0.052	0.002	0.004	0.039	-0.001
Within R^2	0.026	0.019	0.053	0.010	0.008	0.041	0.006

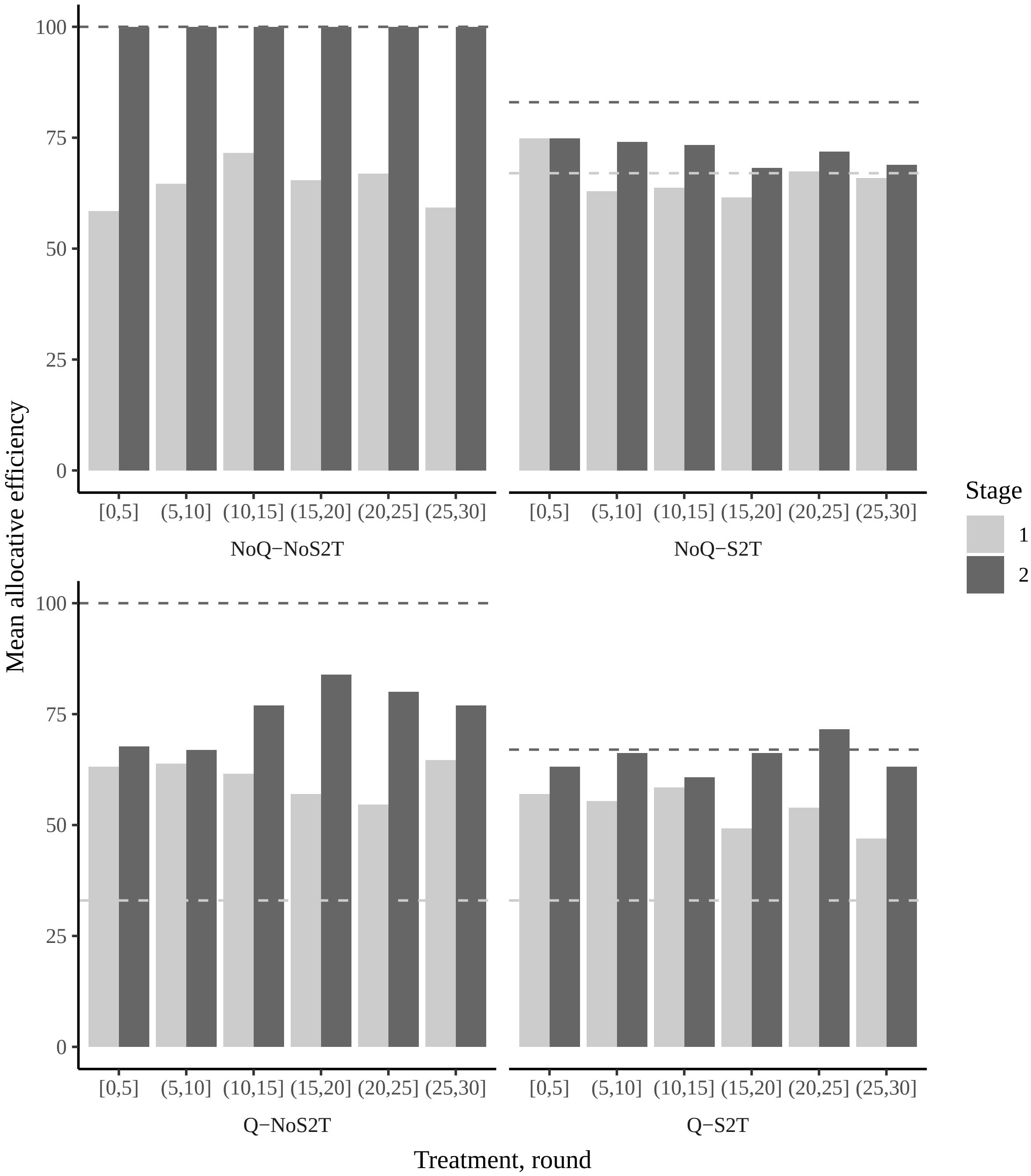
Note: Coefficient estimates from OLS regressions of winner endowment (*average ability*) on treatment and stage with round fixed effects and standard errors clustered by matching group. Significance codes: *p<0.05; **p<0.01; ***p<0.001.

Figure A.1: Average ability ($e_{W_s,s}$) by treatment and stage



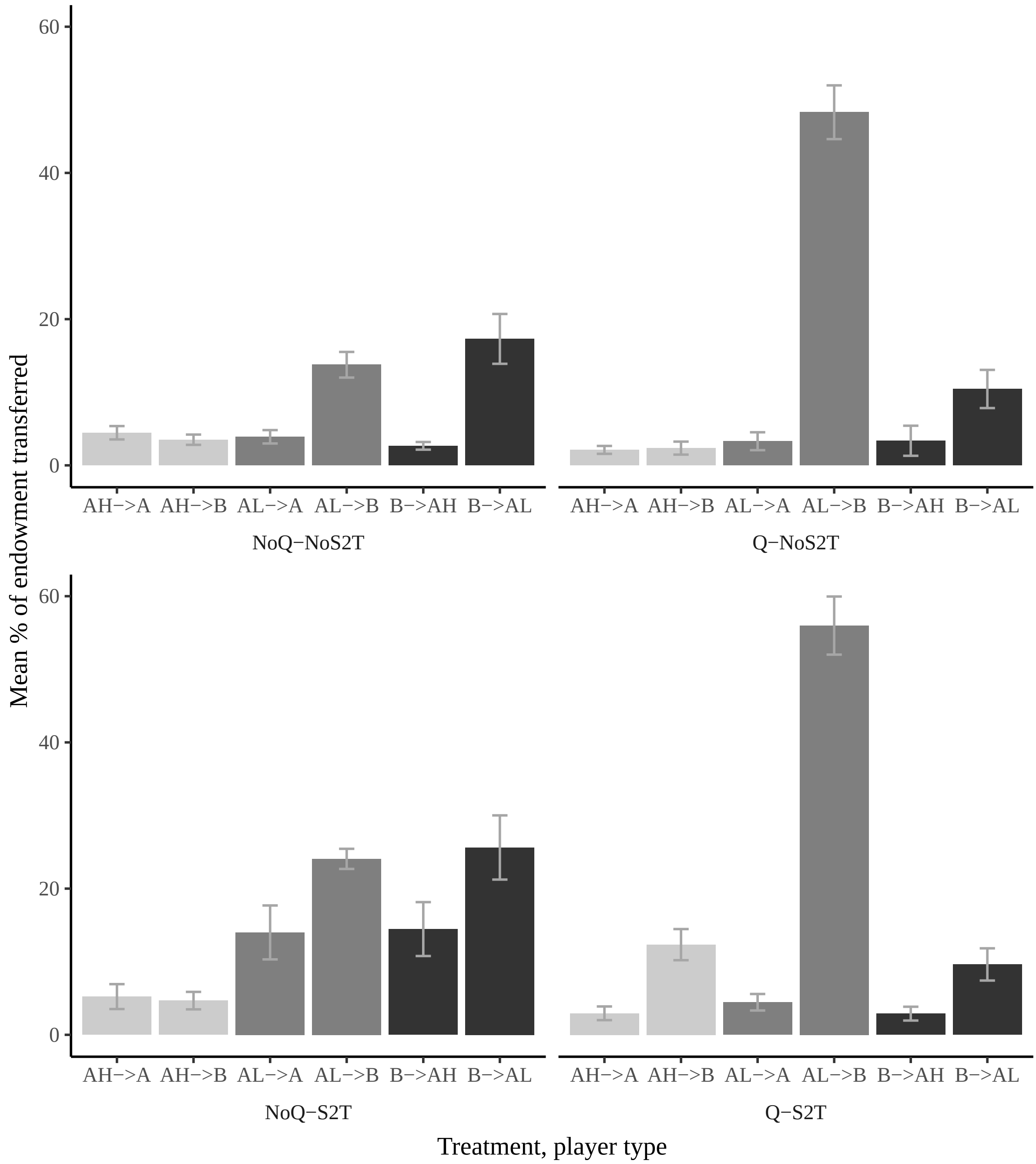
Note: Mean winner endowment by treatment and stage. Triangles indicate theoretical predictions. Error-bars indicate bootstrapped standard errors clustered on matching groups.

Figure A.2: Allocative efficiency over time



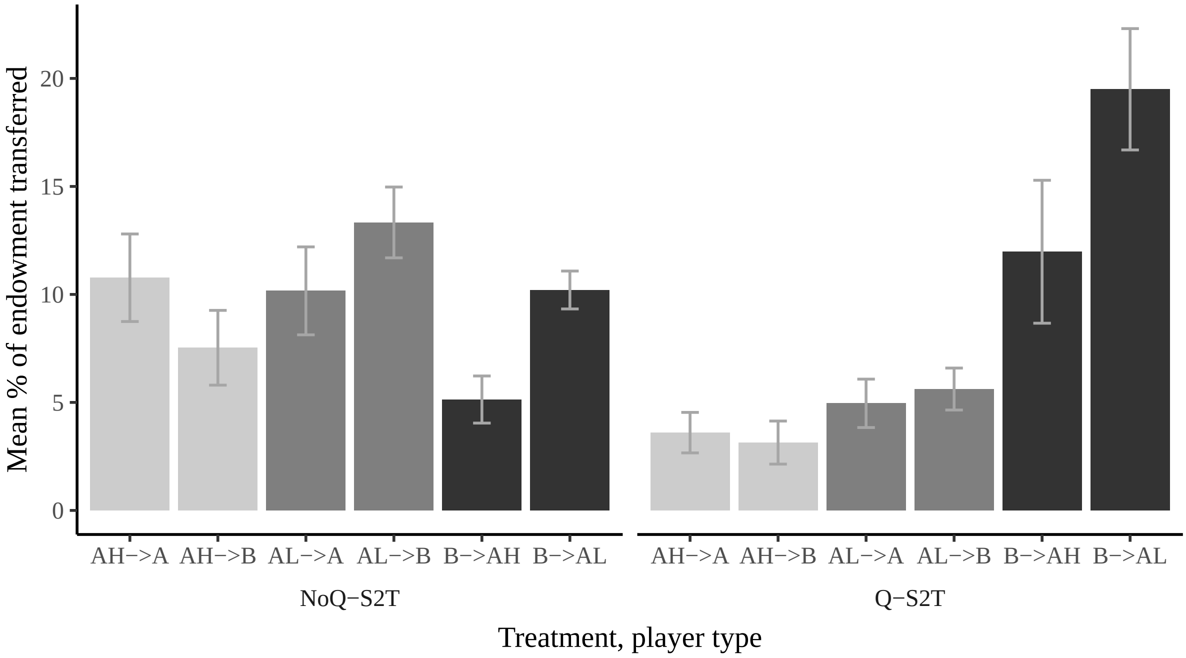
Note: Proportion of stages won by the player with the greatest endowment (excluding the Stage 1 winner in Stage 2) over the 30 rounds. Dashed lines indicated theoretical predictions.

Figure A.3: Stage 1 transfers by treatment and type when $e_{B,1} \neq 4$



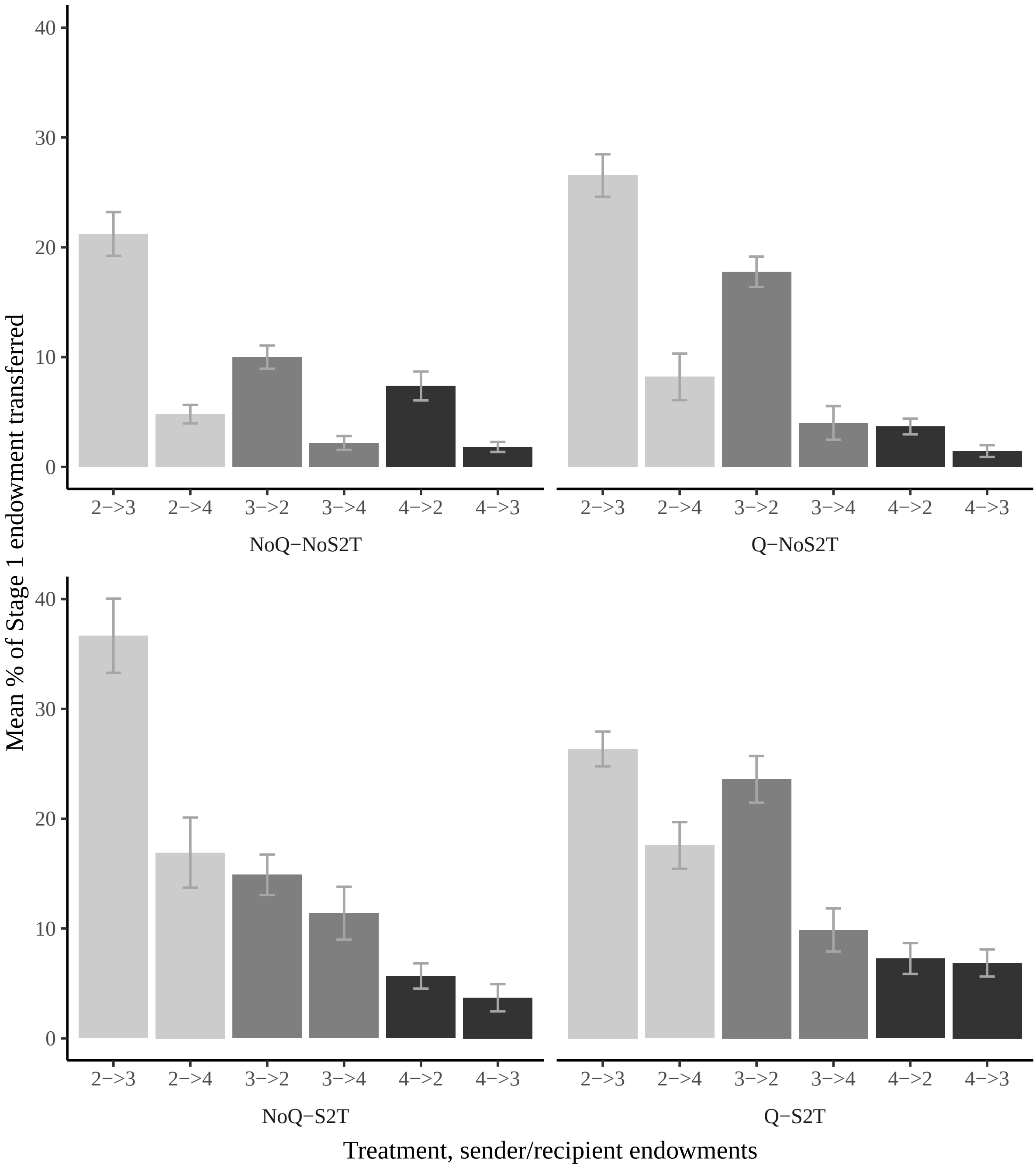
Note: Mean Stage 1 transfer relative to endowment by sender and recipient type when $e_{B,1} \neq 4$. Error-bars indicate bootstrapped standard errors clustered on matching groups.

Figure A.4: Stage 2 transfers by treatment and type



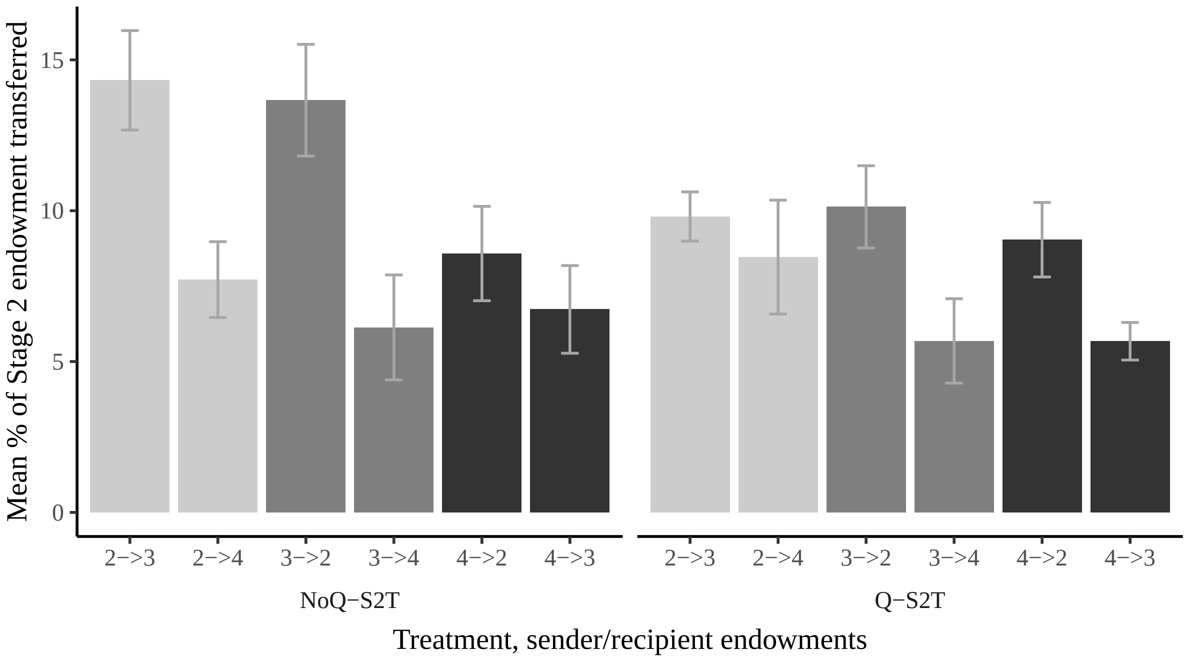
Note: Mean Stage 2 transfer relative to endowment by sender and recipient type. Error-bars indicate bootstrapped standard errors clustered on matching groups.

Figure A.5: Stage 1 transfers by treatment and endowments



Note: Mean Stage 1 transfer relative to endowment by sender and recipient endowment. Error-bars indicate bootstrapped standard errors clustered on matching groups.

Figure A.6: Stage 2 transfers by treatment and endowments



Note: Mean Stage 2 transfer relative to endowment by sender and recipient endowment. Error-bars indicate bootstrapped standard errors clustered on matching groups.

B Experimental Instructions

Instructions

Treatments:

Stage 2 transfers:

- S2T: transfers of points are allowed in Stage 2.
- NoS2T: transfers of points are not allowed in Stage 2.

Type B quota:

- Q: the winner of at least one stage must be type B.
- NoQ: type does not matter for the winner of either stage.

Welcome to this experiment!

This is an experiment on decision-making. Please read these instructions carefully. In the experiment you can, depending on your decisions, earn a considerable amount of money. It is prohibited to communicate with the other participants during the experiment. If you have a question at any time, raise your hand and the experimenter will come to your desk to answer it. Please switch off your mobile phone or any other devices which may disturb the experiment. Please use the computer only for entering your decisions in the decision forms provided, do not start or end any programs, and do not change any settings.

The experiment will go over 30 rounds. In each round you can earn points, depending on your actions and those of the other participants. At the end of the study, two of the 30 rounds will be randomly selected, and you will get paid according to your points in these two rounds, at an exchange rate of 6 points = 1 Euro.

At the beginning of the experiment, each participant is randomly assigned a type (A or B). Your type stays constant through all rounds. In each round, you are randomly grouped with two other participants. There will always be two type A and one type B participants in a group.

Every round has two stages: Stage 1 and Stage 2.

Stage 1

- At the beginning of Stage 1, endowments of 2, 3, and 4 points are randomly assigned to the three participants.
- Participants can transfer any number of their endowment points to other participants.
- Each participant receives their remaining own and received points as payoff.
- In addition, the participant with the most points becomes a “Bonus Recipient” and receives a bonus of 30 points (both in Stage 1 and in Stage 2, see below).

Stage 2

- New endowments of 2, 3, and 4 points are randomly assigned to the three participants.

- *[Treatment S2T: Participants can transfer any number of their endowed points to other participants.] / Treatment NoS2T: In Stage 2, points cannot be transferred.]*
- Each participant receives their [Treatment S2T: remaining own and received] points as payoff.
- In addition, the participant with the most points in Stage 2 also becomes a “Bonus Recipient”, and both “Bonus Recipients” receive a bonus of 30 points.
- Note that:
  - The points of the participant who became “Bonus Recipient” in Stage 1 are ignored when determining the second “Bonus Recipient” in Stage 2.
  - *[Treatment Q: One of the “bonus recipients” must be of type B. If the ”Bonus Recipient” in Stage 1 is type A, then the “Bonus Recipient” in Stage 2 will automatically be the participant of type B.]*

After Stage 2, the round ends, and you are matched with two new participants in the next round.

If this round is one of the two rounds randomly selected for payoff, then each participant receives the sum of their Stage 1 and Stage 2 points, converted to Euros, in addition to the show-up fee of 5 Euros.